The Royal Navy’s fuel supplies 1898-1939: the transition from coal to oil

Brown, Warwick Michael

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THE ROYAL NAVY'S FUEL SUPPLIES, 1898-1939; THE TRANSITION FROM COAL TO OIL.

Ph.D.

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2003
Abstract

This thesis examines the consequences of the Royal Navy's transition from burning coal to burning oil 1898-1939, and argues they were more far reaching than recognised hitherto. That because the Navy was fundamental to the existence of the British Empire and fuel fundamental to a modern mechanised Navy securing naval fuel supplies became a decisive factor in determining the Government's oil policy. Although the technical aspects of the transition were completed quite rapidly, fears over oil supplies delayed its completion and had ramifications for Britain's industrial, foreign and domestic policies. Consequently, the decision to introduce oil fuel was a political rather than a military one. The thesis examines the two main strategies the Admiralty adopted to secure its oil supplies. First, controlling where possible the sources of oil through ownership of an oil company. That this became a source of interdepartmental friction and was exploited by the oil companies, particularly the Anglo Persian Oil Company, to extract preferential treatment from the Government. Second, creating a large oil reserve, the pursuit of which post 1918 ignored the lessons of the First World War and brought the Admiralty into conflict with the Treasury. The thesis argues that although both strategies had varying degrees of success, neither addressed the principal threat to naval oil supplies, which was the limited commercial infrastructure – particularly oil tankers – that was both predictable and avoidable. The thesis demonstrates that once reliant on oil the Navy could not, unlike with coal, control its fuel supplies in isolation but was constrained by the nature of the supplying industry and the conflicting demands of other users, and, finally, that resistance to the Navy's use of oil persisted until 1939.
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Abbreviations and Measurements

Abbreviations

Throughout this work, for the sake of clarity, the British Royal Navy is referred to as the Navy, the Board of Admiralty is referred to as the Board and the First World War is referred to as the War.

Measurements

Petroleum and oil fuel can be measured by either weight or volume. Accurate conversion between the two is difficult as it depends on specific gravity and temperature. In common with British practice at the time, this work uses the English (long) ton of 2,240 pounds (equal to 1.01605 metric tons or 1.12 (short) US tons) throughout for coal, petroleum and oil. The Americans measured oil by volume and used the barrel (35 US or 42 Imperial gallons). Where the original document refers to barrels an approximate equivalent in tons is given based on seven barrels to the ton.

Nomenclature

The nomenclature of petroleum and its derivates is a complex subject. This work uses petroleum when referring to the crude product, as originally extracted from the ground and oil to refer to naval fuel oil.
A SECOND STRING

'King Coal (jauntily to Britannia) "AFRAID I'VE GOT TO CUT ONE OR TWO OF OUR DANCES" Britannia, "OH, DON'T APOLOGISE! IT'S GIVEN ME THE OPPORTUNITY OF MAKING THE BETTER ACQUAINANCE OF PRINCE PETROLEUM - VERY NICE AND GUSHING. YOU MUSTN'T THINK YOU'LL ALWAYS BE INDISPENSABLE."

(Source: Punch 10/4/1912)
Preface

This thesis is concerned with the various aspects of the Royal Navy’s fuel between 1898 and 1939. It argues that the effects of the Navy’s Faustian bargain of sacrificing the strategic asset of coal for the tactical advantages of oil – the greatest single technical change the Navy made in this period – were considerably more far reaching than has been recognised hitherto. In 1898 the Navy was unequalled in size. It power was the product of more than size, it was also derived from tradition, advanced technology, a global logistical infrastructure, a large domestic industrial capacity and an abundant supply of the world’s best maritime fuel. The period covered by this study was a dynamic time technically and politically. The Navy was forced to cope with the introduction of submarines and aircraft as well as changes in strategic direction, two periods of expansion, a world war, disarmament and treaty restrictions. Although this thesis is concerned superficially with fuel, the sustenance of mechanical power, ultimately it is about the preservation of imperial power. Fuel is fundamental to a modern mechanical navy without which a warship is at best a bluff and little more than a hulk. It is therefore astounding that hitherto no work has been devoted to it and it has been treated glibly by most naval historians. Perhaps this is because it lacks the romance of sail or the excitement of combat and leaves few artefacts to stir the imagination; it has, quite literally, gone up in smoke. Nevertheless, the effects of the Navy’s fuel policy are clearly evident in today’s oil industry.¹

Naval history is more than events at sea; Britain’s Navy had a massive social and economic impact on the nation, consuming a significant proportion of its wealth and technical skill.² Where and how the Navy obtained its fuel was crucial to Britain’s existence as a maritime power and consequently the subject of national policy. For another island nation, Japan, with no domestic oil source, the severing of its navy’s fuel supplies in 1941 was a casus belli.³ Why Britain was nearly brought to its knees in 1917 by a shortage of one type of fuel when it had massive reserves of what had been only a few years before the world’s best maritime fuel is an important question. However,

¹The most obvious example is British Petroleum (BP), which without the Admiralty’s support would not exist today.

²Peacetime naval expenditure during the period varied from 6.38% (1932) to 22.7% (1913) of total Government revenue.

to concentrate on the '1917 oil crisis' would be akin to mapping an iceberg and ignoring the part in the water. Although this study concentrates on the supply of fuel, it also informs our wider understanding of the tactical, operational, strategic, organisational, financial and political aspects of the Navy as Captain James Goldrick RAN put it:

If we are to understand navies in the machine age, there must be a new approach to the subject one that integrates the elements of technology, finance, operations and personnel in achieving an understanding of the subject.  

This is also a two way street, because the Navy was fundamental to Britain’s survival its fuel needs had a significant impact on the formulation of defence, industrial, foreign, economic, domestic and social policies at the national level. Consequently, this study is a synthesis of different historical disciplines and presents a new and important facet of naval activity that aids our understanding of the Navy’s role in shaping naval and national history in the first half of the twentieth century.

The first trials of oil burning in marine boilers were conducted in the 1860s, however, it was not until 1898 that the trials that led directly to its introduction commenced. When the Navy rapidly overcame the technical problems, which is hardly surprising as it was the largest and most experienced organisation in developing and introducing new technology in the world at the time. However, the supply problem and its repercussions lasted for over forty years, and due to the paucity of secondary literature the extent that the Navy’s fuel requirements affected policymaking has been overlooked up to now.

Fuel is give scant attention by most naval historians. Indeed the only study that specifically examines British naval fuel during the First World War contains a number of major inaccuracies. So brief and slipshod appearance does fuel make in most works of naval history that they are as often as not misleading. They do though afford a

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6For example see Arthur J. Marder, From the Dreadnought to Scapa Flow, vol. 1. (OUP: London, 1961), p. 271, Marder wrote that ‘The Fisher Royal Commission favoured four years ‘war consumption in reserve,’ and that in 1917 ‘[O]il was down to three weeks supply’. (Marder’s italics) Both these assertions will be corrected in this thesis.
useful contextual backdrop as well as providing technical and statistical information. Industrial and company histories are also patchy in regard to naval fuel, ranging from the scholarly history of British Petroleum to the ‘popular’ coffee table history of Shell. Patchy also describes the official and semi-official war histories; coal and oil were equally vital to the allied war effort 1914-18 but only the coal industry has a volume devoted to it. Oil only received its own volume for the Second World War. Nevertheless, no thesis is an island and a work that spans over forty years and is a synthesis of many historical disciplines must rely to some degree on secondary literature where it exists and is demonstrably of sufficient academic quality.

Consequently, the bulk of this thesis is based on primary sources, and a wide-ranging subject necessitates the synthesis of a wide range of primary sources. Naturally, archival work commenced in the Admiralty files at the Public Record Office (PRO). This soon revealed that supplying the Navy with fuel involved many other departments of state, and the records of the Board of Trade, Cabinet Office, Colonial Office, Department of Scientific Research, Foreign Office, Ministry of Munitions, Ministry of Power, Ministry of Transport and the Treasury were all invaluable, as were the records of the railway companies, also in the PRO. Useful too were a number of Government papers located outside the PRO among personal papers or preserved by the Naval Historical Branch. Although this study is concerned with the British Navy, the American national archives yielded some helpful reports and newspaper cuttings on the Navy’s fuel sent to Washington by the various American Naval attaches of the time. Hansard’s record of the debates in both Houses of Parliament along with published parliamentary papers and the annual Naval Estimates and accounts were also all extremely useful sources of information.

The policies and actions of the oil companies are an essential element to this work and where they exist, their records were examined and proved a very fruitful source. Unlike the major American oil companies, BP maintains an archive, at Warwick University, dedicated to preserving its records and those of its predecessor companies - such as the Anglo-Persian Oil Company (APOC) - which were crucial to this study. The Royal Dutch Shell group also maintains an archive, at Shell House, London, but it is primarily for internal use. Fortunately, inspection of the surviving records (1913-22) of the Asiatic and the Anglo-Saxon Petroleum Companies was generously granted. By contrast, just a few records survive from Lord Cowdray’s

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7The works on general naval policy, ships’ specifications and company history used in the thesis are appropriately cited and included in the bibliography.

Less than comprehensive too are the private papers of the principal individuals involved. Major players in the oil industry were the most reticent in passing on their papers for posterity and it is regretted that none of their personal papers could be located. As a group, admirals were slightly less reticent. The published collections of the papers of Admirals Fisher, Jellicoe and Beatty by the Marder and the Navy Records Society’s were very enlightening.\(^8\) Of the unpublished private papers, only those of Admiral Fisher, at Churchill College, Cambridge, and Admirals Slade and Pakenham at the National Maritime Museum, contained much of value. Moreover, only Jellicoe published an autobiography that contains anything informative about fuel. It has been left to the politicians, especially Winston Churchill, no doubt with an eye to their place in history to ensure their legacy has been preserved either in personal papers or autobiographies, even so these too are less than comprehensive. Papers consulted include those of William Bridgeman and Churchill at Churchill College, Cambridge; and Eric Geddes and Walter Long in the PRO. Another essential source of information were contemporary journals. Particularly helpful of the many seen were Engineering, The Engineer, The Petroleum Review and Mining News (which became the Petroleum Times in 1919), the Journal of the Royal United Services Institute and the Naval Review.

The thesis starts with an examination of the practises the Navy employed in the purchase, transportation, storage and use of coal before the First World War. Why it maintained only a low level of reserve and why the Navy’s coal supplies were provided by many small private companies coordinated by an Admiralty Coal Agents (ACA).

Chapter two looks at the introduction of oil fuel and why fears over the supply of oil made the Navy opt to use combined coal-oil firing for its larger vessels. It also examines the technical and operational advantages and disadvantages of oil as a fuel.

Chapter three covers the introduction of the oil only fired battleship that made the Navy dependent on foreign fuel sources and the background to the political decision that initiated the change. Chapter four examines the Admiralty’s involvement in the oil industry and its 1914 contract with APOC. The next three chapters cover the First World War; five looks at coal supplies to see how the pre-war plans stood up to war

conditions; six looks similarly at wartime oil supplies; seven examines the search for
domestic oil production as well as addressing Admiralty-oil company relations and
wartime attempts to form an 'all-British' oil company. This theme is continued into
chapter eight that examines the powerful Admiralty role in the post-war attempts to
construct an 'all-British' oil company. Nine considers the creation of the large post-
War oil reserve - the subject of constant acrimony between the Treasury and the
Admiralty. Ten explores inter-war operational planning as regards fuel and the role of
the Oil Board. Chapter eleven redirects the thesis back to coal and evaluates post-War
resistance to the Navy's use of oil. A *leitmotiv* of all the chapters is the Admiralty's
efforts to control its fuel supplies; how its degree of control fluctuated according to the
nature of the supplying industry and the conflicting demands of other consumers.

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Chapter One

Coal and the Navy 1900-14

This chapter observes how the Navy acquired, transported, stored and used coal prior to the First World War. It examines the strategic benefits of possessing the world’s best steam coal, the advantages and disadvantages of the using a fuel with a large established infrastructure and the relationship between the Admiralty and the coal companies. Strategic and technological changes in 1900-14 forced the Navy to revise its war plans, fuel arrangements and the very fuel itself. Strategically, the rise of the German Navy necessitated that the bulk of the Navy be concentrated in British waters. To facilitate this realignment commitments needed to be reduced elsewhere, and to this end Britain signed the Anglo-Japanese treaty in 1902. This and Japan’s destruction of the Russian Navy in 1905 released Britain from having to maintain a significant naval presence in the Far East. The 1904 Entente Cordiale with France removed the need for a large Mediterranean fleet to counter France. However, as Germany’s allies Austria and Italy remained astride the Empire’s lifeline to the Orient, the same degree of disengagement achieved in the Far East was not possible in the Mediterranean. Marder places the formulation of the first war plans aimed specifically at Germany in the summer of 1904, when the disposition of the destroyer flotillas and the possible capture of Heligoland as an advance base were discussed.\(^1\) The major realignment was, however, initiated by Admiral John Fisher following his appointment as First Sea Lord in October 1904.\(^2\)

No two coals are the same. Even seams in the same mine can produce coals with different properties, from rock hard anthracite through to bituminous and cannel coals. Admiralty Welsh steam vessel coal was a semi-bituminous coal; not so hard that it burnt too hot and damaged furnaces, but not too friable and open so it broke into dust and burnt too fast. It contained few impurities, allowing fires to be maintained longer before furnaces became choked and required extinguishing, cleaning and relaying. It produced a more complete combustion keeping smoke and ash to a minimum and maximum stowage of calorific value per volume. Naval furnaces and forced draught


\(^2\)Ibid, p. 491.
arrangements were designed to maximise the inherent properties of Welsh, and the stokers’ skill of maintaining a fire evenly across the furnace floor and adjusting the air intake to make efficient smokeless fires also played a part in fully utilising its properties.

Initially, however, the Navy used North Country coal. Its main drawback was the clouds of dense black smoke it created betraying a ship’s position, obscuring signals and encrusting the, still necessary, rigging and masts with soot. The merits of Welsh coal were evidenced to the Admiralty by a series of trials 1848-49 to find the best fuel for naval purposes. Conducted by Sir Henry de la Bèche and Dr. Lyon Playfair, the trials clearly established the superiority of Welsh for Naval use, they reported:

> It is rare to find one coal in which is combined all the qualities essential for the requirements of a ship of war, viz. A quick production of steam - large evaporative power - a smokeless combustion- a capacity for storage in small bulk - the powers of resisting attrition - a freedom from qualities that tend to spontaneous combustion, in addition to other properties of less importance.3

The advantages of Welsh were confirmed in 1854 by experience during the Crimean War.4 Nevertheless, it was not until the late 1850s that the Admiralty obtained most of its steam coal from South Wales.5 The decision to buy Welsh was not one the northern mine owners intended to accept without a fight.6 The controversy, or as the *Northern Daily Express* called it ‘The Welsh and English Coal Fight’ was a vicious affair.7 Caught in the cross fire the Admiralty responded with further trials. As a result in 1869 the Fleet was instructed to use a mixture of small Welsh with a half to a third of North Country coal, a practise that ‘appeared to commend itself on the grounds of economy.’ Evidence soon accumulated of the impracticability of mixing coals on board ship,

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7 *Northern Daily Express*, 30/3/1859.
increased smoke and damaged furnaces. Although use of mixed coal continued, by 1872 the Admiralty purchased nearly all its steam coal from South Wales. Finally, in 1887, mixing coals was abandoned and unless circumstance prevented, Welsh was used exclusively. Nevertheless, the pit head price of North East coal was consistently lower than Welsh. When economy did not interfere with operational requirements the Admiralty purchased the cheaper product, for example 60,000 tons in 1902, for yard craft, heating buildings and cooking both ashore and afloat, indeed even oil-fired ships used coal for culinary purposes until the 1920s.

A responsibility of Senior Naval Officers (SNO) on foreign stations was to monitor local developments and advise the Admiralty of any new fuel source that might prove useful to British or foreign warships. It was the Admiralty’s policy to:

> Widen the sources of supply as far as practicable, and to take advantage of the coal resources of the colonies when they can show local coal to be of suitable quality for H. M. Ships, and can be supplied as reasonable rates.

Use was made of New Zealand Westport coal, although ‘not quite as good as Welsh,’ it was considered a ‘satisfactory substitute’ and a useful ‘second source of supply for the China station;’ with, for example 100,000 tons being acquired 1902-3. During the 1898 Welsh miners’ strike, to preserve stocks of Welsh on the North America station, local Pocahontas coal was used. At home, the strike caused a temporary return to the practise of adulterating Welsh with North Country coal, and curtailing of the annual

---


9 Ibid.

10 *Royal Commission on the Coal Resources of the United Kingdom, 2nd Report (1904), Cd 1990-1991, p. 144. (Hereafter R. C.)*


12 R. C. p. 143.


14 First Lord of the Admiralty’s (FL) statement 1900 Naval Estimates. Cd. 494.


16 *The Engineer*, vol. 85, p. 265, 24/6/1898; R. C. p. 147.
manoeuvres.\(^{17}\) Despite the northern mine owners' efforts the Admiralty remained wedded to Welsh simply because it was the best available fuel in the world.

High class Admiralty steam coal only existed in about 150 square miles in East Glamorgan and Monmouthshire. Anthracite bordered it to the north and bituminous coal to the south.\(^{18}\) A ‘semi-bituminous coal with a volatile content of between 12% and 16% was considered the best’ and by mixing different Welsh coals and improving furnaces it was hoped to increase the number of seams suitable to draw on.\(^{19}\) However, in practice mixing Welsh coals appears to have been very limited, as only one-mixture features on the list of coals contracted for in 1907.\(^{20}\)

The best steam coal lay deep underground in the Rhondda's valleys, and to mine it required a high level of capital investment. Nixon's Navigation colliery's main shaft, for example, took seven years to excavate before production started in 1860. The Admiralty’s use of Welsh enhanced its reputation for quality and significantly boosted investment and production. Moreover, as more efficient marine engines permitted longer voyages and larger cargoes keeping stocks of Welsh overseas became increasingly viable, and consequently South Wales' coal exports boomed - from 63,000 tons in 1840 to nearly 4,000,000 in 1874, the year that Welsh surpassed North East coal as the principal source of commercial bunker fuel.

Welsh coalfields had accessible seams, high productivity and relatively sophisticated mining methods. Steam vessel coal production outstripped all other types of Welsh coal combined in 1880. In the Rhondda alone, thirty-seven collieries were opened 1860-81 and by 1914, fifty-three were in operation.\(^{21}\) This massive expansion was accompanied by an equally large growth in local infrastructure. New railways were built and new coaling ports developed at Penarth, Newport, Port Talbot, Swansea, and

\(^{17}\) R C. p. 144.


\(^{19}\) Rippon, Engineering, p. 32.

\(^{20}\) Memo. The Admiralty Coal and Collier Work at Cardiff, June 1907. MT23/215/T5359. Coals from the same field were mixed, as the collier was loaded. Mixing North Country with Welsh had to be done on board the warship.

\(^{21}\) Asteris, Rise and Decline, p. 27.
Llanelli and Barry, the latter rising to vie with Cardiff as the world's busiest coaling port by 1913.22

Coal, however, had serious drawbacks as a naval fuel; coaling ship was laborious, dirty, dangerous, detested and time-consuming. Dust penetrated every nook and cranny. Warships were the most arduous vessels to coal because of the watertight subdivision and armour protection 'which it is undesirable to pierce more than necessary.'23 For special purposes, trials of new, repaired and refitted vessels, as well as for royal yachts and destroyers hand picked coal was used.24 As warships increased in size and speed, so did their appetite for coal. In 1861, the Warrior (9,210 tons) had bunkerage for 850 tons; in 1914, the Tiger (28,430 tons) could carry 3,320 tons.25 Speed of coaling was paramount; all other essentials could be replenished in a fraction of the time required to coal. It was axiomatic for rapid coaling 'that every soul who can possibly take part should do so,' and few crewmembers escaped this gruelling task.26

The standard Navy coal sack held two-hundredweight (101.6 kg), destroyers used one-hundredweight sacks and at the majority of overseas stations baskets were used. Once the sacks were full, they were winched from the collier onto the deck of the recipient ship, to be barrowed away and emptied down chutes into the bunkers below.27 Bunkers had to be packed as quickly as possible as the coal was poured in:

And when a bunker opening gets choked, they don't ask anxiously on deck, "have we buried the coal trimmers?" They blame them for not stowing it fast enough. As a bunker gets filled the trimmers have to come up, till the last man left had to lie flat on his back pushing the coal up into the corners with his feet.28


The Navy was continually seeking to reduce coaling times through motivation, and organisation of crews and better equipment. Coaling was quicker in the longer days of summer, though darkness slowed rather than curtailed the operation. In 1903 the C-in-C Portsmouth wrote:

They [their Lordships] may take that the rate of coaling from one lighter each side will not exceed 130 tons per hour, I am aware that they have often exceeded this amount when they have concentrated all coaling facilities on one, but the amount I have stated will not be probably much exceeded.29

Often, to encourage crews, an element of competition was introduced, be it against the clock or other vessels for a trophy.30 Coaling feats were published outside the service; in May 1902 The Engineer reported that:

The cruiser Terrible made a new world’s record for coaling of warships sometime ago, belonging to the China squadron. The operation lasted nine hours, and in that time no fewer than 2,500 tons of coal were placed in the Bunkers.31

Improved equipment also increased coaling speeds, the main one being the Temperley Transporter. This consisted of a rail, suspended between the collier and recipient vessel, which a traveller ran along from which the coal bags were suspended. It could lift up to one and a half tons at a time, although, in practice, a ton was normal (plate 2:1 and fig. 2:1). In 1899, the Navy had nearly 200 Temperleys in service.32 Although opinions of their effectiveness varied between officers, colliers used them for many years, and they made a significant contribution to the speed of coaling.33 The Temperley’s temperamental mechanism and the provision of suitable winches, derricks and stays on colliers however provided a constant source of irritation for the Navy.34 Of the seven

29C-in-C Portsmouth to Admiralty, February 1903. ADM 1/7675.
31The Engineer, vol. 93, p. 537, 30/5/1902.
33The Engineer, vol. 65, p. 265, 18/3/1898.
34Attwood, Warship, p. 54.
colliers provided with Temperleys for the 1905 manoeuvres, only four performed satisfactorily, and coaling was delayed while they were assembled.\textsuperscript{35}

Plate 1: Temperley Transporter being used to coal the battleship *Royal Sovereign* in 1899.

(Source: *TSNAME*, vol. VII (1899) plate 3).

\textsuperscript{35}Memo. C-in C Channel Fleet, 3/10/1905, and resulting correspondence. MT23/188/T5226.
At both home and overseas bases obsolete vessels fitted with derricks were used as coal hulks. Although far from ideal, they saved valuable quay space and provided cost-effective coaling facilities in deep water. In 1905, the Navy took delivery at Portsmouth of the C1, a purpose-built floating coal depot. Originally contemplated as a prototype for a whole class, it remained, however, unique. No mechanical device ever fully managed to mitigate the intensive physical exertion that coaling entailed and such strenuous labour could not fail to adversely affect the crew's efficiency. Following the 1912 annual manoeuvres, the captain of the cruiser Falmouth suggested that:

Ships would be more efficient if each collier carried eighty dumpers or more to shovel in a collier, trimming and unhooking only being done by the ship's company. No stokers in 'Bristol'.

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class [light cruisers] being available in war to help in holds. Coaling slower than in peace. Even in short time since war [manoeuvres] began, hands showed signs of being tired out after coaling, owing to previous work on which ship has been employed.  

Although the suggestion received consideration, space for only an extra four men existed onboard the colliers that coaled warships directly (under 4,000 tons), and no further action was taken.

When at sea, as coal was burnt fresh supplies had to be brought from ever-distant bunkers, in a manner that maintained the vessel's trim. As two feet of coal gave the equivalent protection of one inch of iron, coal in side bunkers was burnt last to preserve its protective value. Trimming was more than just an inconvenience. In action, each boiler room depended on the supply in its own watertight subdivision. After examining the drawings of the _Dreadnought_ the Admiralty Machinery Design Committee (AMDC) observed:

That to obtain certain advantages about the watertight subdivision of the ship their Lordships are prepared to accept the great inconveniences in management, working and supervision, (including the impossibility of transferring coal from one stoke hold to another), consequent on the entire separation of the engine room and the individual boiler rooms.  

As vessels burnt increasing amounts of coal, they required more men to feed the furnaces. One battleship's captain thought his boiler room complement insufficient and informed the Admiralty that if high speeds were to be maintained in action gun crews would have to lend a hand, leading to a diminution of his ship's fighting power. The lower deck's journal, _The Fleet_, agreed and asked: 'How is it humanely possible in war for men to spend one part of their time trimming coal and the other fighting their guns!' In 1914, Admiral Jellicoe thought that the coal burning ship had reached its practical zenith in the design of the latest battle cruiser. He wrote Fisher:

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38 General comments for ships engaged in manoeuvres, 1912. ADM1/8273.

39 Attwood, _Warship_, p. 214.

40 AMDC to Controller, 21/6/1905. ADM1/7734.

41 _Vanguard_’s captain to Board, June 1911. ADM1/8230.

42 Milestones and Motors, ' _The Fleet_, April 1913. ADM116/1209.
It [oil fuel] is also most a necessity for these vessels because of the great difficulty that they experience in our present battle cruisers of getting coal to the furnaces sufficiently rapidly to keep their full speed after they have reduced coal on board to from 50 to 60% of its full stowage."

Responsibility for the provision of fuel belonged to the Fourth Sea Lord, under whose auspices operated the Director of Contracts (D-of-C), the Director of Stores (D-of-S) and the Director of Transports (D-of-T). Technical development and scientific research were carried out under the supervision of the Controller, the Third Sea Lord. The Admiralty had direct control over the purchase of steam coal, and only bought it from about thirty-five collieries on an approved list whose coal had undergone exhaustive tests. Once on the Admiralty List a colliery was unlikely to be removed, and inclusion was keenly sought. While inclusion did not guarantee an order, it did bestow an independent seal of quality on that particular brand of coal, and was an important marketing asset."

Each year, when the estimates were prepared in the autumn, the D-of-S informed the D-of-C the coal requirements for the coming year. Then, usually in October, the D-of-C issued tenders to all the mines on the Admiralty list. Contracts were awarded to around twenty-five collieries for differing amounts depending on price and the mine's capacity. In 1907, for example, contracts ranged from 3,250 tons, as part of a mixed consignment, to 90,000 tons. Most commercial coal was sold forward on long-term contracts with the customer responsible for the cost, insurance and freight (c.i.f.), in essence the pithead price. The Admiralty, the single largest customer of Welsh steam coal, and the larger passenger steamship lines, insisted that the price in their contracts include delivery to a nominated port (free on board-f.o.b.) - the Admiralty stipulated

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43Jellicoe to Fisher, 29/12/1914. ADM1/8397/365.
46MT23/215/T5359.
47Naval Estimates for the appropriate years and MT 23/215/T 5361. 24 pits in 1903, 25 in 1905 and 26 in 1907.
Cardiff. There were exceptions, such as small quantities for testing and emergencies, when coal was purchased as a floating cargo. The chief exception was non-steam coal for yard use at home ports, though yard coal for overseas bases was purchased f.o.b.\(^4\)

Once the contracts were placed, the Admiralty Coal Agent (ACA) oversaw the transportation to the quayside and arranged shipment to its destination. Up until December 1909, there were two ACAs, Messrs. Harrison, Moore & Co. in South Wales and William Mathwin and Son in Newcastle.\(^5\) The latter took over responsibility for South Wales in 1910 becoming the sole ACA. The agent submitted returns twice a week (daily in wartime) stating the position of all vessels on Admiralty charter to the D-of-T, and once a week to the D-of-S giving the position of the Admiralty contracts.\(^6\)

A retired naval captain was employed by the Admiralty at Cardiff as a Superintending Transports Officer (STO). His duties included the 'general supervision' of the transport arrangements, working with but not for the agents. He was also 'charged with confidentially watching the interests of the Admiralty in all local matters regarding transport'. Also at Cardiff were an Inspector of Coals, a serving Engineer Captain, and his assistant, an Engineer Lieutenant. Their job was to inspect cargoes for quality, ensure that the coal originated from the correct seam, check pit tallies and weights, and provide information regarding the opening of new seams and exhaustion or change of quality in existing seams.\(^7\)

The annual coal contracts stipulated the rate of delivery. For smaller contracts, it was quarterly. Large contracts were to be delivered monthly at one twelfth on the annual total plus or minus 20% at the Admiralty's discretion. In effect, the Admiralty could only draw a maximum of a tenth of the annual contract per month and had to take at least one fifteenth per month. This system had the advantage of giving the collieries regular work, which in theory allowed them to quote cheaper prices. It also allowed the colliers on Admiralty charter to be kept fully employed throughout the year. Special

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\(^4\)Jevons, Coal Trade, pp. 295-298; Instructions for the Admiralty Agents in South Wales, 1/7/1901. ADM116/903.

\(^5\)Minute, D-of-T, 13/7/1906. MT23/188/T5364.

\(^6\)ADM116/573. Before 1900 the ACA in South Wales were Harrison, Moore and Harrison.

\(^7\)ADM116/903.

\(^7\)Memo. The Fleet Coaling Service, 1/2/1907. ADM1/7934.
unforeseen reasons it became the subject of ‘persistent negotiation.’ In contrast to most other coals the price of steam coal rose in the summer. Besides seasonal fluctuations the price also varied greatly from year to year. The mines maintained low stocks above ground and with an inelastic supply the mine owners’ ability to take advantage of a high priced spot market was limited. So in a high price year, rather than supply the Admiralty early with coal already contracted for they naturally preferred to sell any surplus on the open market. Consequently, if the Admiralty’s requirements in any one-month exceeded that contracted for, the ACA was forced to go:

[Round office after office, practically hat in hand to beg for coal. When his own persuasion fails he asks Captain Tunnard [STO] to accompany him to give “moral support.” At times of the worst pressure the Director of Contracts goes down to add influence as well.]

The test of the ACA’s ‘patience under insults of a commercial traveller’ was also due to the Admiralty’s policy of maintaining a reserve equivalent to only three months’ peacetime consumption at home ports. However, the facilities at Portland and Devonport were inadequate to accommodate even this level until after 1907.

In 1903-4 the total spent by the Admiralty on steam coal was £1,604,502, representing 4.79% of the total effective services. The D-of-C informed the Royal Commission on Coal Supplies that the Admiralty intended to purchase around 1,250,000 tons that year at approximately twenty-five shillings per ton, including freight. A stock valued at £737,178 was carried forward into the next year. This would equate to a total reserve of just under 600,000 tons, of which 83% was overseas, leaving only about 102,000 tons at home, against an authorised reserve of 110,600 tons. Even at its authorised level the home reserve was less than the maximum the Admiralty could draw under its coal contracts in any one month, and about the average normally consumed on

54MT23/215/T5359.
55MT32/215/T5359.
56ADM1/7934.
57Comptroller’s report for 1903-04. Effective services are total expenditure less payments for pension and gratuities.
58Ibid.
59Coaling Service, Appendix 1 Coal Facilities at the Home Ports, ADM1/7746.
annual manoeuvres.\textsuperscript{60} A minimal reserve had the advantage of not tying up large amounts of capital in stock and storage facilities, and minimised wastage through deterioration and double handling that damaged the coal. The risk was considered acceptable as in wartime or emergency (as defined by the Admiralty) the contracts stipulated that the total production of all the pits under contract would be at the disposal of the Admiralty.\textsuperscript{61} The practice of placing contracts, even for small quantities, with most but not all the collieries on the Admiralty list ensured competitive prices in peacetime and rapid access to large production in wartime. Even without the emergency clause in the contracts, that the Navy's fuel supply was safe within the British Isles guaranteed supply in a major conflict.

Reliance on stocks underground was, of course, dependent on the coal being there to extract. At the turn of the century the Admiralty believed there remained enough coal for another fifty years. Not everyone was as sanguine, Sir Leslie Knowles, MP for Salford, referred to a prediction by Professor Boyd Dawkins of Victoria University:

\begin{quote}
It was a well-known fact that smokeless steam coal was fast diminishing, and the fact that it was fast diminishing constituted in his opinion a national danger.\textsuperscript{62}
\end{quote}

He commended the proposal that the Admiralty buy 10,000 acres of land in the steam coal bearing area and 'keep it unworked for naval purposes.'\textsuperscript{63}

However, if the Admiralty had chosen to buy land in the coal bearing region there was no guarantee that it would produce steam coal. The only way to find out was to sink shafts - a long and expensive procedure. One alternative was for the Admiralty to buy an already established colliery and sublet it to an operator who would only supply the Admiralty.\textsuperscript{64} The Admiralty, however, had no interest in owning collieries.\textsuperscript{65} When offered a colliery it was rejected even before the price was known. From time to

\textsuperscript{60}Coal consumption on annual manoeuvres varied between 60,000 and 150,000 tons.

\textsuperscript{61}Memo 135. CAB37/79.

\textsuperscript{62}Hansard 4: 130: 1388, 1/3/1904.

\textsuperscript{63}Suggested in October 1902 by D. A. Thomas MP. CAB37/79.

\textsuperscript{64}CAB37/79.

\textsuperscript{65}DNI to CID, 3/3/1905. CAB17/4.
time rumours surfaced that the mine owners were forming syndicates to rig prices. Concern over the Government's attitude led some groups to approach the Admiralty to assuage any fears it might have over prices. One syndicate invited the Admiralty to join for £2,000,000, arguing that only ownership could ensure continuity of supply. The Admiralty thought them all remarkably naïve and declined: 'They seem to think that in war it would be trade as usual and the Government would not intervene in the coal fields.'

Although shy of direct involvement, the Admiralty did keep a watching brief on colliery ownership. Foreign ownership per se was not deemed a cause for concern. The Naval Colliery had been in French ownership since 1897, and tendered and supplied the Navy just the same as the other pits on the Admiralty list. The formation of a foreign or domestic cartel may not prejudice supply, but could have injurious consequences on price. Also, if the miners were 'members of one group the effect of a strike would be much greater.' However, unless a price fixing syndicate was in sight the Admiralty was quite content to stand aside and let the market take its course.

Shortly after Knowles' speech, in January 1905, The Royal Commission on Coal Supplies published its final report. The inquiry had examined the country's coal resources, their probable duration, possible economies, international competitiveness and the effect of coal on the Navy and British consumers. It acknowledged the Navy's increasing consumption and the Admiralty's attempts to widen its sources of fuel by increasing the sources of suitable coal and trying other fuels, most notably oil. The Commission also accepted the evidence of Sir W. T. Lewis, agent to Lord Bute, who carried out a survey for the Commission and estimated:

The quantity of coal remaining unworked in certain best steam-coal seam of one foot thick and upwards on Collieries of the Admiralty List at 3,240,182,734 tons. While the quantity in collieries not on the Admiralty List is 174,793,574 tons and the quantity in unlet areas 521,681,129 tons. Total 3,936,657,410.6

66CAB37/79.

67Ibid.

68RC final report, Special Supplement, Colliery Guardian, 27/1/1905. Lord Bute was the leading landowner in the South Wales coalfields.
The commission put the annual production of all the collieries on the Admiralty list between 18,000,000 and 19,000,000 tons, of which the Admiralty took 1,100,000 tons. If accurate, at the current rate of consumption the Admiralty had access to sufficient steam coal for the next 200 years. Moreover, it anticipated that the introduction of furnaces capable of burning more bituminous coals would increase the area of suitable coals, while the greater use of oil would decrease demand.\(^{69}\)

It was the normal practice to supply Admiralty bunker coal 'through and through' as wrought, with only the duff, the finest almost dust-like coal, screened off before it was railed to the port. With the railways from all the pits converging on just a few ports congestion and delays were commonplace. Once at the port the coal was weighed and carefully loaded into colliers. Occasionally, before loading, bunkers were screened again to remove the smallest coal, leaving only the best size for steaming. This was abandoned, however, as the smaller coal protected the larger pieces and its removal only led to new small forming in the bunkers. Furthermore, 'double screening' doubled the time required to load a collier.\(^{70}\)

Despite more efficient machinery, naval coal consumption steadily increased, from 100,000 tons in 1860 to 200,000 tons in 1880,\(^{71}\) reaching 1,100,000 tons by 1902-03.\(^{72}\) Although it was anticipated that the rate of increase would eventually decline through increased use of oil fuel,\(^{73}\) it was expected to continue to climb and peak in 1914 at 1,901,000 tons.\(^{74}\) The inexorable increase was due to more ships, and new vessels that were larger and faster with greater horsepower than their predecessors. In 1909-10, for example, the 1897 battleship Mars displaced 14,900 ton, with a top speed of 17½ knots burnt on average 1.04 tons of coal per knot. While the battleship Bellerophon, of 1909, 18,600 tons and capable of 22 knots, averaged 1.57 tons of coal per knot over the same period, the Bellerophon also consumed 737 tons of oil to the

\(^{69}\)R. C. p. 144.

\(^{70}\)MT23/215/T5359.


\(^{72}\)R. C. p. 143.

\(^{73}\)Secretary of the Admiralty to CID, 27/3/1905. CAB17/4.

\(^{74}\)Statement 'Y' Coal Allowances by D-of-S, 1913-14 Sketch Estimates, 4/1/1913. ADM1/8275
Mars' 65 tons. New vessels also benefited from additional auxiliary machinery for distilling water, electric lighting and hydraulics for operating turrets and other equipment, all of which consumed energy. In January 1905, the fleet’s aggregate horsepower was 2,687,000; just eight years later, it reached 5,665,000. The spiralling cost of providing coal caused concern to the Admiralty, a problem that was exacerbated by maintaining the reserves as a proportion of consumption, spending on the provision of fuel and its associated services, vote eight section ii k, averaged 5.35% of effective services for the five-year 1900-1905, for 1909-1914 it increased to 6.8%.

A major drawback of coal was that it deteriorated in storage. Loss of calorific value was greatest in warm climates, precisely where the Navy needed to maintain most of its reserves. In favourable conditions, Welsh could keep for up to a year. But when exposed to the elements in the tropics it could lose as much as 30% of its calorific value per annum. In Colombo, 'coal that had been in store more than six months [was] little better than Indian coal.' Strict stock control and rotation could significantly reduce the problem for commercial coal merchants. However, as the war reserve on foreign stations was greater than six months' peacetime consumption, these measures could only provide a partial solution for the Navy.

One answer was coal briquettes, also known as patent fuel. Conceived originally in 1839 to utilise the smallest coal and other waste products by forming them into blocks that could be easily burnt in marine furnaces and the Channel Fleet first purchased it in 1874-5 for trial. Disappointed with the results the Admiralty acquired no further supplies until 1877, when small amounts were sent to overseas depots to test how it reacted when exposed to the weather. The results showed it was far less susceptible to deterioration than coal. Consequently, stocks were provided in the Far East, West Africa and the West Indies. However, in hot weather it went soft, smelt

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75Ibid. statement 'B' Coal Consumption by D-of-S.

76ADM1/8275.

77Although part of the increase was due to oil fuel, it also represented a significant increase in the coal consumption.

78R. C. p. 154.

79D-of-S on his 1912 visit to Bombay, Colombo and Trincomalee. ADM1/8285.

80Admiral Moore, Hong Kong, to Admiralty, 24/10/1907. MT23/217/T631.

81Smith, Marine Engineering, p.139.
offensively and caused irritation of the eyes and skin.\(^\text{82}\) As a result its use was discontinued in 1888.\(^\text{83}\)

Nevertheless, the Admiralty sought to take advantage of patent fuel's storage properties and sought a pattern that did not jeopardize health. It tested samples from British, North American, Australian and Venezuelan companies, none of which proved suitable. However, the need to maintain an appropriate fuel reserve in tropical regions spurred the Admiralty to initiate a series of trials of patent fuel 1898-1900. Eight patterns were tested; seven commercial brands plus one of the Admiralty's own devising. Ultimately, it selected its own pattern. The others eliminated principally because of the high level of creosote in the agglutinate that irritated the stokers' eyes and skin.\(^\text{84}\) The First Lord reported to Parliament in 1901 that a suitable patent fuel had been found and that the government intended to purchase it for the service.\(^\text{85}\)

The chosen briquette weighed twenty-two pounds, was made from the screenings of Admiralty contract Welsh coal bonded with a small quantity of anthracite using a minimum of pitch. Although protective goggles and gloves remained necessary when handling them the briquettes produced only a little more smoke than ordinary Welsh. A naval engineer officer was employed to oversee the production at the Star Works Cardiff. The new patent fuel retained its calorific value for over five years, and was stockpiled at overseas stations to supplement the coal reserves and to 'permit the reserves of coal to be turned over with sufficient frequency to prevent deterioration.'\(^\text{86}\) Samples were burnt each year to test its quality and accustom stokers to its use. The rectangular shape was purely to facilitate manufacture and it was tipped into bunkers the same way as coal, and broken up as required for stoking. Spending on patent fuel was greatest between 1901-04, when the original stock was laid down, and again when the ratio of patent fuel to coal was increased in 1906. By the 1913-14 sketch estimate provision for patent fuel was just 3.5% of the overall steam coal budget.\(^\text{87}\)

\(^{82}\) Patent Fuel Trials. ADM 116/573

\(^{83}\) R C. p.146.


\(^{85}\) FLs' Statement 1901. Cd 950.

\(^{86}\) R C. pp. 146-147.

\(^{87}\) FL's statements for 1901 Cd 494, 1904 Cd 1959 and 1907 Cd 3336.
Warships were not coaled in South Wales' ports; coal was shipped directly to warships or naval bases. From 1862, the D-of-C had been responsible for coal transportation. Following a reorganisation in 1900, he relinquished this role to the D-of-T. Thereafter the Admiralty Department of Transports was responsible for all the shipping requirements of the Government. Its largest section was solely concerned with the transportation of coal. This change of responsibility coincided with an experiment in collier ownership by the Admiralty. Despite the First Lord's claim of success, only one vessel was purchased at the time, the Kharki, whose conversion into an oil tanker in 1906 suggests it was not a success worth repeating. Another collier was later purchased in 1908 - the Mercedes. Built in 1901, she had been on charter to the Navy in the Far East but after purchase, she remained in home waters for all her naval career.

The Admiralty had little to gain from operating its own collier fleet. The British commercial collier fleet was by far the largest in the world and could easily cater for the Navy's peacetime requirements. In war, even if the Admiralty had its own colliers, it would still need to supplement them with vessels taken up from trade. It was therefore sensible for both parties to gain experience in peacetime of operating together. It would have also been extremely difficult to obtain Treasury sanction for a fleet of colliers in a period of falling shipping costs.

When coal required shipping the Admiralty informed the ACA of the details, who then arranged to charter an appropriate vessel. In 1900, the Admiralty used three different types of charter. First was 'Collier Transports,' a long-term time-charter, used mainly to charter larger colliers for shipping coal to overseas stations. The vessels discharged their cargoes either directly to warships or to shore, and when practicable were used for the return of stores from overseas stations. Five vessels were employed as Collier Transports in 1906, two of which were employed exclusively to convey coal to the Mediterranean. One firm, J T Duncan of Cardiff specialised in supplying vessels

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88R C. p. 150.
90Salter, Shipping Control, p. 40.
91James, Royal Fleet Auxiliary, p. 6.
92Sigwart, Royal Fleet Auxiliary, pp. 73-73.
93Asteris, Rise and Decline, p. 32.
94MT23/202/T152.
to the Admiralty. In 1908, three of its four vessels were on time-charter to the Admiralty and in 1912 the company commissioned two colliers built specifically for coaling large warships.

The second was 'coastwise charter,' primarily intended for short periods of engagement, and most frequently used during manoeuvres when colliers were required for a fortnight or a month. A few small colliers were also employed on continuous coastwise service. These boats were only suitable for discharging their cargoes ashore and were 'employed almost exclusively within the coastal limits' where they shuttled between a particular naval port and South Wales.

As colliers steadily increased in size, it initially worked to the Navy's advantage; small colliers were unsuitable for coaling warships directly and undertaking longer voyages, whereas larger vessels made it possible to merge long-term charter and continuous coastwise charter. Three larger vessels that were not allocated to any particular port replaced the small continuous coastwise colliers. They could also, if necessary, coal warships at sea or deliver coal to overseas bases, the underlying principle being 'that all colliers engaged continuously should be regarded as a nucleus for the war requirements.' On the other hand, very large colliers also had disadvantages; it was easier and cheaper to move, say, 10,000 tons in one large vessel rather than three or four, but when required to coal warships directly very large colliers slowed the work down, as only two warships could be alongside at once. Whereas three medium sized colliers could coal six warships simultaneously. In 1914, the dead weight considered most suitable was 1,800-4,000 tons.

The third method of engaging colliers was 'foreign charter,' when vessels were engaged to deliver a single cargo. Again, the Admiralty specified that the vessel should conform to certain standards and able to coal warships directly. Engaged to deliver to a specific port, their contracts stipulated that in an emergency the Admiralty could order them to a different destination or to follow the Fleet. This 'Fleet Option' clause was

95Memo., D-of-T, 12/11/1906. MT23/201
97MT23/201.
98Ibid.
99Ibid.
intended for use in war or emergency and was rarely invoked in peacetime. Most ship owners gambled that the clause would not be invoked and arranged return loads before departure. Malta and Gibraltar, the most common destinations, were both well suited for colliers to pick up return loads of iron ore from southern Spain.

How many colliers would be required in war was, of course, contingent on who the enemy was and the scene of operations. The 1905 war plans for coaling the Mediterranean Fleet involved twenty-seven colliers of 2,500-3,000 tons remaining on station, with twenty-three large depot colliers delivering coal from Britain. At the time the STO reported there were fifty-nine suitable vessels in Cardiff able to follow the Fleet in the event of war and a further twenty-eight smaller ones suitable for coaling 'some of the ships.' These aside at least seventy additional vessels used for coaling the Fleet over the preceding years and had been 'fairly reported on,' and at least three hundred colliers were judged suitable for employment. The 1907 war plans postulated that most conflicts would require 100 colliers, unless the enemy was the United States, when 140 would be needed.

In the opening stages of any conflict, organizing the colliers would be difficult. Many would be at sea plying their normal trade and, as very few carried radios, out of touch. Only on completion of their passage, could they be placed under Admiralty orders and issued with naval codebooks and semaphore equipment. Sea transportation, although cheaper than rail for homeports, involved a greater risk of interruption by enemy action in wartime. In a conflict with Germany, reliance could not be placed on the safety of colliers further east than Portsmouth. Colliers would meet the immediate mobilisation needs, but subsequent requirements would be moved to the east coast ports by rail. Although a great deal of importance was attached to the trial of the wartime system of supplying of coal by rail, such a trial would have disrupted the

100 MT23/196/T2791.
101 More coal was issued to ships at Malta than all other overseas stations combined, 220,000 tons in 1907. ADM1/7746.
102 Coal Supplies at Malta and Gibraltar, 1905. MT23/180/T1776.
103 Minute, STO, 3/5/1905. MT23/180/T1784.
104 MT23/215/T5359.
105 MT23/278.
national rail network for days, and there does not appear to be any evidence of a large-scale test occurring. Nevertheless, in order to ensure a smooth transition from sea to rail, emergency contracts were drawn up and signed. For example, in 1907 Messrs Cory, Britain's largest coal merchants were contracted to supply in wartime 5,000 tons of coal after sixty hours notice to the Thames and Medway, and 5,000 tons per day thereafter. Since an average coal train at that time consisted of twenty-three trucks of ten tons each, 5,000 tons was equivalent to twenty-two coal trains. In 1910, it was anticipated a maximum of 350,000 tons per month would need moving from Wales to the east coast, requiring around 1,400 coal trains. To arrive as planned, priority over all other traffic for the coal trains and the returning empties would be essential. Instructions to the General Managers of the Railway Companies stated 'the transport of coal, oil fuel and petrol for the Navy is, as a rule, to have priority over all other supplies both naval and military.'

Unless delivered directly to warships, on arrival at naval establishments coal became the responsibility of the Fleet Coaling Service, organised as a distinct naval service in 1900, and placed under the remit of the Fourth Sea Lord. The dockyard Superintendents were responsible for storage, while the Fleet Coaling Officers, on the Commander's staff, were responsible for coaling craft. In 1904, the Fleet Coaling Service comprised ten tugs, five floating depots, two coal hulks, twenty self-propelled miscellaneous vessels and 224 lighters.

In 1885, the number of mercantile steamers surpassed that of vessels under sail. British dominance of the world's best steam coal and bunkering station was an important strategic, as well as trading, asset. For Britain, control of the world's maritime bunkers enhanced her power and influence in peacetime, and allowed her to deny coal to hostile powers and coerce neutral ones in wartime. Her stranglehold on the world's shipping was based on three interrelated elements; the best steam coal, a uniquely comprehensive network of bunkering stations and crucially, although often overlooked, by far the world's largest collier fleet. This extensive network of bunkering

107 ADM1/7934
108 C-in-C Portsmouth to Admiralty, 28/2/1903. ADM1/7675.
109 Instructions issued by the Railway Executive Committee, CID sub-committee, 1913. ADM1/8367/26.
110 ADM1/7934.
stations allowed British warships to complete long voyages without having to coal in a foreign port.111

The ability to coal at sea would therefore appear to be of dubious value for the Navy. However, the essence of naval warfare is to have unfettered use of the sea, while denying it to the enemy, hence the Navy’s time honoured use of blockades. Following the introduction of steam, the time a vessel could remain on station as part of a blockading force was determined by its coal. Vessels returning to port to refuel either weakened the blockade or required replacing. This handicap could be reduced if the blockading vessels could be replenished at their blockade station. If coaling at sea could be achieved the advantages would be immense. Coaling at sea was, however, fraught with difficulties; in 1883, Lieutenant Lowery RN wrote:

In the most perfectly calm weather most serious risk of injury to the lighter fittings on a ship’s side would be run by attempting to allow the colliers to lie along side, and on 99 days out of 100 in the North Atlantic, this would be impossible.112

Of the more than sixty schemes submitted to the Admiralty only two, the Temperley-Miller and the Metcalfe, were extensively evaluated in trials.113 Both had the recipient vessels towing the collier in line. The Temperley-Miller employed a reciprocating traveller along a single line tensioned by a winch, under which bags were suspended [Plate 2:2]. Metcalfe used an ‘endless rope,’ rather like a conveyor [Plate 2:3]. The Temperley-Miller system was tested at sea in February 1902, but at forty tons per hour, its transfer rate was deemed inadequate and no further trials were under taken.114 Metcalfe’s system received a longer elevation in 1905-06.115 After which the D-of-S suggested a small committee should examine what had been achieved.116 It recommended the adoption of Metcalfe’s system. Although ‘arrangements were made

113ADM/7827.
114Ibid.
115Metcalfe to Controller, 13/2/1902. ADM 1/7745; Report for C-in-C Home Fleet, 1/11/1903. ADM/7824
116D-of-S to 4th SL, 2/10/1906. ADM/8004.
to provide a number of sets of apparatus,’ it is doubtful whether they were ever used.\textsuperscript{117} The brief for the 1912 annual manoeuvres, advised that every opportunity should be taken to practise coaling at sea, drew the comment: ‘That this is not considered necessary, as in the weather when it is practicable, the conditions will be similar to those to coaling at anchor.’\textsuperscript{118} In the final analysis neither system offered the prospect of transferring coal at the necessary rate. Moreover in the confined waters of the North Sea - the expected scene of operations - two vessels attached to each other on a steady course at a constant moderate speed presented an ideal target for torpedo attack.

Plate 1:2. Trials of Temperley-Miller’s equipment in 1902, showing bags of coal suspended from a reciprocating traveller between the battleship \textit{Trafalgar} and the collier \textit{Muriel}. (Source: TSNAME, vol. XII (1904) plate 61).

\textsuperscript{117}FL’s Annual Statement, 11/2/1908, Cd 4553.

\textsuperscript{118}Marginalia on General remarks by C-in-C Home Fleet, enclosure ‘A’, July 1912. ADM1/8269.
Coal stocks at overseas stations were maintained in three different ways. First, a stockpile was maintained under the direct supervision of the Navy, as at the major naval bases, such as Malta, Gibraltar and Hong Kong, which in 1904 totalled fourteen. Second, coal was provided by the D-of-S, but storage was the responsibility of a local commercial concern or an Admiralty agent who was paid a retainer. These would be regular ports of call for warships in transit, but with no significant permanent naval presence, for example at Aden, Colombo and Jamaica - where an Army Service Corps officer acted as Admiralty coal agent.\textsuperscript{119} Third, stocks were provided and maintained by contractors with coal from collieries on the Admiralty list, or in some cases, a small Admiralty stock was supplemented by a private contractor. In 1904 coal was provided in this manner at fifty ports.\textsuperscript{120}

\textsuperscript{119} 1910-11 Estimates. 5547.

\textsuperscript{120} DNI report, ADM231/44.
It was the Director of Naval Intelligence’s (DNI) responsibility to compile an annual statement showing the ‘first wants and monthly war expenditure’ overseas, and the stocks available in the hands of the Navy and British companies. Based on this, the quantity required to bring the overseas stock up to their authorised level was calculated. In 1902 there were 160 British naval vessels on overseas stations, by 1914 these had diminished to seventy-six.\(^{121}\) In 1906, the First Lord stated that:

The reserves of coal and patent fuel on Foreign Stations have been revised where necessary in the light of the recent reorganisation of the Fleet.\(^{122}\)

This might suggest that the reserves had been reduced in line with the fewer number of vessels permanently on foreign stations. Nicholas Lambert argues that after the reduction of warships in the Far East:

\[T\]he Admiralty endeavoured to exploit and develop what might be termed its “hidden strengths.” Considerable sums were expended on maintaining large coal stocks’.

His case, although predicated on a misreading of the figures, is, not far off the mark.\(^{123}\) Between 1904 (£648,428) and 1912 (£906,106) expenditure on fuel for foreign stations increased by almost 40%, contradicting the First Lord’s implication that less vessels required less fuel.\(^{124}\) The explanation is that between 1903 and 1907 although the total approved fuel stock on the China station, for example, increased from 135,500 tons to 150,000 tons, the proportion of patent fuel increased from a third to nearly half.\(^{125}\) The revision to which the First Lord referred was a revision to the ratio of patent fuel to coal. Fewer vessels on station reduced peacetime consumption and stock rotation, so the war stock needed to be more durable. Consequently, increases in tonnage were

\(^{121}\)Colonial Office to Admiralty, 16/4/1914. ADM1/8375/108.

\(^{122}\)FL’s Statement 1906-07. Cd 2837.

\(^{123}\)Nicholas Lambert, ‘Economy or Empire’ in, Keith Neilson and Greg Kennedy, Far Flung Lines, (London: Frank Cass, 1997). p. 57. Lambert incorrectly quotes 300,000 tons as the coal reserve at Hong Kong. The authorised reserve on the whole China Station in 1907 was 80,000 tons of coal and 70,000 tons of patent fuel. ADM1/7934 and ADM231/42

\(^{124}\)Comptroller reports’ on the Fleet Coaling Service, 1904 and 1912.

\(^{125}\)ADM1/7746 and ADM1/7934.
proportionately less than the increase in value because patent fuel cost, on average, 25% more than coal. Reserves of coal on the China Station remained at a year's turnover for the reduced number of vessels. The increases in patent fuel brought the total reserve to a year's war usage for a modern force of a similar size that existed before the fleet redistribution.\textsuperscript{126} Overall, however, the level of stocks on overseas stations diminished as a proportion of the total reserves.

Admiralty confidence in the domestic supply system's capacity to keep up with demand at home ports in peace and wartime led to low stocks in Britain. Nevertheless, stocks grew at home bases in line with the growth of the Fleet in home waters and the greater consumption of individual ships. Positioning the stocks at the established bases on the south coast was fine if Britain was confronted by her traditional enemy, France. Seeing as the new protagonist Germany was located across the North Sea and not the English Channel, operations would have to be conducted from east coast ports. Initially in 1906-7 stock increases were sited at Portsmouth, Devonport, Portland and Chatham. Consequently, these ports also attracted the greatest investment in mechanical handling equipment, with additional land for storage being acquired at Portsmouth and Plymouth and a new coaling jetty built at Portland.\textsuperscript{127} However, the Admiralty's planned investment in coaling machinery was never fully realised and the budgets for vote eight-section ii k were consistently underspent between 1906-11. The only totally new coal depot was established in 1907 at the West India Dock.\textsuperscript{128} Land for the naval base at Rosyth was purchased in 1903, but although the final scheme included storage for oil no mention was made of coal. Nor were any preparations made for a coal depot at Scapa Flow.\textsuperscript{129} The omission of shore installations was due to a policy change in 1909.

Speed of coaling of each ship was important, but the overall time necessary to coal a squadron or fleet was even more important. With shore-based stocks, the turnaround time of a fleet was dependent on the available wharfage, tugs and warships' derricks. In 1909, the policy of sending colliers with the first supply - an estimated half-month's consumption (250,000 tons) - on the outbreak of war was abandoned and replaced by one where the Fleet was to be sent sufficient coal to fill its bunkers at the

\textsuperscript{126}ADM1/7934.

\textsuperscript{127}Coaling facilities at Portsmouth, 1905. ADM116/922.

\textsuperscript{128}FL's Statement 1907, Cd 3336; ADM 1/7934.

\textsuperscript{129}FL's Statement 1908, Cd 3913.
possibility of war. Once hostilities commenced, colliers, loaded with coal delivered by rail at the nearest suitable port, were to be on hand ‘as close as possible to the sphere of operations.’ This had, in peacetime, the cost advantage of doing away with extensive provision for shore-based storage. It also increased the number of ports from which warships could operate and, most importantly, squadrons could be coaled more quickly from a large number of colliers than from the shore. The plan envisaged that the colliers would be loaded ready to rapidly coal warships on their return from patrol. The ports where floating stocks were thought necessary were Lerwick, Firth of Forth, River Tyne, River Humber, Yarmouth, Harwich and Sheerness. A suggestion that bagging the coal at Cardiff would save time was quickly rejected by the D-of-S. He claimed that the four million extra coal bags required would take three to four years to make and cost £1,400,000, and even if there was sufficient labour to fill them it would take so long the Welsh Coal fields would be brought to a standstill.° When war came, the Navy’s authorised home reserve was 250,000 tons, distributed among thirteen ports. The D-of-S reported to the First Lord on Tuesday 28th July 1914 that at the end of the week the fleet would be completely coaled and shore-stocks at home would amount to 211,000 tons with another 70,000 tons afloat. The situation in the Mediterranean was equally satisfactory, with 249,432 tons in stock, discharging or in transit, compared to the authorised level of 230,000 tons.131

In a major conflict, the Admiralty would inevitably need to draw heavily on the Welsh pits. In 1907 the Navy’s immediate wartime needs were thought to be half a million tons per month - about five times peacetime consumption. South Wales exported around 25,000,000 tons of steam coal per annum, just over half its annual production of all coals, and more than enough to supply the Navy.132 Although the contracts’ emergency clause guaranteed access to sufficient coal, as the collieries usually sold on long-term contracts, its implementation would adversely affect other customers, most of whom were British shipowners whose disruption would also disrupt the war effort. The Admiralty was the largest single customer for Welsh coal, but more than that, its patronage conferred the product with a respected independent approval of quality. Consequently, South Wales benefited from capital investment faster than

131Appendix 1.
132Jevons, Coal Trade. pp. 113-16.
otherwise would have been the case. From the Admiralty’s point of view, the industry grew in a highly advantageous way. No large company monopolised the mines or controlled prices. In the Rhondda Far Valley twenty-six companies shared ownership of the thirty-nine collieries. The coal shipping industry grew equally fractiously, and the Admiralty saw no need to interfere in either coal extraction or shipping. Only industrial action on the Taff Valley Railway or by a united mine workers union could, and on occasion did, disturb supplies.

Coaling speeds increased eightfold 1860-1914 by the use of better equipment and colliers. Coaling from shore depots in the 1860s, had by the turn of the century largely given way to coaling directly from colliers in port, consequently new bases did not need extensive coaling facilities on shore. Although coaling at sea underway was not practical, fleets could take their own coal supplies with them on exercise or overseas deployment and coal in any suitable anchorage.

Coal’s infrastructure and production far exceeded the Admiralty’s anticipated wartime requirements. A fortuitous blend of geology, infrastructure and geography made the rapid supply of the world’s best coal to the centre of operations virtually impervious to enemy interference. Low peacetime stocks could thus be kept at home, granting a significant financial saving. This conjunction of perfection did not apply overseas, where hazards to colliers and journey times made it prudent to maintain a year’s reserve. However, the comprehensive network of coaling stations and large British collier fleet dominated shipping bunkers giving the Navy a unique advantage. Although Welsh remained superior to other domestic and foreign coals, it was not impervious to improvement. The Navy relentlessly searched for more efficient methods of burning and handling coal, and went a long way to solving the problem of deterioration by adopting a suitable patent fuel.

The abundance of coal and coal infrastructure enabled the Admiralty to confidently leave the supply and logistics to private industry. Once the contracts were signed direct involvement was limited to quality control. Only when private industry could not supply its needs, such as a suitable patent fuel, did the Admiralty develop its own product, however, once completed the Admiralty moved into the background to monitor quality, leaving production to a private company. The ACA required little

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133 Egan, Coal Society, p. 16.
134 Geoffrey Herbert Carter, The Rise and Fall of the Portland Naval Base 1845-1995, (Exeter: Ph.D., 1998), p. 32. Coaling speed from a jetty in 1866 was 23-25 tons per hour, in 1914 ships were coaling at 200 tons per hour directly from colliers.
supervision. Years of experience in dealing with the numerous small companies in the Navy's supply chain imparted a knowledge of prices, a level of expertise and personal touch that the Admiralty could not hope to replicate in a department of its own. More than once the agent's sagacity provided a buffer between the ridged structures of the Admiralty and the more malleable practises of the private companies, reducing friction to a minimum. Relying to such a large extent on the commercial infrastructure and the marketplace did have drawbacks; many of the colliers were not the ideal specification for the Navy's needs, and the coal contracts were not as flexible as the Admiralty might have wished. It is also difficult to envisage the Admiralty having total confidence in the agent system if the fuel were not a domestic product. If all else failed, the mines, miners, railways and shipping companies were under British jurisdiction; once a contract was signed, it could be enforced, initially in the courts and ultimately by whatever means the Government considered appropriate.
Chapter Two

The Introduction of Oil Fuel

This chapter looks at the introduction of oil fuel into the Navy, from the initial experiments of burning oil in naval boilers, to the introduction of the first all oil warships some forty years later. It examines the technical advantages and disadvantages of oil in relation to coal, and explores the wider political and strategic ramifications of what was ostensibly a technical change. It considers the role played by industry and other navies in the Admiralty’s decision to move to oil-burning when it did. Finally, the chapter examines why the Navy initially opted for dual-firing for its major units when oil-burning was technically feasible.

The sinking of the first deep oil well in Pennsylvania in 1859 is widely considered to have initiated the modern oil industry. At the time, petroleum was used for the manufacture of the newly developed kerosene, the only alternative portable source of illumination to candles, which dominated the oil industry for the next fifty years.1 To produce it petroleum was heated and the lighter fractions such as kerosene and naphtha were distilled off. The residue, a thick treacle-like substance, was initially of little value, small quantities were burnt to heat the distilleries, and the remainder was often discarded. The quantity and composition of the residue depended on the properties of the original petroleum, and varied from field to field. Pennsylvanian petroleum was very light and left little residue.2 Petroleum found in Romania and on the Russian shores of the Caspian Sea left far more. Consequently, the first oil-fired ships appeared on the Caspian Sea in the 1870s. They employed primitive burners, and had no incentive to burn the waste product economically.3

The advantages of liquid fuel over a solid fuel, such as coal, were soon recognised by officers in the British, French, Russian and American navies. With its greater calorific value, oil promised greater ranges, easy refuelling and smaller boiler-room complements. Supply was not a problem envisaged by its early proponents, who

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with no evidence were supremely confident of its ubiquity, and, in Britain thought it could be readily obtained from coal.4

Two of the foremost advocates of oil for the Navy were Captain (later Admiral) J. H. Selwyn and a Mr. Richardson. After learning of trials in America, in 1865 Selwyn persuaded the Admiralty to instigate its own trials at Woolwich Dockyard. A boiler designed by Richardson was constructed based on a method employed in Russia in which the oil vapours were ignited as oil ran into the firebox along heated stepped troughs.5 The tests confirmed oil's greater evaporative power, but the design required a firebox two and a half times the length normally used for coal.6 Richardson next tried heating slack lime with steam pipes to create a wick for the oil and again igniting the vapours.7 Though the Admiralty considered the trials a success, it concluded that 'a great reduction' in price would have to occur before oil 'might be advantageously used instead of coal.8

In America the Secretary of the Navy reported in 1867:

As in the United States it [Petroleum] is abundant and easily obtainable, we have, in addition to the general interest in its use, a very important special one in its ownership.9

Further American trials found that petroleum's evaporative power was 1.4 times that of coal, but at eight times the price of coal oil was uneconomical. It was, though, the fear of an enemy shell igniting the vapours of the light un-distilled Pennsylvanian petroleum that proved to be the most serious objection.10

4Petroleum as a Substitute for Coal for Steamships' Colburn's United Services Magazine, Naval and Military Journal, part 1 (March 1865), pp. 324-329. A contradictory article that argues ample oil could be derived from coal and the Navy should convert to oil because coal would soon run out.


6Richardson to 3rd SL, 29/5/1865. ADM1/5942.

7North, Oil Fuel, p. 30.


9Annual report of the Secretary of the Navy (United States), 1867, p. 174.

10Ibid. p. 175.
Before heavy petroleum residue fuel could be burnt efficiently, it had to be vaporised to present a sufficient surface area to air. In Britain, Messrs. Wise, Field and Aydon developed a burner in 1866 that atomised oil prior to burning by spraying it in conjunction with steam. Two years later Aydon joined forces with Selwyn to develop, with Admiralty support, an improved steam oil-sprayer. Despite numerous trials, they never overcame the sprayer's thirst for fresh water that limited a vessel's range or required heavy and energy-consuming distillation plant, and again price was a major factor inhibiting further investigations.

Price is a function of availability, and 1860-1890 the commercial oil supply infrastructure was primitive. Petroleum was transported in wooden casks, and although the introduction of tin cans improved matters, both methods were expensive, labour intensive and prone to leakages. Sources were also few and distant, and none of significance existed in the British Empire. None the less, designers continued trying to perfect oil-burners for use in steamships and railway engines. Attracted by the prestige and money to be gained from equipping the world's foremost navy designers were eager to impress the Admiralty with their latest designs. Small-scale tests were conducted between 1866 and the early 1890s, but the prevailing attitude in the Admiralty was that the problems associated with oil fuel were overwhelming.

Other navies persisted with experimentation for their own particular reasons, the Russians and Americans because they had plenty of oil, the Italians because they had no coal, and the French because it suited the small fast flotilla vessels they favoured. None, however, managed to advance the technology sufficiently to make oil-burning acceptable for general service. By the end of the nineteenth century, only a few merchant vessels that traded near the oil fields regularly burnt oil.

As ships increased in size, speed and complexity, the advantages of liquid fuel became increasingly compelling. Designers were searching continually for new ways to improve performance and in the 1890s attention again focused on oil. Designing a suitable burner was only the first, albeit very important, step. Petroleum, like coal, is a

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11Rippon, Engineering, p. 177.
12North, Oil Fuel, p. 34.
13House of Commons paper, 503.
14Hansard, 4:19:1031, 11/12/1893; Smith, Marine Engineering, p. 286.
carbon-based fossil fuel, and, at least at this time, was also burnt under boilers to create steam, but there the similarities end. In 1900, less than 1% of Britain's energy needs came from petroleum products. The small domestic commercial petroleum trade was geared to kerosene and lubricants.\textsuperscript{13} Oil involved the introduction of a completely new technology, one with a minimal infrastructure. With the partial exception of the railways, and even they required new tank rolling stock, all coal-moving equipment was utterly useless for supplying oil. The massive investment that had taken place over decades in coal-moving equipment, both naval and commercial, could not be replaced overnight. Only if a supply of oil were guaranteed was it worth developing an oil-burning system and the expensive necessary logistical infrastructure and storage facilities.

Nevertheless, the practical advantages of oil over coal were immense, well known at the time and deserve detailed examination. First, oil has a higher calorific value than coal; weight for weight it can evaporate more water than coal. One reason for its higher calorific value is that oil contains less inert material, such as ash, that can comprise up to one-eighth the weight of coal. In 1912, Brassey's gave one pound of oil the ability to evaporate thirteen pounds of water, in comparison to coal's 8-8.5 pounds.\textsuperscript{14} Other sources give a pound of 'good coal' the theoretical ability to evaporate 14.6 pounds of water, and oil 19.9 pounds.\textsuperscript{17} Both fuels, however, usually achieved only 66%-75% of the theoretical evaporation rate in practice, although the exponents of each were prone to exaggerating their respective evaporative powers. Most sources agree, though, that oil has on average 1.3 to 1.4 times the calorific value of coal. In practical terms, this meant an oil-burner could either carry the same weight of fuel and have a proportionality greater range or the same range with less fuel, and devote the weight saved to additional armour or weaponry.

The advantages gained from the physical nature of liquid fuel are important too. Although quite viscous oil fuel can be pumped through pipes and hoses, allowing vessels to rapidly and cleanly refuel with minimum effort. It was postulated that refuelling with oil would be relatively easy to accomplish while under way, although

\textsuperscript{13}C. Davis, \textit{British Oil Policy in the Middle East, 1919-1923}, (Edinburgh: Ph.D., 1975), p. 3.


\textsuperscript{17}Frank Lyon and A. W. Hind, \textit{Marine and Naval Boilers} (Annapolis: USNIP, 1915), p. 235.
easier said than done it did eventually prove practical. It was also possible to pump liquid fuel around a ship internally, either directly into the furnaces or to adjust a vessel’s trim to allow for consumption or compensate for damage. Pipes replaced the large hatches and scuttles required for coaling - strengthening a ship’s structure and watertight subdivision. Liquid fuel could also be stowed far more effectively by utilising awkwardly shaped, inaccessible and otherwise redundant spaces, such as a vessel’s double bottom. Oil bunkers could be filled almost to the top and contain 11% more volume of fuel.\textsuperscript{18} Oil was far easier and more accurately measured with calibrated plates on the bunker walls or a dipstick.\textsuperscript{19} If of the correct quality and burnt efficiently oil produces no smoke at all; as combustion of the sprayed oil took place throughout the whole furnace not just on the floor, furnaces could be smaller and reach working temperature much faster, allowing ships to raise steam quicker and leave port sooner. Consequently, vessels could be kept on shorter notice for sea without having to maintain more steam than required for normal dockside usage. At sea, control over the flow of oil into the furnace could be managed to a fine degree, and give maximum speed at shorter notice. Moreover, when a vessel returned to port its furnaces could be quickly extinguished without loss of fuel. Burning oil causes less corrosion to furnaces than coal, extending the time between servicing and increasing the working life of boilers and furnaces. Oil furnaces could also operate without interruption at full capacity, until the oil, not the men, was exhausted. Without the need for large gangs of trimmers and stokers to move coal crews were smaller, improving the habitability for those that remained and giving designers more space to play with. While still not pleasant for the remaining stokers they no longer had to open furnace doors to shovel in coal, boiler rooms ceased to be the hellish infernos they once were. The new criterion for the size of the boiler-room staff was the minimum needed for maintenance, with the commensurate savings in pay and rations. For a volunteer navy better conditions and the need for fewer men were important benefits. In 1913, the lower deck magazine, \textit{The Fleet} calculated that of the '97,000 lower deck ratings' in the Navy, 46,748, or over 48%, 'are engaged in driving the ship'.\textsuperscript{20} By changing to oil-burning the number of

\textsuperscript{18}The only allowance required for oil was for changes in volume due to temperature changes.

\textsuperscript{19}Lyon and Hind, \textit{Naval Boilers}, p. 235.

\textsuperscript{20}\textit{The Fleet}, April 1913, p. 108. CHAR13/21.
stokers in the Queen Elizabeth class battleships was cut from 260 to 110.\textsuperscript{21}

Oil, however, created new practical as well as political problems, some proved more imagined than real while others had implications beyond the Navy. The risk of fire was taken extremely seriously and dictated that oil be stowed, as far as possible, beneath the waterline to reduce the chance of ignition by enemy shell fire. The Navy exacerbated its supply problems by specifying a 175°F flash point, higher than the 150°F acceptable for merchant steamers.\textsuperscript{22} Fires and flashbacks from furnaces did occur, but the fears of fire proved exaggerated and once safety procedures were established fires involving fuel oil were rare. Fuel oil was in fact difficult to ignite - one reason burners proved so difficult to develop. Indeed, spontaneous combustion in coaltankers was probably a greater threat than oil fires.\textsuperscript{23}

Also thought detrimental was the loss of protection provided by coalbunkers. This fear was exaggerated too. To provide protection coalbunkers had to contain coal, which as a voyage proceeded became increasingly unlikely. None the less, coal was used in some armoured deck cruisers as their main source of protection, and its loss was lamented.\textsuperscript{24} Storing liquid oil on ships necessitated improved construction techniques. Oil was 'more searching than water' and dissolved the sealants used between plating, such as red lead; closer and more careful riveting, with metal-to-metal caulking proved adequate until welding eliminated the problem.\textsuperscript{25} At low temperatures, to reduce


\textsuperscript{22}Flash point is 'The temperature at which oils give off sufficient vapour to flash on the application of a flame or spark.' It is not the temperature at which the oil itself burns, that is the fire point which is usually about 25°F higher. Lyon and Hind, Naval Boilers, p 229.

\textsuperscript{23}Spontaneous combustion of coal stored near a magazine was one possible cause of the explosion that destroyed the battleship Vanguard at Scapa Flow in 1917. Three years before a spontaneous fire in one of her bunkers had necessitated its flooding. Report of the Court of Enquiry into the loss of Vanguard, 30/7/1917. ADM137/3681.

\textsuperscript{24}Attwood, Warship, p. 214. That bunkers provided additional stability was correct at the time of the first edition of Attwood's work (1904) but was only significant in vessels with vertical reciprocating engines (1890-1906). In warships with turbines, with all the weight of the engine below the waterline, the reserve of stability is of less importance. See evidence of DNC, P. Watts, to the Admiralty Committee on the use of Oil Fuel in the Navy, 1911-12, (Hereafter Pakenham) 12/12/1911. ADM265/29.

viscosity and make the oil fuel pumpable, tanks needed fitting with heating pipes. The need for oil to be free flowing and have a high flash point made it difficult for some sources to supply it to the Admiralty’s specification. Coal possesses one attribute oil does not; in an emergency a coal depot can be created at short notice on virtually any piece of land, and although time-consuming and arduous work, men can move coal with the most rudimentary equipment. Similarly, bagged coal can be carried in almost any vessel, whereas to store and move oil requires highly specialised equipment.

At the end of the nineteenth century, three factors led to a renewed interest in oil by the Navy - all of which were beyond its control. These were new methods of supply, improvements in burners and an increase in the number and diversity of sources. The introduction of the bulk oil tanker in 1892 by Marcus Samuel revolutionised the world oil market. He was the first to show that petroleum products could be safely and cheaply transported in bulk and opened the Suez Canal to bulk oil shipments. Samuel, with his co-conspirator, the ship designer Sir Fortescue Flannery of the Wallsend Slipway Company, secretly planned and built a dozen of a completely new type of vessel, the bulk oil tanker. By shipping Russian kerosene in bulk through the Suez Canal, they hoped to perform a coup de main that would break Standard Oil of America’s monopoly of kerosene sales in the Far East. Samuel achieved his aim and his company, Shell Transport and Trading, became a major force in the oil world. The two men also pioneered the use of oil as a fuel in ocean-going merchant ships, enabling Shell’s tankers to take advantage of the cheap oil residue at Baku. The new tankers demonstrated it was possible to ship oil in the quantities the Navy would require if it were to adopt it.

Work on improving burners pioneered by other navies also began to bear fruit around this time. Torpedo boat destroyers were most suited to take advantage of oil fuel as their speed and space were at a premium. Essential to her strategy of flotilla defence France hoped to improve their performance by adopting the Guyot oil-burner in 1895. The Guyot system sprayed oil over a bed of coal using a combination of steam and compressed air to atomise the oil. Details of the system became known in Britain


27Some oil tankers continued to burn coal until at least the 1920s.

28For the concept of flotilla defence see Lambert, Naval Revolution. As this strategy was directed against Britain, France could not expect access to Welsh coal.
following the publication of a book by Emile Bertin, the Chief Constructor of the French navy. Indeed in the English translation the Director of Naval Construction (DNC), Sir William White, wrote an introduction. However, it did not receive universal acclaim in the French navy and fitting new ships for burning mixed fuel was abandoned in September 1904.

The Russian navy also used oil in its torpedo boats, but was unable to transfer its limited success into larger vessels. Vittorio Cuniberti devised a mixed fuel system for the Italian navy in 1890 that used less steam than other systems. It was of sufficient interest for the Navy to send its Chief Inspector of Machinery, James Melrose to Italy in 1901 to evaluate it. Reports began appearing that the German navy was using oil too and erecting storage tanks at Kiel and Dantzig. Although use of oil as auxiliary to coal was becoming widespread in smaller vessels, by the late 1890s no navy had yet managed to introduce a satisfactory system that only used oil.

At first, the Admiralty examined developments in commercial shipping, where the less exacting technical demands allowed easier use of oil. However, its limited availability made those shipowners bold enough to use oil specify that their vessels, if necessary, could also use coal. The few ships that used only oil remained close to its source, and their sprayers required quantities of fresh water unacceptable to the Navy. Next, the Admiralty examined oil-burning trains; oil had been widely used to power Russian steam trains since 1884 because it was cheaper than local coal. In Britain, the pioneer of oil in railway locomotives was James Holden, the Locomotive Carriage and Wagon Superintendent of the Great Eastern Railway (G.E.R). In 1903, the G.E.R. used a burner designed by Holden in eighty of its 1,200 locomotives 'for fast work' and royal trains. They could also revert to burning coal. Holden designed his burner to utilise the

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32. The Engineer vol. 82, 9/10/1896, p. 375.
oil produced as a by-product of the town gas G.E.R produced for lighting in its carriages.\textsuperscript{34}

The third crucial factor was the discovery of new oil fields. Until the 1890s, only the Pennsylvanian and Russian fields produced significant quantities of petroleum, and at the time, Russia was considered a potential enemy. New discoveries radically altered the situation, first in 1885, in Sumatra, which led directly to the formation of the Royal Dutch Company five years later, and then, in 1897, when Royal Dutch discovered a large field in Borneo rich in petroleum suitable for naval fuel.\textsuperscript{35} New discoveries in California supplemented American production that increased again early in the twentieth century by large finds in Texas (1901), and Oklahoma (1901-05).\textsuperscript{36} America's abundance of petroleum made Admiral Meville USN write in 1902 that 'the presence of an unlimited supply of fuel oil at the seaboard is a new phase of the problem'.\textsuperscript{37} However, only small deposits were discovered in the British Empire. The most significant being in Burma, operated by the Burmah Oil Company, where production rose from 10,250 tons in 1889 to over 170,000 tons in 1901; in global terms this was small beer and used to supply kerosene to India.\textsuperscript{38} In 1901, total oil production in the British Empire represented just 1.3\% of total world production.\textsuperscript{39} Nevertheless, by the late 1890s, oil was available, albeit overseas, moveable in bulk and the technology to reap its benefits in view. Unless the Navy acted it would soon face the prospect of its vessels being seriously outclassed by oil-burning navies.

In December 1896, the Admiralty announced its intention to try oil-burning in the destroyer Surly. Trials commenced 3\textsuperscript{rd} March 1898 using two types of burner, the Rusdes and Ecles, already widely fitted in merchant ships, and one of Holden's design. Using Russian and Borneo oils both burners proved unsatisfactory.\textsuperscript{40} When oil was

\textsuperscript{34}James Holden R. C., 29/4/1903, p. 219.

\textsuperscript{35}Yergin, Prize, p. 73.

\textsuperscript{36}Ibid. p. 82.

\textsuperscript{37}Petroleum Review, 29/3/1902, p. 331.


\textsuperscript{39}D.N.I. Naval Progress, July 1903. ADM231/38.

\textsuperscript{40}Melrose to Controller, 31/3/1898. ADM265/26.
burnt with coal 'not more than 50% of full evaporation of the boilers could be obtained without emitting dense black smoke.' Moreover, evaporation rates were below that normally achieved with Welsh coal. The trials continued into 1899, improvements were made but incomplete combustion of the oil causing excessive smoke continued to plague them, a problem less common and relevant in merchant vessels as they could burn oil more thoroughly in their larger furnaces. Melrose, who was overseeing the experiments, requested that more trials be conducted simultaneously on shore and in 1901, three different types of boilers were erected at Devonport Dockyard. In the same year, two of the cruiser Bonaventure's furnaces were also converted to burn oil. Overall, the results proved sufficiently promising and the pace of experimentation was accelerated. In addition to more ships joining the trials, consideration was given to the large-scale storage of oil at the major naval bases. The cruiser Bedford and the battleships Mars and Hannibal all had boilers converted to burn oil-only, and in the battleships two further boilers were modified to burn coal and oil. The captain and engineering officer of the Hannibal preferred the oil-only boilers. However, the captain commented:

Taking into consideration everything I know of relating to oil fuel, e.g. supply, storage, fittings etc., I strongly recommend that our ships be fitted with oil-coal boilers and not with oil only.

A small experimental plant was built at Haslar Dockyard, Portsmouth, and two further types of boilers constructed. Surly was used to test Kermode pattern burners that used compressed air, and another type by Orde that employed superheaters to vaporise the oil before combustion, Kermode's was best, but still inadequate to meet the Navy's demands. At Haslar, the Navy devised it own burner that showed great promise.

41Ibid.
42Only 8.8 lbs of water being evaporated per pound of oil as compared with 10.7 lbs for coal. ADM265/28.
43Ibid. The boilers types were Normand, Belleville and Cylindrical.
44Controller to Directors of Stores, Contracts, and Works and the Engineer in Chief (E-in-C). 13/10/1902. ADM1/7676.
45Captain Gillard to Vice Admiral Commanding Channel Fleet, 18/4/1903. The Vice Admiral dutifully passed this opinion on to the Secretary of the Admiralty 28/4/1903. ADM1/7676.
Melrose’s reports showed a steady improvement in boiler efficiency and smoke reduction, and when oil and coal were burnt together the coal ‘is burned with less waste than when coal is burned alone.’ The Controller commented ‘that the difficulties of burning oil fuel are practically disappearing’ to which the D-of-S appended:

Although there are certain advantages in the use of oil alone, I am inclined to the combined use as the most promising use on a large scale. Especially as this is not an oil producing country to any large extent and in time of war we might run short.  

Work continued on shore at Haslar in parallel with the sea trials, and a system based on the Navy’s design that did not require any ‘external agents’ such as compressed air or steam, was developed. A closely guarded secret, it was granted a secret patent in June 1904. First tried at sea in the destroyer Spiteful during the winter of 1904-05, with her coal-burning sister ship Peterel going through the same manoeuvres as a control. Spiteful clearly demonstrated the superiority of burning oil in destroyers. In 1904, the First Lord, Lord Selborne, boasted that:

The experiments with oil fuel have continued without a day’s intermission and I think it can be accurately stated that in no country has greater attention been given to this subject or experiments been more exhaustive. 

In Mars and Hannibal the steam consuming oil-burners were replaced with the new Admiralty pattern in 1905, and with the exception of the New Zealand all the major ships in service were converted to dual-firing. All subsequent battleships, armoured cruisers and battle cruisers were built as dual-firing. Using the new Admiralty pattern sprayers full boiler power could be achieved using either coal alone or 70% coal and up

47Melrose to E-in-C and Controller, 6/6/1903. ADM1/7676.

48Report of American Naval Attaché, 1907, NARA, RG 38, E-10-b, Box 837. The oil sprayers for the burner were built by the Admiralty and delivered to the shipbuilders with great secrecy.

49FL’s Statement, 1904-05. Cd 2402.


51Summary of the Investigation of the Committee Dealing with the Supply of Oil for his Majesty’s Ships with Notes on Subsequent Actions, 1903-1906. September 1907, p 1. Admiral May, mss MAY6 (Hereafter Pretyman).
to 30% oil. By burning oil only 80% of full power was achievable.52 The next class of
destroyers, the twelve 'F' class boats, were the first destroyers to burn oil only and have
turbine engines.11 However, fears that supplies of oil could not be guaranteed in
wartime account for the next sixteen boats of the 1908-09 programme, the 'G' class,
reverting to coal-burning. They only served to further demonstrate the advantages of oil
and all subsequent destroyers burnt oil.54 Technically the introduction of oil-burning
was a very real achievement, and Melrose's role was recognised with the award of £750
gratuity.55 The political accolade must go to Selborne56 for supporting the expansion of
the trials from what was a minor affair in one or two destroyers to one involving the
most modern battleships the Navy possessed, even though he considered:

The substitution of oil for coal is impossible, because the oil
does not exist in this world in sufficient quantities. It must be
reckoned only as a most valuable adjunct.57

Indeed few were prepared to make the Navy wholly dependent on such a precarious fuel
as oil, whatever its advantages.

Once the decision was made to 'adopt oil fuel as an auxiliary' an Admiralty
committee was established to examine the vexed question of supply;44 its president was
the Financial Secretary to the Admiralty E. G. Pretyman MP, its membership consisted
of the D-of-C, Professor Vivian B Lewis a chemist from the Royal Naval College
Greenwich, and the Assistant D. N. I. Sir Boverton Redwood, 'a well known petroleum
expert and advisor to the Home Office' was co-opted at an early stage. The committee
interviewed the leading figures in the British oil trade about possible sources of oil, but

53March, Destroyers, p. 85.
54Appendix 2 for comparison of G and H classes.
55TS/25. (Equivalent to the purchasing power of about £45,000 in 2002).
56D. George Boyce (ed.), The Crisis of British Power; The Imperial and Naval Papers of the Second
Earl of Selborne, 1895-1910, (London: Historian's Press, 1990), p. 6. Selborne was aware that the
growth, industrialisation and ambitions of other nations meant Britain would soon be unable to maintain
her numerical superiority and would therefore have to rely on technical superiority to stay ahead.
58Pretyman.
not in regard to transportation and storage. No details of evidence were published, nor did it issue a final report before the Board formally dissolved it in June 1906.\(^5\) Only a brief summary of its deliberations survives.\(^6\) The committee noted that commercial interests ran counter to the Admiralty's as companies wanted to leave the minimum residue suitable for fuel oil after extracting the lighter, more valuable, fractions from petroleum and that the normal practice was to refine petroleum as close to the source as possible, so only the costs of transporting the finished products were incurred.\(^7\) The Admiralty called for residue of a higher quality than was normally created, and the ease with which Admiralty specification oil could be produced varied from field to field, depending on the properties of the original petroleum.\(^8\)

After assessing the world's known petroliferous regions, the committee concluded that the two largest, Russia and America could not be relied on in wartime, as neither had a sufficient surplus available for export. Geological knowledge was also rudimentary and unable to determine the full extent of the known fields, how long they might last or accurately indicate any new ones. In 1897, for example, the Royal Dutch wells in Sumatra dried up after only two years' production.\(^9\) Nevertheless, when the committee examined the Empire's oil prospects, it was remarkably optimistic:

There is food for encouragement in the thought that there is a prospect of new oilfields being opened up in British territory, from which ample supplies may be forthcoming for H. M. Navy.\(^10\)

The committee was worried that foreign syndicates would obtain the rights to British fields but decline to exploit them to 'artificially manipulate the world's supplies,' and took steps to ensure the Colonial Office retained the mineral rights of all Crown

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59. The fall of the Conservative Government in December 1905 was probably the real death knell. Pretyman was replaced by Robertson as Parliamentary and Financial Secretary to the Admiralty. The Board merely recognised the change.

60. Admiralty to Treasury, 24/12/1907. T1/10626A.

61. For example 60% of Russian oil was residue after distillation.


63. Yergin, Prize, p. 73.

64. Pretyman.
Colonies and were obliged to inform the Admiralty of any prospecting. Subsidising British companies was rejected; as a ‘matter of principle’ mining operations should be ‘left to private enterprise.’ Although, ‘out of consideration for the companies’ and to enable them to plan ahead it recommended that the Admiralty be allowed to make forward contracts for up to three years. This was accepted by the Treasury, indeed it went even further and placed no time constraint on contracts that involved ‘fixed quantities of oil at a given price.” Given the Treasury green light the Admiralty signed a long-term contract with Burmah Oil in 1905 for 10,000 tons per annum.

One known domestic source was oil distilled from Scottish shale; the committee calculated that this could provide up to 80,000 tons of naval oil fuel in wartime. Other potential domestic sources were the by-products of industrial processes involving coal, chiefly the production of town gas that produced 80,000 tons of creosote a year and 50,000 tons of ‘Blast Furnace Oil’ from the manufacture of coke for the steel industry. The committee concluded that:

One result of the investigations has been that it is evident that the quantities of fuel oils available and in sight are much less than hitherto been supposed, and there can be little doubt that, at the best, only sufficient will be obtainable for use as an auxiliary to coal. Oil must be regarded as a supplement not as a substitute.

Another fuel problem facing the Navy was the provision of petrol for submarines. Trials with commercial petrol were conducted, and though slightly inferior to Admiralty issue, it was deemed suitable. However, the requirement steadied when new submarines began to be fitted with diesels that used oil fuel.

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Ibid.


Burmah Oil–Admiralty contract, November 1905. ADM116/5814.

Phetyman. Although this would disrupt the production of lubricating oils and other by products.

Ibid.

Although most of the Navy's larger ships were rapidly converted to dual-firing, oil was 'not to be used to drive the main engines unless under special circumstances.' One exception was each quarter for training, when oil was burnt in conjunction with coal for a twelve-hour period.\textsuperscript{21} The restriction was for a very sound reason; until oil storage facilities could be built, there was little oil available. The cost of storage and its associated equipment threatened to be enormous. Spending on new works had already increased five-fold in the last eight years (1897-98 to 1904-05 compared with the previous eight), due to the needs of increased numbers and larger vessels.\textsuperscript{72} In selecting Admiral Sir John Fisher as First Sea Lord Selborne hoped, he had found a man capable of restraining naval expenditure. He told Fisher that the naval spending had reached its peak, and 'in 1905-06 not only can there be no possible increase ...[,]... we should show a substantial decrease.'\textsuperscript{22} The need for oil and economies coincided with the end of borrowing for Naval works with Naval Loans Acts. In future, all works would have to be paid for out of annual budgets.\textsuperscript{74} In December 1905, the election of Campbell-Bannerman's Liberal Government, which implemented an expensive social agenda, further tightened the noose around naval spending.

How much oil was needed and where it should be stored was, of course, dependent on the anticipated theatre of operations and consumption. In March 1905, an internal Admiralty conference decided that, based on predictions provided by the DNI, 'storage should be provided on the war requirements'. ...[...] 'of the Fleet four years hence,' with twelve months supply kept at home ports and six months at Malta, Gibraltar and the Far East, and distributed in the same ratio as coal. Initially the D-of-S calculated this would require 350,000 tons of storage by 1909.\textsuperscript{24} The principal homeports at Medway, Portsmouth, Portland and Plymouth would account for 216,000 tons.

\textsuperscript{71}Limitation of use of oil fuel in H. M. Ships, 20/4/1905. ADM1/7825.


\textsuperscript{73}Quoted in Sumida, \textit{Naval Supremacy}, p. 27.

\textsuperscript{74}Ibid. p. 24.

\textsuperscript{75}D-of-S memo., 10/5/1905. ADM1/7826. The DNI's prediction was for coal, the oil fuel consumption was assumed a fifth in dual-fired ships and 3/5 of the coal figure in oil burning destroyers.
Estimated to cost two pounds a ton, storage was expensive, but it compared very favourably with the D-of-S's 1902 estimate of five pounds a ton.

Storing oil was a new competence the Admiralty had to learn. Oil companies tried to keep as little of their capital tied up in stock as possible and rarely stored large quantities of oil for long periods. Initial inquiries by the Director of Works (D-of-W) during 1902, about the size of tanks available revealed that 'no tanks have been made in England larger than 2,000 tons [capacity],', though some larger tanks did exist abroad. Unsure whether tanks should be separated by earth or concrete banks, placed close together, near coal stocks or inland and the oil piped to the quay-side the Navy employed a consultant engineer, Mr Barringer, to advise on storage and tank construction. Barringer designed a 5,000-ton tank that became the Admiralty standard, and personally supervised the first installation at Portland. Later schemes were completed under the Admiralty's own supervision, at an average price of two pounds ten shillings per ton. Because oil was used in conjunction with coal, tanks could not supplant coal stores and new sites had to be found, sometimes necessitating the purchase of additional land.

Realignment of the Fleet made it necessary to provide oil facilities on the East Coast for the new oil-burning destroyers about to enter service. In July 1908, the D-of-S expressed unease that the only oil north of Sheerness was 500 tons of private stocks at South Shields. To tide the Admiralty over until it built its own tankage, the D-of-C approached private companies with a view to renting existing facilities. At the smaller ports, companies were also invited to erect and manage tankage at their own cost, in return for a long-term Admiralty contract. Their response was less than enthusiastic. They offered to find the Admiralty land, but declined to build and manage any installations.

By 1907, the predicted 350,000 tons storage requirement had been reduced to an initial programme of 110,000 tons, all at homeports. The completion of this amended

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76Admiralty to CID, 19/6/1905. CAB17/46.

77D-of-W memo., 6/12/1902. ADM1/7594C; Admiralty to Treasury, 1/8/1904. T1/10926A.

78D-of-W to Pakenham, 19/1/1912. ADM265/29.

79Companies were approached at Grimsby, Grangemouth, Felixstowe, Invergordon and Inningham. ADM116/1077.

80Report on East coast coaling and oil facilities, 1908. ADM1/7992.
total suffered severe delays, and was to take until 1910-11 to compete, with no significant quantity being ready before 1909.\textsuperscript{41} The aspiration of a twelve months' reserve had also been frustrated and the D-of-S was working to an amended figure of 160,000 tons, predicated on four months' wartime use.\textsuperscript{42} Despite the Navy establishing itself as the world leader in the use of oil fuel, for four years (1905-1909), the only oil storage it had of its own was 20,000 tons at Portland. Supplemented from 1906-07 by renting 26,500 tons from private companies at Thames Haven until completion of the full programme;\textsuperscript{43} the small domestic consumption of oil fuel meant the Navy could expect no more than 15,000 tons of commercial stocks would be available for requisition in an emergency. Paucity of storage facilities in 1909 necessitated that if an emergency occurred at least 35,000 tons of oil would have to be maintained afloat in tankers on the East Coast, and that 'Ocean-going Destroyers' would have first call. Oil for other warships would be strictly limited to 'time of great emergency,' which effectively meant only when in contact with the enemy.\textsuperscript{44}

During the trials, every available oil was tried. The cheapest suitable fuel came from Texas, and the first bulk purchase of Texas oil was made in 1902. Purchased c.i.f. Thames Haven and stored there on arrival, it cost forty shillings per ton.\textsuperscript{45} With one exception all oil purchases up to 1907 were c.i.f.; thereafter all purchases were made f.o.b. Only when the Admiralty had its own storage and was not reliant on the vendor's facilities could it separate the cost of shipping from the cost of the oil and shop around for the best price for both. Shipping costs were estimated by the Admiralty when it contracted for the oil. The actual cost was settled on an individual ship basis as each tanker was chartered over the period of the contract. Freight charges represented 40%-50% of the total cost for Texas oil and 50%-70% for Burmese oil landed in Britain. By

\textsuperscript{41}Admiralty to Treasury, 4/12/1908. T1/10926.


\textsuperscript{43}The private companies were Thames Haven Oil Wharves Co., with about 16,500 tons, and Shell 10,000 tons. The contracts were short-term and reviewed annually, they cost the Navy about £4,000 per annum. Admiralty to Treasury, 1906-1909. T1/10926A.

\textsuperscript{44}D-of-S report, 20/2/1909. MT23/229.

\textsuperscript{45}Melrose calculated that over a 12 month period Texas oil would cost 2.4 times that of Welsh coal, Shale oil would be 2.7 times, Borneo oil 3.5 times and Russian 4 times as expensive. ADM265/26.
arranging its own shipping, over the next three years the Admiralty managed to effect savings of between four and six shillings a ton on Texas oil.\(^{86}\)

Before 1910, all Admiralty oil came from either Burma or the United States. After 1910, Rumanian oil was also purchased in large quantities, plus some Scottish shale oil and a small amount from Borneo. Only the absence of shipping costs made expensive Scottish shale oil viable.\(^{87}\) Conversely, only a small amount of Borneo oil was purchased for consumption in the Far East. Burmese oil cost much the same as Texas oil f.o.b., but the shipping costs were far greater because of the distance. A tanker could complete only four round trips a year to Rangoon, compared with six to the Gulf of Mexico.\(^{88}\) Nevertheless, the contract with Burmah Oil guaranteed the Admiralty up to 10,000 tons a year in peacetime and up to 100,000 tons in wartime, the company was also obliged to retain a stock of 20,000 tons of oil to Admiralty specification at Rangoon for emergencies.\(^{89}\) It was clear though, when the Burmah Oil contract was signed, that the Navy's wartime requirement would very soon outstrip Burmese production. The contract, had as much to do with ensuring that an 'all British undertaking [was] working an important oil field in British territory.'\(^{90}\) It helped to shore up the company weakened by a kerosene price war in the Indian market and prevent it falling into the hands of foreign nationals, thus providing the sort of support for a British oil company recommended by the Pretyman committee.\(^{91}\) Even so, it was seven years before the Admiralty took its full annual quota of 10,000 tons, and only then following a sharp rise in the price of American oil.\(^{92}\) The contract balanced price with certainty of supply. The role it played in persuading Burmah to become involved in exploration for oil in Persia will be examined later.

\(^{86}\)Pakenham.

\(^{87}\)Even without shipping costs it was slightly dearer than Texas oil. However, it was a light oil particularly suitable for use in submarines and its first purchase coincides with the introduction of the diesel D and E class submarines.

\(^{88}\)Pakenham, Section III Transport.

\(^{89}\)Burmah Oil Contract, November 1905. ADM116/5814

\(^{90}\)Admiralty to CID, 19/6/1905. CAB 17/46.

\(^{91}\)Corley, Burmah Oil, pp 78-93.

\(^{92}\)Pakenham. The Admiralty took between 7,000 to 7,600 tons per annum 1907-11.
In less than ten years, the Navy had taken the lead in oil-burning technology. It had developed and introduced oil into service either as an adjunct to coal, or, in the case of destroyers, as the sole fuel, and shown that it was technically possible to use oil only in all classes of warships, fears over wartime supplies, not technical difficulties, prevented oil-burning being introduced across the board. If necessary domestic oil production could supply the few oil-only vessels until a reserve, stock was created, and the dual-fired ships could always use coal.\(^93\)

As First Lord, Fisher's influence on the introduction of oil could not fail to be important, but his earlier role remains unclear. The *Surly* trials were commissioned two months after he vacated the office of Third Sea Lord. Although he befriended the oil magnate Marcus Samuel, the latter's biographer Henriques places the first meeting between Samuel and Fisher in 1899, again after the *Surly* trials.\(^94\) Nor did Fisher, as some suggest, set up the Pretyman Committee.\(^95\) However, when C-in-C of the Mediterranean Fleet in 1901 he did urge the advantages of oil fuel on Selborne, and his advice would certainly have been influential, as Fisher undoubtedly impressed Selborne.\(^96\) Who later recorded: 'Sir John's mind worked like lightning and he could think and he could talk and argue with the best.'\(^97\) However, Fisher was not directly involved in any of the trials, at least not until he became the First Sea Lord. Even then, his enthusiasm for speed and advocacy for oil were tempered by concern for supply, as his 1904 paper *Naval Necessities*, reveals. His ideal battleship would use 'coal only when making passage, and the oil when in the neighbourhood of the enemy' although he did acknowledge that the future of the all-oil ship was inevitable once 'a constant source of oil is assured.'\(^98\)

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96The peacetime consumption of all oil burnings destroyers in 1910-11 was about 80,600 tons. Domestic sources had the potential, according to Pretyman (see below) to produce 210,000 tons.


95Marion Kent, 'The Purchase of the British Government's Share in the and British Petroleum Company 1912-14,' *Past and Present*, No. 39, April 1969, p. 148. She gives Fisher the credit for setting up the Pakenham Committee in 1904, although it was in fact set up in 1903 when he was 2nd SL and later C-in-C Portsmouth.


97Boyce, *Selborne*, p. 5.

98Kemp, *Fisher*, vol. 1, p. 81.
The exaggerated stories of Henriques are partly to blame for confusing Fisher's role in the introduction oil. Henriques gives the relationship between Samuel and Fisher almost mythical properties. According to Henriques, these two larger than life figures battled to convert the Navy to oil against the dullards at the Admiralty.99 Henriques' contention that on 26th June 1902 the battleship Hannibal was 'completely hidden in dense black clouds of jet-black smoke and soot,' that this led directly to the postponement of 'the large scale introduction of liquid fuel into the Royal Navy' and 'very nearly lost us the First World War' is utter nonsense, but repeated by careless writers.100 Fisher was important, but during his time as First Sea Lord, coal-burning destroyers were reintroduced, albeit temporarily. On the other hand, with the Swift he pioneered the development of the oil-fired light cruiser. However, the Navy did not owe Fisher, as wrote Marder, for 'the beginning of the substitution of oil for coal.'101

Marcus Samuel deserves credit, as he led the way in the use of oil at sea. Like Fisher, he was adept at promoting his own cause and used many forums to preach the case for oil, specifically his oil. He also practised what he preached in his own ships and his reputation needs no posthumous embellishments by Henriques. Nor, as Henriques alleges, did dullards staff the Admiralty. It closely monitored all fuel developments and regularly tried whatever fuel seemed best with regard to economy and efficiency, be it a coal, patent fuel, oil or even peat.102 As in many other fields, the Admiralty had the responsibility of finding the correct balance between reliability and superiority, a constraint that frequently frustrated the zealots of the new. It is the timeless dilemma in war that if the latest technology fails, through either breakdown or lack of supplies, second chances are rare. Nevertheless, no other organisation in Britain, and probably the world, had more experience of testing and introducing new technologies into service than the Admiralty.

It was obvious from 1860 that oil offered superior qualities over coal if they could be harnessed, but it was though external factors that forced the Navy into re-
examining its use in the late 1890s. Despite ownership of the best steam coal, the Navy could not risk falling behind its competitors; it was forced to introduce oil. It did though in a manner that proved Fisher's dictum that the British Navy could watch, learn, and then introduce improved innovation faster than its rivals. Oil also opened a new area of the Admiralty's relationship with industry. It sought commercial expertise, which it then assimilated and built on to produce a superior product more suited to military purposes, adding further to the service's high level of confidence in British technology. Lack of oil in the Empire was offset to some extent by the fact that oil could be stockpiled without it deteriorating. In time a minimum reserve could be established, provided the funds were made available. Delays with storage were partly due to budgetary constrictions and partly to the finding and acquiring suitable sites.

The greatest inhibition against a headlong rush to the total acceptance of oil was the contentious question of supply, not though just because the sources were external to Britain. To focus on the fact that, unlike coal, no significant source of oil existed in the Britain, is to miss the strategic point. Control of Welsh coal and the logistical infrastructure were the most important factor, not its geographical position (although the latter inevitably led to political control). Britain was a world power, the Navy had to be able to operate in any quarter of the globe. It was fortunate that Britain's major enemies in the nineteenth century were relatively close to her source of naval fuel, but not close enough to directly threaten it. Given the choice, a local reliable supply is preferable, ultimately though it is reliability not the location of supply that is paramount.

By 1910 oil burning, either in destroyers on its own or with coal in larger vessels was firmly established. Arguments continued over the soundness of relying on a predominantly foreign fuel, but concern about adequate supplies had largely been assuaged by the provision of stocks, tankage and diverse sources. Pessimists acknowledged that in the event of a war, in the improbable scenario of the stocks being exhausted and replenishment prevented from overseas, home production could satisfy the oil-burning destroyers while the remainder of the fleet burnt coal. On the other hand, although the optimists wrote as though the empire contained an abundance of oil

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103 The classic example being the Dreadnought of 1906.

104 Oil reserves at the end of 1910-11 were 166,460 tons. CHAR13/23.
requiring just a small injection of capital to make it available, they too balked at a Navy solely reliant on oil fuel.\textsuperscript{103}

\textsuperscript{103}For examples of optimism regarding the Empire’s oil prospects see \textit{The Times} 4/3/1910, \textit{The Naval and Military Record} 10/4/1910 and \textit{The Economist} 5/3/1910.
Chapter Three

The All Oil Battleship

By restricting oil-burning to smaller vessels the Admiralty matched consumption to guaranteed sources thus ameliorating oil's major drawback - uncertain supply; this chapter examines the introduction of oil-fired battleships during Winston Churchill's tenure as First Lord of the Admiralty, a change that made Britain for the first time dependent on overseas fuel sources. It examines the work of the Pakenham Committee and the Royal Commission on Oil Fuel and Engines, and how the financial implications of their conclusions affected the introduction of oil fuel. The chapter then explores the implications of technical details and the use of oil on national policy, and visa versa, before illustrating the Admiralty's response to the challenge of a new fuel technology with a limited commercial supply infrastructure.

In November 1910, the USN decided that the time had 'arrived for building battleships to burn oil only.' Britain's technological lead in using oil was receding, and although still ahead of her most likely enemy, Germany, unless progress was maintained it would only be a matter of time before its lead was lost. Britain possessed the technical ability to build oil-only ships of any size, but to equip the whole Navy with oil-only warships would render it dependent on foreign sources of fuel.

Admiral Sir A. K. Wilson succeeded the mercurial Fisher as First Sea Lord in January 1910. He accepted Fisher's changes, but was not an innovator himself. 'The doors of the Admiralty are closed to all new ideas and developments,' Esher wrote Balfour of Wilson's appointment. Out of office, Fisher still felt his views were important and respectfully heard. Hoping to maintain the momentum of his naval reforms he dispatched a stream of letters to the press and any influential person he felt could further his aims. His prominence made him the recipient of lobbying, and he was sought by others to put their view to echelons of Government from which they might otherwise be excluded. This was particularly true when it came to technical innovations that fitted in with Fisher's strategic and tactical opinions, and he willingly

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crusaded on their behalf irrespective of their practicality. One of Fisher’s hobbyhorses was speed. He wrote: ‘What you do want is super-swift—all oil and don’t fiddle about armour; it really is VERY silly! There is only ONE defence and that is SPEED!’ Fisher regarded oil as the key to superior speed, and out of office his enthusiasm for oil increased. Reservations he had harboured over supply were allayed, partially by Samuel’s assurances that he could furnish all the Navy’s oil requirements, but if not Fisher believed ample supplies could be distilled from domestic coal. He was even more enthused though by the diesel internal combustion engine, which offered a fourfold decrease in oil consumption and made possible, he thought, a battleship that could go round the world without refuelling. Fisher concluded that:

The Admiralty and the Government must be shoved over the precipice over these two things - oil and internal combustion engines as regards propulsion of warships.

The Navy had used diesel generators from the turn of the century for lighting, and the first diesel powered vessels were the ‘D’ class submarines of 1907. Fisher’s dream of a diesel battleship was far ahead of its time. He remained convinced, however, that one would be built soon, and feared that it would be by the Germans. He extolled the virtues of diesels in press interviews, and wrote McKenna in August 1910 that ‘the “Motor Battleship” [would be] as superior to the Lion as the Lion to the Dreadnought.’ At the time, diesels developed insufficient power for large warships and the E-in-C regarded them an impracticable proposition for the Navy. Fisher was, however, still considered an eminent authority on naval matters and his case required addressing. A 1910 editorial in The Engineer did so in no uncertain terms.

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5Rippon, Engineering. p. 127.
6Mackay, Fisher, p. 426.
8Naval Annual 1911 p. 85. Described Fisher as a leading naval authority.
The statements made about battleships and cruisers being fitted with internal combustion engines may for the time be dismissed as absurd.

Fisher remained undaunted; his faith was sustained by Samuel and Sir Charles Parsons, inventor of the steam turbine, who assured him that 'there would be no difficulty in fitting a battleship 32,000 h p with internal combustion engines.' However rapid the development of the diesel, it never managed to keep pace with Fisher's aspirations. Conveniently, he regarded the technical difficulties as details for others to solve, rarely insurmountable, and often the bastions of reactionary forces within the Navy: 'You won't get your experts to plunge for it' typified his view.

Fisher first met Winston Churchill in 1907, when Churchill was the Under Secretary at the Colonial Office. In Churchill, Fisher found a kindred spirit; both men 'shared a boyish enthusiasm for technical developments,' and the old sailor beguiled the young politician with tales of the Navy. They established a lasting, if at times stormy, relationship that has been explored in many works. Churchill 'found Fisher a veritable volcano of knowledge and of inspiration.' Of his appointment as First Lord of the Admiralty on 24th October 1911, Churchill wrote 'as soon as I knew for certain I was to go to the Admiralty I sent for Fisher.' Initially minded to reinstate the seventy-year-old Fisher as First Sea Lord, Churchill demurred and selected instead Admiral Sir

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10Marcus Samuel, 'Oil Fuel and Internal Combustion Engines' The Petroleum Review. vol. 26, no. 527. 20/4/1912. p. 231; Parsons to Fisher, 12/9/1912. FISR1/12. 32,000 hp was about the same power developed by the battleships under construction at the time, the Iron Duke Class, but far short of the 75,000 hp required for the fast battleships of the Queen Elizabeth class.


Francis Bridgeman as Wilson's replacement. However, he kept in regular contact with Fisher, who, as always, gave freely his opinion on all naval matters.

Churchill cites a War College study as identifying the need for a fast division of battleships. To perform their role they needed a speed in excess of the enemy's battle-line, but without concessions in armour and armament. Only oil-fired boilers could ensure these characteristics. However, apart from the strategic risk of relying on an extraterritorial fuel supply, the creation of a large oil reserve was expensive. Naval spending, after a brief period of stability, was starting to escalate alarmingly due to new construction and coming increasingly under attack from inside and outside Parliament. For a First Lord appointed to implement rigorous economies extending oil-burning was going to be very difficult politically.

When Churchill arrived at the Admiralty, there were 'built or building 56 destroyers' and 74 submarines 'solely dependent on oil' plus the dual-fired vessels. 'We were not, however, dependent upon oil to such an extent as to make its supply a serious problem,' Churchill later wrote. Nevertheless, his concern over oil supplies predates his appointment as First Lord. In his former post of Home Secretary, he had already canvassed the opinion of Charles Greenway, the managing director of the APOC, on how best to 'check the rapacity of the foreign oil trusts.' Greenway's predictable response was that this could only be done by creating an all-British vertically integrated oil company with its own source of petroleum, and only APOC had the potential to fulfil this role. Churchill pledged Greenway his political but not financial support.

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16Ibid. p. 61.
17Ibid. p. 100.
18Burt, Battleships in WW1, p. 251.
21Charles Greenway (1857-1934), later Lord Greenway, Director of APOC 1909-1934; Managing Director, 1910-1919; Chairman, 1914-1927.
22Speech by Lord Greenway on his elevation to the Peerage, 24/1/1927. CHAR2/151.
Besides the War College report, pressure to introduce oil-only battleships came from different quarters. Fisher was one; he arranged a meeting between Churchill and Samuel in July 1911, the same month of the Agadir Crisis that Churchill claimed alerted him to the true nature of the threat posed by the German Navy, at which Samuel reminded him that the USN was building oil-fired battleships. Supply remained the greatest anxiety, from both the practical aspect (whether enough oil was available), and from the financial aspect (if so at what price). Both factors were intrinsically interlinked through the mechanism of supply and demand. More predictable than the price of the oil were the costs of the necessary storage facilities, though these could only be calculated after the size of the reserve had been settled. Churchill later described the battle for oil as: 'as anxious and as harassing as any hazard in the war.' He had 'feared on more than one occasion' that he would succumb to the opposition, but was convinced that British Naval supremacy could only be sustained by the introduction of all oil-fired vessels.

In December 1911 an internal departmental committee of inquiry was established under the chairmanship of the recently appointed Fourth Sea Lord, Captain Pakenham, to examine:

1 How can a sufficient supply of oil be obtained and a sufficient reserve stored in the United Kingdom to enable us to use oil fuel only in all new construction.
2 What steps should be taken to establish the reserve of Oil? From what sources, in what ship, and along what routes should it be obtained?
3 In what circumstances, at what expense, and up to what date will it be possible to convert the four battleships and one cruiser of the 1911-12 programmes into "oil only"? What addition to the existing reserves of oil would be necessary on this account alone?

23Burt, Battleships in WWI, p. 252; Greenway's Speech, 24/1/1927. CHAR2/151.
24Churchill, World Crisis, vol. 1, p. 29.
25Samuel to Churchill, 9/12/1911. CHAR13/1. The USN's decision was public knowledge. 'American Battleships to Exclusively Burn Oil', The Petroleum Review, vol. 25, no. 508, 29/7/1911, p. 77
26Churchill, World Crisis, vol. 1, p. 102. This statement may contain a degree of hyperbole, the exaggeration of the struggle to enhance the victory; none the less it was a significant and hard-fought campaign. He also wrote it when the decisions he took were still a matter of controversy, particularly over the Government's involvement in APOC.
Generally to report on the advantages, or otherwise, of relying upon oil for Naval Service including effects on personnel and cost.\textsuperscript{27}

Submissions were taken from the leading luminaries in the oil production and storage industries, as well as from the heads of all the Admiralty departments concerned.

An interim report was speedily produced in mid-January 1912 recommending the creation of 'not less than 12 months’ war reserve. Existing oil storage was considered insufficient and it recommended that work on additional storage commence at once, and oil to fill it be contracted for on a forward basis. It also advised that the Admiralty re-examine its oil fuel specification because it ‘naturally limits choice and enhances price.’\textsuperscript{28} Pakenham failed, however, to endorse extending the use of oil, and there can be little doubt its findings were a major setback for Churchill’s policy. Moreover, instead of suggesting a date by which it would be possible to convert the battleships (\textit{Iron Duke} Class) of the 1911-12 programme, it helped ensure that the 1913-14 battleships reverted to dual-firing.

If the 1912-13 battleships were to bum oil, Churchill needed an authoritative endorsement for his policy acceptable to the Board and his Cabinet colleagues. If Pakenham would not come up with the goods, a Royal Commission might. It would carry more weight than an internal committee, and he could select its chairman from outside the Admiralty, one who was either compliant or sympathetic to his policy as well as cognisant of the financial reality.\textsuperscript{29} Fisher was ideal; he had authority and enthusiasm for the cause, however, having recently crossed swords with Churchill over Admiralty appointments, he would need wooing to accept the job.\textsuperscript{30} Churchill wrote Fisher:

\begin{quote}
You have got to find the oil: to show how it can be stored \textit{cheaply}; how it can be purchased regularly and \textit{cheaply}; and with \textit{absolute certainty} in war. \textit{Then} by all means develop its application in the best possible way to existing and prospective ships.\textsuperscript{31}
\end{quote}

\textsuperscript{27}Pakenham, Appendix 3.

\textsuperscript{28}Pakenham.

\textsuperscript{29}One reason for Fisher’s appointment as First Sea Lord in 1904 was because he was regarded as the right man to curtail Naval expenditure.

\textsuperscript{30}Bacon, \textit{Fisher}, vol. II. p. 150.

Churchill's personal visit and numerous letters bolstered Fisher's conviction that he was the only man for the job and could, consequently, dictate his own terms. Fisher played hard to get, initially declining, only changing his mind after the Commission's terms of reference were altered to include engines as well as fuel: 'it [fuel and engines] all hangs together' he wrote Churchill. Confident that Fisher would deliver on fuel, Churchill considered an excursion by the Commission into diesel engines a small price to pay. The choice of Fisher was not without political risk. Hopwood described him as 'wild and volatile,' and fears were expressed that Fisher's recall would reopen the divisions that had characterised his time as First Sea Lord.

Given a free hand in selecting the Commission's members, Fisher chose experts in petroleum, geology, engineering and shipbuilding. To some the lack of representation from the coal industry made its conclusions foregone. Churchill made it clear that the Commission's role was purely advisory, not executive. Under no circumstances would it be allowed to dictate policy or action. Its work was to be separate from the Admiralty, and its proceedings and conclusion would remain secret to preserve the commercial confidentiality of those giving evidence. Secrecy also allowed Churchill to use its conclusions without fear of contradiction, and curb, if not fully curtail Fisher's flare for publicity.

One measure of the faith Churchill had in Fisher is that after securing his chairmanship, with the supply problem still unresolved, he decided in July 1912 that the Queen Elizabeth class battleships would burn oil only. This was to remain secret

35 Hansard, 5:41:2729-30, 5/8/1912. Reaction to the announcement in the House of Commons by Mr. Gretton, 'Lord Fisher's recall has caused a great deal of dismay and alarm throughout the Navy.'
36 The Royal Commission on Fuel and Engines, ADM116/1208 and 1209. (Hereafter Fisher) See Appendix 3 for members.
37 Naval and Military Record, 23/10/1912.
38 FISR1/12.
39 Revised legend for oil-burning R III design sent by DNC Watts to 3rd SL, 16/7/1912. ADM138/340
until 17th July 1913. Formation of the Royal Commission was announced to the House on 22nd July 1912. A low-key affair, it was a relatively small item in the midst of a long statement:

Thirdly, a Royal Commission is about to be appointed to inquire into the question of liquid fuel and its application to warships. There is nothing sensational about this. The inquiry will be a very long business, but it will not obstruct Admiralty action in the meanwhile, and it portends no sudden or extensive changes in the methods of Navy construction. But the subject is one of very high importance and requires comprehensive and exhaustive study. Lord Fisher has, at my request, consented to take charge of this inquiry.

Fisher set to work immediately badgering the Admiralty for information and selecting the Commission's members. He threatened Churchill that he would 'have the first interim report...[]... before the blessed Commission is announced.' Once its existence was public, the well intentioned sent it unsolicited suggestions. Lord Northcliffe offered to put up a prize 'for alcohol as a substitute for petrol.' Fisher continued to pursue his personal chimera of the diesel battleship, and was not short of his own grandiose schemes: 'My idea' he wrote in July 1913, 'is to have an artificial inland sea of oil in England, buried underground with pipes leading to the coast!' The Commission took evidence from over forty experts in all aspects of the oil industry. Throughout its proceedings, Fisher privately informed Churchill of its progress, and would personally endorse almost every proposition put before it. Each new suggestion became a panacea to Fisher, starting with Northcliffe's alcohol proposal, which was going to make oil 'only a passing factor!' Then, Lord Cowdray's Mexican oil provided the solution, followed by Dr Bielby's oil from coal: 'we shall obtain a
satisfactory oil fuel from our own coal fields Bielby is a great man!" he wrote Churchill.⁴⁶

Officially, the Commission informed the Admiralty of its deliberations in writing via the Secretary of the Admiralty.⁴⁷ This official channel was a two-way street, as on occasion the Admiralty sought the advice of the Commission. In November 1912 the Commission published a preliminary report extolling the virtues of oil over coal, and recommending that the minimum oil reserve ‘should never be allowed to fall below at least four years’ current peace time consumption.’ Moreover, to ‘secure the country against all contingencies’ storage capacity ‘should be at least thirty percent’ more than the minimum stock, consequently ‘a steady progressive programme to this end is considered ...[]... vital and imperative.’⁴⁸

Commission member George Lambert, the Civil Lord of the Admiralty, held out against the consensus and only signed the preliminary report after adding that the oil reserve should be reconsidered and appealing to Churchill to increase the reserves to match probable wartime requirements. He wrote:

> It [public opinion] would crucify any Board that failed to make a certainty of plentiful oil supplies, for the want of which a large part, and the most modern part, of our fleet would be crippled.⁴⁹

Lambert had Pakenham’s backing, who regarding himself as a pragmatist and ‘given the reserves, ...[]... would personally move light heartedly to oil.’⁵⁰ However, until then Pakenham cautioned that construction of oil-only vessels should be delayed until the completion of an appropriate oil reserve. He too wrote Churchill in December 1912:

> As a member of the board responsible for supplies, I desire to state clearly my opinion that the provision now made for


⁴⁷E.G. Dumas (Secretary to the Fisher Commission) to Secretary of the Admiralty, February 1913. FISRI/1/12.

⁴⁸Fisher.

⁴⁹Lambert to Churchill, 13/12/1912. ADM116/1294B.

⁵⁰Memo. by Pakenham, Pakenham mss MS/82/131. Although undated is clearly written in 1912.
reservoirs of oil fuel is, both in quantity and in probable rapidity of accumulation, insufficient to justify the adoption of oil as the sole fuel in any but small vessels.  

With the decision to build oil-burners in the 1912 programme decided, Pakenham and Lambert were opening the battle over the 1913-14 programme’s battleships. Their influence was a major factor why the ‘R’ class battleships reverted to dual-firing. Lambert thought this did not go far enough as the light cruisers and destroyers in the programme were still oil-burners, he informed the Secretary of the Admiralty:

It is only with reluctance that I differ from the decision ...[... My view expressed last year and confirmed this, is that before we discard coal we should be certain of an adequate supply of oil for times of peace & emergency - a certainty as to which at present I confess to considerable doubts.

Fisher’s second interim report of 27th February 1913 tackled the more substantive elements of the problem. It anticipated the day when diesels would replace steam turbines, a transition that would ultimately lead to a reduced requirement in the size of the oil reserve. In the meantime, however, it thought there were adequate supplies of oil available in the world for at least the next fifteen to twenty years:

But that adequate supplies cannot be depended upon if a hand-to-mouth system of purchase is necessitated by the absence of adequate storage.

Fisher rejected the notion that if the Navy could ensure the safety of Britain’s food imports it should be able do the same for oil imports, arguing that as the oil did not originate from British territory the ‘sources of supply and manufacture of oil fuel may be interfered with.’ Henri Deterding pointed out, however, that the Admiralty could

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51Pakenham to Churchill, 20/12/1912. Pakenham, mss, MS/80/074.
52Burt, British Battleships in WW1, p. 271.
53Lambert to Secretary of the Navy, 18/4/1913. ADM167/47.
54Second report of Fisher Commission, 15/1/1913. ADM116/1209.
55Ibid.
always afford to outbid its commercial rivals in time of emergency. The report confirmed the earlier recommendation regarding the level of reserves and excess storage capacity and that the additional tankage would allow the Navy to buy oil cheaply in times of surplus on the world market, which, as the Treasury was not invited to give evidence, was rather naive.

The Commission placed great store on the evidence of Sir Thomas Bowring, who recommended the creation of a large storage capacity, as it would protect the Admiralty against future uncertainties, particularly against:

[The] huge monopoly, surpassing in power and aggressiveness even the great Standard Oil Trust of the United States, [that] is in process of rapid formation and may in a very short period control, together with the Standard Oil Trust, practically the whole petroleum supplies of the world.

Bowring was referring to the Royal-Dutch Shell Group (RDS), which under the aggressive and successful direction of Dutchman Henri Deterding had widened its sources of petroleum from Borneo to include Russia, Romania, Mexico and America. RDS was the product of the 1907 amalgamation of Samuel’s Shell Transport and Trading Company (40%) and the Royal Dutch Oil Company (60%). RDS was a holding company; its constituents parts, Shell, Royal Dutch, Anglo-Saxon and Asiatic Petroleum, continued to trade separately. The combine though provided the only serious non-American challenge to Standard Oil. Bowring’s evidence struck a chord with the Commission; despite repeated assurances from Samuel that Deterding was an Anglophile and from Deterding himself that he was pro-British and anti-German, it had severe reservations about RDS. This did not prevent the Navy purchasing oil from RDS, if the price was right. However, unlike Standard Oil, which was unequivocally foreign, RDS occupied a strange no man’s land. It almost wanted to be British, but was prevented by its Dutch connections. Deterding even moved the company headquarters

56Henri Deterding (1866-1937), Managing Director of Royal Dutch Shell 1907-1936.

57Sir Thomas Bowring, Chairman of Bowring’s Shipping Company, owners and operators of oil tanker.

58Second report of Fisher Commission, ADM116/1209.

to London and lived in England, receiving an honorary knighthood in 1920. However, Samuel's tactless offer of a contract in return for unconditional 'diplomatic support for its oil interests in various parts of the world' suggested that the company's pro-British stance was a matter of convenience. The Commission felt it could not ignore RDS's 60% Dutch majority shareholding (some of which was in German hands), and thought as Holland bordered Germany the company could be susceptible, via the Dutch Government, to German political and military pressure, and what the company promised in peacetime and what it actually could deliver in wartime might be a different matter. Everyone knew to whom the Commission was referring when it wrote 'in view of the possible action of an alien oil trust which is virtually controlled by potential enemies.' Rivals shamelessly exploited RDS's foreign connections for their own purposes. The full extent to which RDS-British Government relations were affected varied between departments, persons and periods. Nevertheless, mistrust was to continually plague the company's relations with the Navy and the Government, as will be shown in later chapters.

Bowring also suggested that as commercial oil sales were normally done on a forward contract basis the Navy would be obliged to do the same. Otherwise, it might find most of the oil already spoken for and be dependent on available surpluses. He thought fifteen years a suitable contract period for the Navy. Lord Cowdray, who informed the Commission that his Mexican Eagle Company's oil was normally 'allocated under contract for many years ahead,' corroborated this. Advising that forward contracts extending over fifteen years were urgently needed, the Commission warned:

[I]t would be most unwise to enter into any comprehensive contracts which would make this country dependent for its supplies of Naval fuel upon any one or two areas, however extensive and however likely to continue prolific.

The day before the second report was signed the Admiralty informed the Commission of the disappointing response it had received to its tenders sent to all the

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60 Samuel to the Fisher Commission. ADM116/1208.

61 Fisher.

62 Fisher.
major oil companies. It believed this indicated that demand had overtaken production. Indeed, in the twelve months from February 1912, prices had risen 47%-85%. The Admiralty’s intention to spread forward contracts across as many sources as possible proved impossible. Only two companies offered long-term agreements, and both oils were of questionable quality. First was Anglo-Mexican Petroleum Products, part of Lord Cowdray’s Mexican Eagle Group, which offered 200,000-300,000 tons per year for up to ten years, but because of its high sulphur content and high viscosity a special plant was necessary to refine it to Admiralty specification. The other submission came from APOC, and was subject to the company being able to raise sufficient capital to develop the Persian oil field. The Commission advocated that the Government should ‘as a general principle’ be prepared to help financially to preserve the ‘independence of control of important sources of supply already developed.’ It was a principle the Admiralty had never accepted with regard to coal suppliers, and were loath to do so for oil. The Treasury was reluctant too, for fear of setting a precedent involving the transfer of public money to private companies. The Admiralty sought the Commission’s opinion on the offers, and whether any other suitable sources might emerge in the near future. It responded with a much stronger position in favour of Government aid than in its recent second report.

We cannot too strongly emphasize the view...[...]that whatever should be necessary should promptly be done to render available the vast supplies obtainable from Persia.66

The Naval Estimates for 1913-14 proved exceptionally contentious. The radical Cabinet members wanted a reduction, whereas the sketch estimates of December 1912 entailed a substantial increase over the previous year. They were rejected. Lloyd George, the Chancellor of the Exchequer, thought Churchill had gone native in the fight

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63Ibid.

64Ibid.

65Ibid. Confidential Memo. enclosed with letter from Admiralty to Fisher Commission 26/2/1913. Also in FISR1/12.

66Memo. by Fisher Commission, 18/3/1913. ADM1/8329.

against ‘bloated armaments’ and his ‘inflammable fancy had been caught by the fascination of the monster ship.’ The Treasury challenged the Admiralty’s basis for comparing the British and German fleets, and consequently the level of construction required to maintain the margin dictated by Government policy. To get his construction programme through Cabinet, Churchill had to demonstrate the parsimonious nature of his regime at the Admiralty; it was not a good time to request large expenditure for oil reserves. Fisher’s Commission kept the oil issue alive, allowing Churchill to confine it to a backburner until the Naval Estimates had received Cabinet approval.

The Commission continued taking evidence in 1913 and in April Fisher sent Churchill a résumé of the Commission’s work. He believed it:

[T]o have adequately and fully dealt with the important subjects of storage and supply, at all events to such an extent as to enable the Admiralty to deal administratively with them.

Churchill denied Fisher’s request to dissolve the Commission in June and allowed it to linger on until February 1914, even though its final report added nothing of substance to its earlier ones. Useful as the Commission’s recommendations were, the Admiralty was not bound by them. Indeed, the Admiralty accelerated its storage and research programme, made long-term contracts and entered into negotiations with APOC as the Commission sat.

Not until 17th July 1913 did Churchill reveal to Parliament the logic behind the ‘fast division’ of battleships. Tactically, they were an innovation. Historically, they were the latest manifestation of a long line of battleships that technically stole a march on the opposition, as the ‘Dreadnought’ and the ‘Super-Dreadnoughts’ had done before. When Churchill came to mention oil supplies he diverged from the Commission’s views, in fact he almost ignored its recommendations completely. Instead, he argued

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70 Résumé of the work of The Royal Commission on Fuel and Engines. ADM116/1209.
72 The final report of the Fisher Commission, 10/2/1914. ADM116/1209 and ADM265/38.
that as long as Britain retained command of the sea she could import oil. He pointed out that, based on the previous year’s figures, the Navy consumed only 0.4% of the world’s total petroleum production, and deduced, ‘there is plenty of oil in the world.’

Churchill’s solution to the supply problem diverged from the previous policy in which private industry competed for one-off tenders to supply oil. Nor was it that recommended by the Fisher Commission. Instead, he announced two policies - an interim and an ultimate. The interim involved a series of forward contracts lasting about five years ‘to secure a regular and adequate supply,’...[]...‘while the complicated, administrative, scientific and financial questions involved in the ultimate policy are settled.’ Inspired by the operation of the Government-owned Naval Dockyards and Cordite Factories he said, ‘the Admiralty should become the independent owner and producer of its own supplies of liquid fuel.’ Initially, the creation of a large reserve would give the Admiralty ample supplies in wartime and the ability to ride out price fluctuations in the market. Ultimately, the Admiralty was to refine its own fuel. In short, the Admiralty was to become a speculative oil trader and create its own chemical industry. Churchill saw no reason ‘why we should shrink from making this further extension of the vast and various businesses of the Admiralty’.

Churchill’s solution united the Socialists and Tories. No objection came from the Conservative opposition to the extension of the Admiralty into the business world, as something was finally being done to correct past failings. Admiral Lord Charles Beresford, Fisher’s long-time protagonist, attacked the Admiralty not for using oil, which he supported, but for not arranging its provision when it ordered the vessels that would use it (the normal practice with ammunition). For the Socialists, it appeared that Churchill’s extension of state business would protect the nation against the ‘capitalist tyranny and exploitation’ of ‘Mr Rockefeller and Mr Deterding,’ as they had

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73Hansard 5:55:1472, 17/7/1913.
75Hansard, 5:55:1490, 17/7/1913.
demanded." Kier Hardie wrote in the Daily Chronicle, 'With Mr Churchill’s policy for obtaining oil no fault can be found.'

There were dissenting voices. The Economist, a long-standing critic of what it regarded as Admiralty profligacy, thought it would be better run by a board of businessmen and considered the new venture a 'stupendous blunder:'

'[And]that Churchill...[]...with the help of three or four admirals and two or three civil servants...[]...should think of looking round the world for suitable oil fields in competition with Mr. John Rockefeller, a ridiculous policy.'

The announcement of the Admiralty's entry into the oil business can now be seen for what it was: Parliamentary hyperbole. However, it served Churchill's purpose by allowing him more time for talks with the oil companies over contracts and letting the negotiations with APOC to continue unhindered. In addition, important for a minority Government, it disarmed many of his opponents.

The adoption of Berringer's 5,000-ton design as a standard oil tank was regarded as a great success. Costs varied, from £5,000 per tank at Gosport up to £12,673 at Portland, depending on the suitability of the site and the number of tanks. Steel tanks required a large area of level ground that was not marshland, unlike, for example, the Humber Estuary. As the demand for oil grew proportionately at all ports in line with the growth in the fleet's usage, storage too increased incrementally at each port, reducing the opportunity to take advantage of savings through economies of scale.

The arrangement thought best was four standard tanks, fifty feet apart, 'in a saucer, which, in the event of damage, would hold 25% of the contents of the group.' By June 1915, the Navy had completed 187 of the 214 planned standard tanks, with the balance due for completion by the end of the year. Steel tanks' principal

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78 Quoted in The Economist, 27/7/1913, p. 160.

79 The Economist, 27/7/1913 p 159-160. Ironically Admiral Slade and the D-of-C, F. W. Black, later joined the board of APOC.


82 Ibid.
disadvantages were corrosion and vulnerability to attack. The severity of any corrosion is determined by a number of factors such as oil's sulphur and water content, acidity, and the degree and type of bacteriological contamination - problems that persist today. Experience of tank corrosion at this time was extremely limited and the chemical mechanisms involved were far from being fully understood.

The large distinct shape of steel tanks made them difficult to hide from warship's direct fire and placing them inland involved long pipe work and additional expensive pumping equipment. The new fuel also presented an ideal target for the new weapon, the aeroplane. A Committee was created in August 1913, chaired by the Director of the Naval Air Department, to consider 'rendering oil tanks indistinguishable from their surrounding, from the point of view of aerial attack.' Trials with camouflage and protective netting proved disappointing. The most effective passive defensive measure was expensive underground storage, but where the tanks were required most, near the coast, the water table was usually high, making it difficult to excavate and prevent empty tanks rising to the surface. Failing that, it recommended camouflage painting and the planting of suitable trees should be carried out.

Two other committees examined the wider security aspects of oil tanks. One looked at the threat from insurgents and proposed the provision of 'high fences, blockhouses and wire entanglements.' The other, the Home Ports Defence Committee, reported just before the outbreak of war, by which time several of their recommendations were already in hand, also recommended underground storage as the

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85 Information supplied by Mr. A. Cunningham, Sales Director Sigma Protective Coatings, Amsterdam.

84 Memo., Admiralty Chemist, 19/9/1913. ADM116/1308.

85 The cost of the pipes was only one factor, laying pipelines into busy harbours was a nightmare. The work involved, digging up roads and railways and obtaining rights of passage from landowners, local authorities and railway companies made it expensive and very time-consuming.

86 Oil Tank Camouflage Committee 1913-14. ADM116/1220.

87 Memo., D-of-W, 4/6/1915. ADM1/8423/158

88 Report of the Oil Tank Camouflage Committee, 30/4/1914. ADM116/1220. Its terms of reference were widened to include all buildings vulnerable to air attack.

ideal solution. In 1915, the Board concluded the cost of underground storage was not only prohibitive but could not be completed before the end of the War.⁹⁰

Concrete storage offered certain advantages over steel. Although the initial cost was about the same, the annual maintenance would be less. The disadvantage was the lack of suitable sites, and the effect of oil on concrete was unknown. To remedy this deficiency, in 1911, an experiment was conducted at Chatham that showed concrete was suitable for storing heavy viscous fuel oils.⁹² Only two concrete reservoirs schemes received serious consideration, one each at Portland and Rosyth. Although both quite large, they were essentially experimental. The Portland scheme involved lining the Vernes Ditches and a quarry with concrete to provide forty-three tanks or compartments for up to 477,000 tons of oil. At eleven to eighteen shillings a ton the cost compared quite favourably with the twenty-two to twenty-five shillings a ton for steel tankage. However, the need to pump the oil 400 feet uphill into the reservoirs, and fears over the concrete cracking led to the scheme’s cancellation.⁹³

The Rosyth scheme went ahead as East Coast storage was strategically more important and, although large, it was smaller and less risky than the Portland scheme.⁹⁴ Initially Rosyth was to have four reservoirs with a combined capacity of 369,000 tons, at a cost of £320,000. A reduced total of 200,000 tons was approved in 1913, enough the D-of-W thought to demonstrate the viability of the whole project.⁹⁵ Due for completion in January 1916, work was delayed by labour shortages, the storage shortfall being made good by the erection of additional steel tanks.⁹⁶ It was not until September 1918 that it was ready for use and it remained the only above ground concrete oil storage the Navy built.⁹⁷

⁹³Proposed Portland Concrete Oil Fuel Storage. ADM116/1308.
⁹⁶Labour was diverted to complete Rosyth no.3 dock.
In 1907, the Admiralty owned three tank vessels. The *Isla* - formally the collier *Thistle* - which was used for supplying petrol and light oils to submarines. For oil fuel another collier conversion - the small *Kharki*, and the larger *Petroleum*, completed in 1903 - were used. The latter purchased from her original owners, the Petroleum United Agencies of London in 1906. Commercial shipping carried most of the Navy’s oil. As with colliers, the D-of-T maintained a list of suitable commercial tankers that could be called on in wartime, in 1907 a total of 75 vessels. Once f.o.b. shipments became the norm, whenever a cargo of oil required shipping, tenders were invited from ship owners. However, unlike tenders for coal shipments, oil tenders were issued directly by the Admiralty Department of Transport. Vessels were chartered six months in advance for periods of twelve or twenty-four months. For example, in 1912 of the nineteen firms invited to tender, only four responded, including all three vessels already under contract and due for renewal. The *Petroleum*, with her 6,170-ton capacity, remained the only Admiralty vessel suitable for moving oil in bulk. In 1912, however, she developed defects that kept her in dockyard hands, leaving the Admiralty entirely dependent on commercial shipping almost until the start of the War.

The demand for petroleum products led to a boom in tanker construction in the early years of the century with on average two tankers being launched each week in British yards during 1908. Competition permitted the Admiralty to benefit from decreasing freight rates until 1911, after when rates increased alarmingly as the demand for oil increased faster than the growth in capacity of the world’s tanker fleet. Price per ton for single voyages from Port Arthur, Texas, increased from a low of eight shillings in 1910 to fifty shillings and sixpence in 1912. Estimating the cost per ton

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99Minute, D-of-T, 5/9/1907. MT23/211.

100Minute, D-of-T, December 1912. MT23/269.

101Ibid.


103Ibid.


105Pakenham, Enclosure No 4. ADM265/29.
to ship oil from Port Arthur using new vessels would be thirteen shillings and sixpence, the D-of-S argued, the most economical course of action would be for the Admiralty to purchase its own ocean-going tankers. Attempts to buy existing tank vessels proved fruitless, and new construction appeared the only way forward. Consequently, in 1912 the Navy commenced a tanker-building programme. 107

The Fisher Commission never fully addressed the issue of shipping. Fisher personally regarded Admiralty owned tankers as test beds for the Navy to gain experience with diesels.108 When Fisher asked Churchill for an assurance that naval tanker would be fitted with diesels, Churchill vetoed further work on the vessels until he received a report on the most suitable engines.109 In the meantime, he pledged to Fisher that: 'Every tanker ordered or purchased by the Admiralty will be driven by internal combustion alone.'110 Produced in only two weeks, the report stated that fitting diesels would delay completion by twelve months and cost the Admiralty £345,000 in extra engine and freight charges, enough to convince Churchill that construction should proceed as originally planned, though it was delayed later by Treasury action.111 Fisher’s hope that tankers would prove a suitable test for diesel engines received a further setback when the tenders to build three large tankers, each with a different makes of diesel engine, were declined.112 Nevertheless, by March 1913 the Navy had six tankers under construction. Four small 1,000 ton vessels destined for employment refuelling at naval bases, of which two had diesels, and two larger ocean-going tankers,

107Ibid.
112Appendix 5, ADM265/37. The three types of engine he hoped to have fitted were; Carel (Ghent), M.A.M. (Nurnberg) and Sulzer (Switzerland). The Man diesel engines were actually delivered and used in monitor Marshal Ney. Denis Griffiths, 'British Shipping and the Diesel Engine: The Early Years,' Mariners Mirror, vol. 81 no. 3 (1995), p.315.
the *Santa Margherita* and *Trefoil*, were both completed at Barrow with Vickers diesel engines.\(^\text{113}\)

The first tanker built especially for the Navy was the *Burma*, 1,382 gross tons, in 1911.\(^\text{114}\) She was designed to refuel vessels directly alongside, either in port or at sea.\(^\text{115}\) When refuelling a battleship at sea *Burma* was in the rear; when refuelling destroyers she was in the van by about 200 yards. Her refuelling system used a five-inch diameter bronze hose capable of delivering 140 tons of oil per hour. However, it proved time-consuming to rig, cumbersome to use and was prone to bursting.\(^\text{116}\) The operation was practised two or three times a year by the *Burma*, but only with destroyers. In 1911, for example, the *Burma* took two hours to transfer 117 tons of oil to the destroyer *Mohawk*.\(^\text{117}\) To refuel half a dozen destroyers took the best part of a day.\(^\text{118}\) Claims that oiling at sea was a simple operation were common, and it was frequently cited as a major advantage oil had over coal. Fisher described oil tankers as 'peripatetic fuelling stations' which littered the oceans, from which warships could refuel at will.\(^\text{119}\) Exaggerated expectations were compounded by exaggerated claims. One equipment manufacturer's advertisement ostensibly showed its products being used successfully to refuel a battleship at sea.\(^\text{120}\) The journal *Shipping Illustrated* claimed in 1912 that the *Petroleum* could refuel a battleship while steaming at nineteen knots.

\(^{113}\) Petroleum Review, 29/3/1913 p. 365; Sigwart, Royal Fleet Auxiliary, p 89. None of the diesel engined vessels were successful, three of the four having to be re-engined. Although these vessels were building in 1913, some wartime construction tankers laid down later were completed before them.

\(^{114}\) Sigwart, Royal Fleet Auxiliary, p. 73.

\(^{115}\) Petroleum Review 11/3/1911, p 137; The Engineer, 1/9/1911, p 253.

\(^{116}\) Sigwart, Royal Fleet Auxiliary, p. 18.

\(^{117}\) Log of *Burma*, 15/8/1911. ADM53/94323. For example of a failed refuelling at sea see log of *Burma*, 2/9/1912, ADM53/94326. *Burma*’s logs have no examples of her refuelling a battleship at sea, nor do the few surviving logs of the *Petroleum* (see cit op 124).

\(^{118}\) To put this into perspective, seventy-seven destroyers escorted the Grand Fleet at the Battle of Jutland. Marder, Scapa Flow, vol. II, pp. 293-295.


\(^{120}\) D. K. Brown, The Grand Fleet; Warships Design and Development 1906-1922, (London: Chatham, 1999). Brown gives the first battleship to be refuelled at sea as *Victorious* in 1906, but only cites an advert in the 1914 edition of Jane's Fighting Ships. The Log of *Victorious* for 1906 details experiments 'for taking in oil' but only water was passed to her from *Petroleum*. 9/2/1906. ADM33/31581.
even though her top speed was only nine knots.\textsuperscript{121} Although destroyers replenished from larger fleet units in good weather in 1913,\textsuperscript{122} no instructions for oiling at sea appear in the \textit{Manual of Seamanship} until after the War.\textsuperscript{123} The American Naval Attaché reported in 1913 that the Navy had tried oiling at sea:

\begin{quote}
[A] good deal but have had no good result. The Admiralty officials do not hesitate to say that their apparatus is inefficient and unsatisfactory, and they are anxious to know what our results have been.\textsuperscript{124}
\end{quote}

With the focus on operations in the North Sea, oiling at sea, as with coaling at sea, was considered risky, unnecessary and given a low priority.

The oil specification determined which oils were acceptable to the Admiralty; on the other hand, the available oils dictated the Admiralty oil specification. A balance had to be struck between supply and technical requirements. Supply had to be the first priority, as technical solutions could only be applied to what was available. The Admiralty's specifications were concerned with the properties of oil as regards minimum flash point, viscosity at low temperature measured in seconds,\textsuperscript{125} maximum sulphur, water and acidity 'and freedom from impurities.'\textsuperscript{126}

Fear of fire imposed a flash point of 285°F (140.5°C) in the initial oil specification, this was reduced to 200°F (93.3°C)\textsuperscript{127} in 1903 and finally in 1912 to 175°F (79.5°C).\textsuperscript{128} The exception was shale oil which was allowed a minimum flash point of 200°F. For the purposes of pumping, the point at which oil solidified was

\textsuperscript{121} \textit{Shipping Illustrated}, 2/11/1912 and Appendix 5.

\textsuperscript{122} Remarks by C-in-C Home Fleet on 1912 manoeuvres. ADM1/8269.

\textsuperscript{123} \textit{Manual Of Seamanship} vol. II 1909 (amended up 1915) and vol. II 1923 ed. (London: HMSO).

\textsuperscript{124} Report by American Naval Attaché, 12/7/1913. NARA, RG 38, E-10, Box 838,

\textsuperscript{125} The time taken for a known quantity of oil to flow through a know size of aperture, therefore the longer the time elapsed, measured in seconds, the thicker the oil. The standard equipment in British service was the Redwood Viscosity meter. There was no international agreed unit of viscosity at the time.

\textsuperscript{126} Appendix 6


\textsuperscript{128} ADM 265/29.

\textsuperscript{129} Appendix 6.
crucial. If too high, in cold climates it could be catastrophic for vessels at sea. Shale oil was far less viscous than petroleum residues and reserved for use in destroyers (particularly ones without tank heaters), and diesel submarines, which also used Burmese oil, the lightest of the residues. The standard commercially available oil fuel had a flash point of 150°F (65.5°C), although fuel with a flash point as low as 75°F was burnt.

Sulphur occurs naturally in petroleum, the level varies with the source. Although signs of sulphur corrosion in tanks were present with the earlier specification of no more than 0.75% sulphur, this was increased to 3% in 1912, a level at which the fumes and corrosion were considered acceptable. Water also occurs naturally in petroleum, too much would cause the burners to pulsate and, by displacing oil, reduce a vessel’s range. Water is easier to remove than sulphur and the water content was kept to less than 0.5%. Each petroleum source had its own unique physical properties. Some residues met the Admiralty’s specification without further refinement and could be issued directly to ships. Others failed in one or more areas and required either additional refining or blending. Nearly all the changes in specification were made in an attempt to increase the sources from which acceptable oil could be drawn, rather than for technical reasons.

Pakenham’s Committee confined itself to examining sources in relation to the then current 1910 specification. Early on, Churchill became convinced that unless the oil specification was relaxed and the custom of buying oil annually was abandoned the Admiralty would face grave difficulty in obtaining its projected requirements. Pakenham’s Committee confirmed his fears:

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130 Appendix 6.
131 A flash point of 150°F was approved by a Lloyds’ Insurance Committee in 1902. NARA, RG 80, Box 39.
135 Appendix 6.
136 Ibid.
The high standard of the Admiralty specification for oil fuel naturally limits the choice and enhances price. It is desirable that experiments should be undertaken to ascertain whether modification cannot be advantageously made. It specifically identified viscosity and sulphur level as areas where changes could safely be made. It questioned if a 150°F flash point was permissible and if mixing oils from different sources could achieve the specification. However, in July 1912, citing increased fire risk the DNC's department opposed any further reduction in the flash point. The Third Sea Lord, Rear Admiral Sir Henry Jackson, thought this unduly cautious, but concerned that his officers disagreed with him asked Eustace D'Eyncourt, on his appointment as DNC, for his opinion. D'Eyncourt came down on the side of the Third Lord, at least for new construction. He did, however, fear that the older vessels converted to use oil would have an increased fire risk with a fuel of a lower flash point and lower viscosity because the plating in their tanks was not built for it. Witnesses before the Fisher Commission had also urged that the oil specification be relaxed in order to widen the potential sources of supply. Although the E-in-C considered 3% sulphur and a flash point of 150°F acceptable, a committee convened to examine the problem decided to stay with a minimum flash point of 175°F, but allow a higher sulphur content at 3%, principally to make Mexican oil acceptable. If too tightly drawn the specification could exclude some oil sources, it had to be a compromise between ideal and availability.

Oil introduced a completely new technology and a new set of practical problems. Commercial expertise in many aspects of oil's use was lacking. The Navy had, for example, to create its own storage facilities, and although the standard tank was a success, the need for a large reserve provoked explorations into other forms of storage, such as concrete tanks. Technically, the oil-fired battleship did not pose a problem and was the next logical step, but was only taken in response to events in other navies. However, it was the pivotal point as regards supply, and made Britain for the

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137Pakenham.

138Sir Eustace H.W. Tennyson D'Eyncourt bt. was appointed DNC August 1912.

139Fisher.


141Ibid.
first time reliant on foreign fuel sources and involved the creation of a massive and expensive fuel reserve. Only a politician could provide the political impetus for this sort of change, regardless of the stature of the Admirals who supported it. Churchill had the determination to implement the change. The fast battleships were as much a vanguard for his oil policy as they were for the fleet. He was aware that his political success was judged publicly by the building programme and in Cabinet by his budgetary control. Convinced of the German naval threat to Britain and that oil-burning was inevitable, Churchill thought the more widespread the latter, the easier it would be to deter or face the former. With no technical reason why all warships could not use oil, only surety of supply stood in the way.

Once it had been established that enough oil actually existed, the major hurdle was cost. To extract the necessary funds from a Cabinet expecting savings Churchill needed the full backing of the Admiralty. He hoped the Pakenham Committee would create a detailed policy that both he and the Board could support. Although Pakenham supported the use of oil, it was only if a politically untenable reserve was created. Churchill turned to his old friend Fisher for help; confident that Fisher would come up with a solution Churchill started construction of oil-burning battleships. Instead, Fisher indulged his witnesses' outlandish schemes and used it to further his advocacy of the diesel engine. His recommendation for a reserve of four years' peacetime usage was virtually the same as Pakenham twelve months' wartime reserve. The Commission at least fully backed the use of oil but beyond that its main recommendations had already been put forward by Pretyman (forward contracts), and Pakenham (large reserve).

All the inquiries confirmed the domination of Standard Oil and RDS over the world's oil market. As with coal, the arrangements the Admiralty put in place to purchase oil were dictated as much by the structure of the industry as by the location of the sources. With a virtual duopoly and no slack in the infrastructure to be taken up in wartime, even though it was the largest customer for oil in Britain if not the world, the Admiralty had a much weaker hand when buying oil than it had with coal. Even in peacetime relying on the market for shipping proved problematic, and to secure oil at a reasonable and predictable cost the Admiralty commenced work on its own fleet of tankers. Long-term contracts, the creation of a large reserve in Britain and a fleet of

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14Churchill later wrote that Fisher proposed four years' anticipated wartime consumption. His figures for wartime stocks are also inflated claiming a reserve of 1,000,000 tons ten months into the War. Churchill, World Crisis, vol. 1, pp. 136-37.
tankers were the Admiralty’s initial responses to the supply problem and all had financial implications not associated with coal. However, these were not enough to placate those who opposed the change. To secure oil for the Navy the Government felt compelled to intervene in the oil industry. A fact welcomed by the smaller British oil companies that used the opportunity presented by the Fisher Commission to attack the ‘foreign’ duopoly and elicit Government support for their own commercial battles with the two giants. As will be seen in later chapters their fortunes were mixed, but the legacy of their attacks was the belief that to ensure naval oil supplies Britain needed its own oil company. At the time the Fisher Commission’s existence proved more valuable than its conclusions, and its secrecy allowed Churchill to ignore or cite it without contradiction whenever politically prudent. Fisher’s commission kept the oil issue alive at a time when many of Churchill’s Cabinet colleagues would have happily buried it. However, by 1913, the Navy was reliant on oil more than ever and despite his announcement to Parliament, Churchill had yet to secure a safe supply for peace or war.
Chapter Four

**Anglo-Persian and the Oil Reserves**

This chapter concentrates on the period immediately before the War and examines how Churchill faced the Admiralty and Fisher’s reluctance to accept oil burning without a massive oil reserve, the grip of Standard and RDS on the world’s oil market and the Cabinet’s reluctance to countenance increases in naval spending. First, however, it looks at the important part the Admiralty played in the inception of the Anglo Oil Company (APOC), and the company’s role in Churchill’s oil policy.

William Knox D’Arcy, APOC’s founder, was granted the oil concession for 480,000 square miles of southern Persia in 1900. Exploiting any discoveries would be difficult, as Persia was an under developed country with a weak administrative structure and government. Arduous conditions, lack of infrastructure, and hostile tribesmen were compounded by the limited geological knowledge of the time. The first oil strikes, in 1903-04, soon dried to a trickle stretching D’Arcy’s resources to the limit, making Standard Oil and the Rothschild’s interest in buying the concession attractive. Although the Pretyman Committee was keen to foster all potential sources of Petroleum under British control and ownership, Pretyman told D’Arcy that even if the Persian concession did prove petroliferous, it would not be politically easy for the Government to help with direct investment. Nevertheless, the lack of oil resources in the British Empire made the sale of the Persian concession to a foreign company unacceptable to Pretyman. He suggested that D’Arcy write officially to the Admiralty to ask for help, as both he and Selborne were very sympathetic to his plight. In the prevailing laissez-faire economic doctrine, the Treasury were less sympathetic and rejected any notion of direct help, forcing the Admiralty to make other arrangements.

Selborne sought the assistance of Lord Strathcona, an aged multimillionaire imperialist, who he convinced that retention of the concession was vital for the Navy. Though too old to take an active part, Strathcona invested £50,000 and lent his good

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2. Ibid.
name to a rescue syndicate. In August 1904, armed with Strathcona’s name and money, Pretyman hosted a meeting between D’Arcy and two directors of Burmah Oil, John Cargill and Charles Wallace. An agreement was reached the following May that kept the concession in British hands. Burmah Oil would provide £100,000 for exploration and, if oil was found, a company with £3,000,000 capital would be formed to work the concession. It also provided technical expertise and management skills, most notably those of Charles Greenway. For Burmah Oil the agreement protected its lucrative Indian kerosene market from coming under pressure should another company find oil in Persia. Simultaneously the company was negotiating for an Admiralty oil fuel contract, a fact that almost inevitably influenced its actions. Greenway later admitted, that although it was a hard-nosed commercial decision, it was taken with some reluctance by the board of Burmah Oil.

Whether Burmah Oil’s Admiralty contract was a reward for the company’s support for D’Arcy can only be a matter of conjecture. It was though in line with Pretyman’s recommendations, and the only long-term contract signed at the time. However, it necessitated modifications to the refinery that were not universally approved within the company, and as it received the minimum orders possible under the contract, taking the investment into account the company claimed it made a loss on Admiralty fuel. Moreover, Burmah Oil received no help from the Admiralty in its dealings with the Government of India over applications for drilling licences. The company came to rue the contract, and its directors became wary of future dealings with the Admiralty. Unbeknown to the company, this lack of help was simply because the Government judged it was not required. If the company’s survival or its British control had been called into question, the CID had advised that the Government should take steps to save it. Both parties came to believe that it was they that had performed an act

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3Corley, Burmah Oil; Lord Strathcona’s evidence to Pakenham; BP71221.
5Cargill’s Speech at Burmah Oil’s AGM 1909. Petroleum Review, 22/5/1909. (Quoted in Jones Oil Companies, p. 140.)
7Greenway to Pakenham. 29/12/1911. ADM265/29.
8Hamilton (Burmah Oil Director), to Greenway, 21/9/1912. BP71221.
9Correspondence between CID and the 4th SL, June 1905. CAB17/46.
of altruism towards the other. Nonetheless, the foresight of Pretyman, Selborne and Sir Boverton Redwood, who acted as an intermediary and advisor, saved the Persian oil concession for Britain at very small cost, if any, to the Government at a time when many still considered the Navy could continue to rely on coal.

In 1908 oil was found in Persia in sufficient quantities to warrant the creation of a separate company. Reassured by the new 1908 Liberal Government that it would continue the policy of its predecessors, Lord Strathcona agreed to front the company. The Admiralty, however, wanted its part in the development of the Persian oil field excluded from the flotation prospectus, as it might gave a false prospect of the potential sale of oil fuel to the Navy. The APOC was incorporated on 14th April 1909 with two million pounds of capital. It laid a 130-mile long pipeline from the wellheads to Abadan Island, where work commenced in October on a refinery due for completion at the end of 1911. Technical problems, however, delayed production by almost eighteen months and the kerosene that finally emerge was ‘barely marketable.’ The refinery’s failure ‘nearly wrecked the company’ and prevented it from marketing its own products. In response Greenway, now Managing Director of APOC, implemented a dual strategy. First, he signed a ten-year marketing agreement with Asiatic Petroleum (part of RDS) in October 1912 in which Asiatic refined and marketed APOC petroleum. The second part involved enlisting Government help. In his evidence to the Pakenham Committee, in December 1911, Greenway recalled his experiences at Burmah Oil, when the Navy purchased only 36,000 tons in five years after the company had invested considerable amounts of capital in new plant, and warned it was RDS’s aim was to smash APOC if it invaded its markets. His testimony instigated a common theme, one reiterated by APOC spokesmen for many years - that the wholly British-

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10 Ferrier, B.P., p. 105.
11 Ibid., p. 95.
12 Strathcona to Pakenham, 29/12/1911. ADM265/29.
13 Ferrier, B.P. pp. 105-6.
15 Ibid., pp. 148-50.
16 Greenway to Pakenham, 29/12/1911. ADM265/29.
owned APOC lived under the constant threat of suffocation or absorption by one or other of the two oil giants.

Although John D. Rockafeller's monolithic Standard Oil had been broken up by American anti-trust legislation in July 1911, the British Government had doubts that the legislation would substantially affect Standard's hold on the American oil industry. Its appreciation proved not too far off the mark, as Standard's off springs, although ostensibly wholly separate companies, 'generally respected one another's markets and carried on their old commercial relationships' for many years, a practise that made it easier for APOC to cite them as one half of a duopoly with RDS.

Greenway's ultimate aim, as he had told Churchill earlier, was to create an oil company that could survive alongside the two giants, holding its own at all levels of operation, production, transport, refining and marketing. The picture he painted of the company's precarious position was largely accurate, and Greenway skilfully used it to accomplish the second element of his survival strategy - Government aid. As Jones points out, the impetus for the breakdown of the laissez-faire doctrine came from the private companies. Of course diplomatic support for British companies and interests worldwide was forthcoming when necessary. But direct financial support had always been resisted. Greenway wanted the Government to go further than ever before. He wanted money via large Government oil fuel contracts, which would in turn he hoped ensure a pro-APOC Government policy in the Middle East.

Following his appearance before the Pakenham Committee, Greenway regularly discussed oil fuel supplies with Admiralty and Foreign Office officials. He suggested informally that the Government should give the company a subsidy of £100,000 per annum against which the company could raise £2,000,000 of capital; in a similar way

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17 Yergin, Prize, p. 110.
18 Memo., for Cabinet, January 1913. CAB37/154/3.
19 Yergin, Prize, p. 110.
20 Jones, Oil Companies, p. 73.
the Government of India supported its railways. He also wanted Persian oil exempted from Indian import tax and the company to be given two large oil supply contracts, one from the Navy and one from the Indian railways. Together these would consume all the fuel oil the company could produce, up to 500,000 tons per annum. The price to the Navy would be thirty shillings per ton f.o.b. Abadan, from which five shillings would be deducted to repay the subsidy. The Government was also to support APOC's application to Turkey for an oil concession in Mesopotamia. Support for APOC in Mesopotamia effectively meant going against RDS, a member of a rival consortium, The Turkish Petroleum Company. In return, the Government would have the right to nominate one or two representatives to APOC's board. From his conversations with the Admiralty, Greenway deduced in 1912, that it was 'very anxious to preserve Persia for all time as a source of supply of oil fuel' in peace and war for the Navy. Moreover, RDS would not be allowed to have a 'monopoly and thus [be] in a position to demand their own price.' Before putting his plan to officials from the Admiralty, Foreign and India Offices, Greenway called on Fisher, then chairing the Royal Commission, because 'it is said [Fisher] completely has the "ear" of Churchill on all F. O. [Fuel Oil] questions.' As far as the Government was concerned, the subsidy was required solely for upgrading the refinery to produce fuel for the Navy. For Greenway and his fellow directors, the money also meant increased production, with any surplus going towards increasing the company's ability to market its products independently. Aware of political objections to granting financial assistance to a private company, Greenway suggested a few alternatives to achieve his aim with minimum fuss. Such as the Government acting as guarantors of a loan, the Admiralty paying for its oil at the start of each year in advance of delivery, or the contract being completed through the Government of India, from whom the Admiralty would then buy its oil.

Although the Foreign Secretary hoped the company would 'not find it necessary to combine with Shell,' both the Foreign Office and the Admiralty still held out against

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22 Foreign Office memo., 49500, 19/11/1912. BP71221.
23 Greenway to Cargill, 13/9/1912. BP71221.
24 Marion Kent, 'Government's Shares in BP'.
25 Greenway to Cargill, 13/9/1912. BP71221.
26 Foreign Office memo., 49500, 19/11/1912. BP71221.
any form of direct financial assistance for fear of creating a precedent. The India Office remained steadfast throughout the negotiations detecting little that posed a threat to India and seeing nothing to prevent APOC, once in receipt of Government money, making an accommodation with RDS anyway. However, Greenway’s persistence was rewarded early in March 1913, he wrote a fellow director that the Government had:

Decided that they must give us any financial assistance that may be necessary inasmuch as now they are committed irrevocably to the adoption of oil fuel they must maintain a hold over the APOC as this is the only part of the world under British control from which they can rely with any confidence of sufficient supplies to meet requirements.

The Admiralty’s volte-face was occasioned by the lamentable response it had received to its invitation to tender for long-term oil fuel contracts. The intention to distribute oil contracts as widely as possible between different suppliers, as had been the practice with coal contracts, had proved futile. APOC’s quote for ‘quantities increasing from 30,000 tons a year in 1914-15 to 500,000 tons a year in 1917-18,’ was dependent on it being able to raise enough capital to develop the oil field. The Fisher Commission was asked for its views responded, on 18th March 1913, in favour of financial support for APOC.

Greenway had got wind of the Commission’s response, but his jubilation proved premature. Convincing the Admiralty and the Commission was one thing, extracting the money from the Treasury quite another. In a memorandum for Cabinet in June, Churchill outlined the three governing principles under which the Admiralty operated in securing its oil fuel; first as wide as possible range of sources geographically; second to maintain ‘independent competitive sources;’ and third, as far as possible use sources under British control or influence, on sea-lanes easily protected by the Navy. Ergo he recommended that the Government sign a contract with APOC to supply oil for the Navy and the Indian Railways. To keep the refinery working at full capacity the Indian

27 Mallet, Foreign Office, to APOC, 5/2/1913. BP71221; FO371/1760.

28 Kent, ‘Purchase,’ p. 145.

29 Greenway to Adamson (Director of Burmah Oil), 6/3/1913. BP71221.

30 Admiralty to Fisher Commission, 26/2/1913. ADM116/1209.
Railways would use the oil in peacetime and revert to coal in wartime, thus releasing Persia's full potential for naval use.31

The Cabinet discussed Churchill's memorandum 18th June, and again 9th July. Greenway was subsequently informed by the D-of-C that the Cabinet had decided to delete the Indian element of the equation, and take full responsibility for any agreement itself. A small sub-committee was appointed to find the best method to complete the contract 'independently on behalf of the Admiralty.' After consulting his colleagues Greenway encouraged the Government to either take up shares to the value of £2,000,000 or furnish guarantees for the same amount.32 The Treasury remained uncomfortable with the notion of subsidising a private company. Especially as the proposed contract was for twenty years; the wells could run dry or a new fuel could replace oil, just as oil was supplanting coal, and what if the company might fail to deliver enough oil for the investment to be repaid. The Permanent Secretary of the Treasury commented 'In my judgement it is sounder to pay for what you want as and when you want it.'33 The Treasury took Beresford's line and criticised the Admiralty for laying down oil-burning vessels before securing any oil. Ironically, the Admiralty blamed the oil shortage on commercial shipowners placing forward contracts for fuel as they lay down oil-fired ships.34 The Treasury, though persuaded of the need for oil, was reluctant to face the risk, and asked whether Burmah Oil could underwrite the investment, as they owned APOC. Wallace replied that as a director of Burmah Oil he could not recommend this to his shareholders as they stood to gain more financially by coming to terms with RDS or Standard Oil.35 The Treasury then asked Burmah to underwrite the oil contract by agreeing to supply Burmese oil if the Persian fields failed.36 This too was rejected, as the Burmese field was incapable of supplying the necessary oil.37 Nonetheless, the Treasury continued to resist parting with any money.


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31 Memo., FL to Cabinet, June 1913. CAB37/115/79; Also see, July 1913 CAB37/116/46.
32 Correspondence among directors of Burmah Oil Company, July 1913. BP71221.
33 Treasury minute, 30/6/1913. T1/11953.
34 Memo for Cabinet, June 1913. CAB 37/115/79; Treasury minute, 14/7/1913. T1/11953.
35 Report by Greenway for his fellow directors following meeting of the Cabinet Sub-Committee, 10/7/1913. BP71221.
36 Report by Greenway, 10/7/1913. BP71221.
37 Cargill to Greenway, 16/7/1913. BP71221.
Concerned that new oil discoveries elsewhere might produce a glut and leave the Navy paying over the odds, the Chancellor, Lloyd George, suggested tying the price to the world oil price or even coal. Greenway was prepared to agree to this, but pointed out that prices moved up as well as down and that by linking the price of Persian to world oil prices the Government was in effect handing price control to the duopoly of RDS and Standard Oil. Lloyd George withdrew his suggestion. The subject next came before Cabinet on 11th and 16th July, when the text of Churchill's statement to the Commons on the Naval Estimates for 1913-14 was discussed. Delivered the next day, Churchill presented his 'interim' and 'ultimate' policies to buy time and prepare the ground for Government intervention. Admiralty and APOC hopes that Government support would not require Parliamentary approval were misplaced. A Money Bill was required, and timetable constraints would prevent it from being presented before April 1914.39

In the meantime, to reinforce the Admiralty's assertions over the prolific nature of the Persian oil fields, a small 'independent' commission of experts was sent to the Gulf to report on the 'prospects of production' led by Vice-Admiral Edmund Slade, a former DNI and well-known proponent of oil fuel for the Navy.39 The independently minded George Lambert wanted to go, but his request was vetoed by Churchill. Slade departed in October 1913, returning three months later to report that the Commission was:

Satisfied that the Company's concession is a most valuable one and providing no unforeseen factor intervenes, the existing field is capable, with proper development, of supplying a large proportion of the requirements of the Admiralty for a considerable period, while the whole concession, judiciously worked, would probably safeguard the fuel supply of his majesty's Navy.40

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38 Greenway to Cargill, 23/7/1913. BP71221.

39 Churchill to Lambert, 15/8/1913. CHAR13/22.

Only after Slade’s return and publication of his favourable report in February 1914 were negotiations with the Company resumed and the details of an agreement hammered out.\textsuperscript{41} Precedents were few and the Treasury officials remained very wary, as one put it:

\begin{quote}
The question really is the precise length of spoon which the Government Departments need when engaged in the unaccustomed pursuit of supping with the city.
\end{quote}

Once the concerns of the Treasury and Foreign Office over the Mesopotamian concession were assuaged an agreement was finally reached, and signed on 20\textsuperscript{th} May 1914.\textsuperscript{43}

The agreement was in two-parts. The first was published and dealt with the financial support for the company. The second contained details of the Navy’s oil supplies and was secret.\textsuperscript{44} The Treasury was granted two \textit{ex officio} directors on the board of APOC, and all subsidiary companies. Although both were officially Treasury appointees, in practice the Treasury and the Admiralty nominated one each. Neither of the Government directors would involve themselves in the day-to-day running of the company, but retained the right to veto any action in order to safeguard the Government’s interest - for example, to ensure the concession was managed so the oil would at least last for the full period of the agreement. The company had to remain British and was forbidden from entering into a ‘trust or combine;’ Slade was appointed a director by the Admiralty and Lord Inchcape by the Treasury.\textsuperscript{45}

The contract was to run for twenty years provided the company retained the Persian concession, although the Admiralty could terminate it with two years notice.

\begin{itemize}
  \item \textsuperscript{41}Memo., Slade to Cabinet by, 10/2/1914. ADM116/4668; Cd 7419.
  \item \textsuperscript{42}Bradbury, Permanent Secretary of the Treasury to Montagu, Financial Secretary of the Treasury, 6/6/1914. T1/11953. The only previous example was the Cunard agreement, 30/7/1903, Cd 1701
  \item \textsuperscript{43}Copies of the agreement, Cd 7419, are in ADM7/948; ADM116/4668; T1/11953 and BP999693.
  \item \textsuperscript{44}The Government agreed to subscribe to the capital of the Company; APOC/HMG Agreement 20/5/1914. Cd 7419.
  \begin{itemize}
    \item £1 Ordinary shares at par £2,000,000
    \item £1 Preference shares at par £1,000
    \item Total Share Capital held by the Govt. £2,001,000
    \item Debentures £199,000
    \item Total Government subscription £2,200,000
  \end{itemize}
  \item \textsuperscript{45}Cd 7419. Appointment of directors of APOC T1/11953/13683/14. Lord Inchcape was Chairman of the British Steam Navigation Co.
\end{itemize}
Over that time the Admiralty was to take delivery, f.o.b. Abadan of 6,000,000 tons of oil fuel, commencing 1st July 1914 at the following rates:

Table 4:1

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<th>Not more than</th>
</tr>
</thead>
<tbody>
<tr>
<td>1914-15</td>
<td>50,000 tons</td>
<td>70,000 tons</td>
</tr>
<tr>
<td>1915-16</td>
<td>90,000 tons</td>
<td>120,000 tons</td>
</tr>
<tr>
<td>1916-17</td>
<td>100,000 tons</td>
<td>150,000 tons</td>
</tr>
<tr>
<td>1917-34</td>
<td>300,000 tons per annum</td>
<td>350,000 tons per annum</td>
</tr>
</tbody>
</table>

With a year’s notice the Admiralty had the option of increasing the annual amount by 50,000 tons per annum up to three times, to a maximum of 500,000 tons. If, however, the full amount was not required it could carry over 100,000 tons into the next year, supply part or whole of the surplus to other Government departments, or sell it. The company could not sell oil in excess of the Admiralty contract to a third party, unless it offered the oil to the Admiralty at the price agreed with the third party. If the company had any surplus residue that failed to meet the Admiralty’s specification it was obliged to offer it to the Admiralty at five shillings per ton under the contract price. The company also had to maintain a minimum reserve stock of 35,000 tons at Abadan. And, as with the coal contracts, in wartime the whole of the company’s stock and production was to be placed at the discretion of the Admiralty.46

The price was thirty shillings per ton f.o.b. Abadan, with the Admiralty entitled to abatement after all the company’s costs had been met and a dividend of up to 10% had been paid to the shareholders.47 The abatement was up to a maximum of 25% of the remaining profits, which was to be reflected in the price that in any event was not to be less than twenty shillings per ton.48 Payment was 90% of a shipment’s price on loading at Abadan with the balance to be paid on arrival, providing it met the Admiralty’s specification.

46Cd 7419.
47As the largest share holder the Government stood most to gain. If the dividend was offset against oil payments a 5% dividend would effectively reduce the price the Admiralty paid for oil fuel from 30/- per ton to 23/6; a 10% dividend likewise to 16/- per ton. BP78127.
48Cd 7419.
A Bill was presented to Parliament 17th June 1914; Churchill opened the proceedings with a robust speech. He took it as read that the Navy needed oil, then made it plain that he did not intend to make the Navy wholly dependent on APOC’s oil. It would buy over half its oil from other companies in addition to experimenting with extracting it from shale and coal. Unless the Government secured APOC’s independence, it would, he argued, be swallowed up by RDS, which along with Standard Oil now controlled the world market. He blamed this cartel for the current high prices, and stated he did not intend to sit idly by and watch ‘the whole world being woven into one or two great combinations.’ ‘We shall undoubtedly, be able to reduce our demands on their oil resources if at any time we consider the prices ruling in the market are excessive.’

Samuel Samuel, brother of Marcus Samuel and Conservative MP for Wandsworth, became extremely agitated at Churchill’s accusations of price manipulation and threatened to make public the price RDS was currently charging the Admiralty, which he claimed was comparable with that of APOC. However, under the terms of RDS’s contract, this was confidential and Churchill was able to prevent its disclosure. To reinforce his case Churchill cited the Slade Commission’s report on the productivity of the oil fields and, although it was wound up four months before the details of the Bill were finalised, Fisher’s Commission supported in principle the Government controlling an oil field.

The Bill was passed with a huge majority, but not without opposition. The Economist, predictably, thought it a ‘risky public speculation of a most objectionable manner.’ Smirking from Churchill’s attack on RDS, Marcus Samuel also challenged the Admiralty to disclose the price it paid RDS for oil. Again, Churchill declined. Samuel had cause to be aggravated over Churchill’s accusations, as RDS was charging

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52 Hansard, 5:63:1140. 17/6/1914.
54 The Economist, 20/5/1914, p. 1315.
55 The Times 23/6/1914. Samuel’s address to shareholders at the Shell Transport and Trading Company AGM.
the Admiralty seventy shillings a ton c.i.f. a British port, not too far removed from
APOP's price of sixty two shillings landed in Britain. However, Churchill was more
concerned over price fixing in the future and ensuring APOP's survival. Injecting it
with £2,000,000 of capital and signing a long-term contract was his way of making sure
the Navy would not be 'mercilessly fleeced at every purchase.' His fear of price-
fixing was soundly based, as it was not uncommon for companies to resolve trade wars
by either price-fixing or territorial agreements. Deterding, ironically specifically
excluded from Churchill's attack on RDS, was fond of quoting the Dutch proverb
'eendracht maacht macht,' or co-operation gives power. Deterding's belief, that
providing the British Government was prepared to pay there would always be sufficient
oil available, was interpreted by Churchill as RDS charging the maximum it thought the
Government would be prepared to pay, and confirmed his fear that, although there was
sufficient oil available, the Navy would be forced by the cartel into paying over the
odds.

Churchill's persuasiveness and urgency overcame the Treasury's reservations
about investing in a private oil company. He gained what he thought was a cheap and
secure supply, without burdening his own budget. Although the Fisher Commission
agreed with the case for Governmental support for APOP, its role was minimal and it
played no part in the actual negotiations. It was fortuitous timing for Greenway that the
Admiralty's oil problem came just when he was in greatest difficulty. He was able to
secure Government assistance on almost exactly the same terms he had suggested to the
Pakenham Committee over two years earlier. Moreover, he had learnt from the Burmah
Oil Contract the pitfalls in dealing with the Admiralty. This time the Government paid
for the capital investment and the Company only repaid from its profits. The two
Government directors presented little threat to the independence of the board and

56Contact between the Admiralty and Anglo-Saxon Oil Company, 31/12/1913. If the Admiralty took the
fuel f.o.b. Suez it cost fifty shillings per ton. R. Waley Cohen (Managing Director of Anglo-Saxon), to
Admiralty 1/4/1914. SHELLGHS/3A/1.

57Cost of shipping to Britain from Abadan is given as between thirty-one and thirty-two shillings by
Greenway in evidence to the Fisher Commission, 19/11/1913. ADM116/1208. RDS oil was also better
quality.

58Memo. for Cabinet, June 1913. CAB37/115/39.

translation is 'union is strength.'
released the Company from the constant threat of take over. It was a notable achievement for Greenway; he had ensured his Company’s survival, and gained in the Admiralty an ally that would prove crucial in coming battles.

The Admiralty did widen its sources and contracted with other suppliers, and where possible placed forward contracts. In December 1913 Anglo-Saxon agreed to supply 60,000 tons of oil January-June 1915, plus a further 100,000 tons July 1915-June 1916, plus the Admiralty was obligated to keep open the possibility of receiving a further 100,000 tons if the company was able to supply it. Anglo-Saxon, however, refused to sign a contract committing itself to more than two years ahead. The best it was willing to do for 1916-17 was to offer the Admiralty 100,000 tons of oil c.i.f. fifteen to twenty-one months before the first scheduled delivery. Allowing the Admiralty fourteen days to accept or reject it at the price offered.\(^6\)

During 1914, Anglo-Saxon supplied oil on an annual basis with ad hoc deliveries that allowed the company the freedom to select the source, provided the oil conformed to Admiralty specifications. Under this arrangement, Anglo-Saxon supplied oil from Trinidad, Romania, Egypt and Borneo. However, shortly after the APOC agreement became public, Anglo-Saxon informed the Admiralty that the offer of further oil from Egypt would be conditional on it taking regular substantial quantities, as their plant was normally geared to the production of commercial fuel and following a meeting between Deterding and Churchill, the Admiralty rescinded the company’s obligation to offer 100,000 tons of fuel for 1916-17.\(^6\)

The other significant pre-war contract was with the Anglo-Mexican Petroleum Products Company Limited, the marketing arm of Mexican Eagle. APOC, aside it was the only company that replied to the D-of-C’s tender for long term contracts in 1913. Anglo-Mexican agreed to sell the Admiralty 200,000 tons of Mexican oil fuel annually for the five years commencing July 1914, with the Admiralty having the option to extend the contract for a further five years. Signed in January 1914, there was a six-month hiatus before deliveries commenced to allow the company to complete the necessary plant at Tampicoto for refining the petroleum to the Admiralty’s specification. It was to be delivered in equal quarterly amounts at sixty-two shillings per ton c.i.f. for the first five years and, if extended, at fifty-five shillings per ton for

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60Cohen to D-of-C, 28/7/1914. SHELLGHS/3A/1.

another five years. However, in the case of either Britain or Mexico becoming involved in a war that rendered the contract 'substantially more difficult' or 'involved risk of loss of or damage to the vessels employed by the company' the company could either suspend the contract or agree new terms for the period of the war. Mexican oil had two significant drawbacks. First, Mexico was outside the sphere of British influence and politically unstable. Indeed, warring factions were to rip the country apart over the next four years. Fortunately, for Britain, the refinery continued to work satisfactorily throughout the period and the company did not default on the contract. Second was the quality of Mexican oil; its high sulphur content made it unsuitable for issue before being blended with other 'sweeter' oils, such as Persian or Borneo oil.

The quantity of oil required by the Navy was predicated on two factors, normal rates of consumption and anticipated wartime expenditure that dictated the size of the reserve. Naturally, as the numbers of oil burning ships in the fleet increased so too did consumption and the size of the war reserve. When Churchill entered office the authorised oil reserve stood at four months estimated wartime consumption for oil only vessels, and three months for dual-fired vessels. Pakenham found the actual reserve at the end of 1911-12 to be 205,000 tons. It strongly recommended:

1. That in this country, which imports 93 per cent of its Oil Fuel, the war reserve ought to amount to not less than 12 months' supply at war rates of consumption.
2. That as by the end of 1913-14 storage will have been completed for only 471,000 of oil, whereas the estimated annual consumption at war rate will be 1,500,000 tons it is essential that construction for storage of a further 1,000,000 tons of oil at once commenced.
3. That forward contracts for delivery of oil be entered into in order to fill this additional storage as it becomes available.

As the last major conflict fought by the Navy had been under sail what actually constituted wartime expenditure could only be speculative. Using the recent 1905 Japanese-Russo war as a guide, Pakenham outlined storage proposals that extended into

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62Contract between Admiralty and Anglo-Mexican, 7/1/1914. ADM7/648B.
64Appendix 6.
65Pakenham.
1918-19. By which time the annual peacetime consumption was expected to have increased from 226,000 tons in 1911-12 to 388,000 tons. Pakenham’s proposal of a year’s wartime consumption as a suitable reserve, would in 1918-19 would require 3,285,000 tons, a sixteen-fold increase over what was actually in existence and over three times what Pakenham had suggested was appropriate for 1911-12. Inevitably, this large increase would have to be matched by an equally large increase in the storage-building programme. If Pakenham’s recommendations were fully implemented the Admiralty would have to find at least an additional £8,079,000 for 2,190,000 tons of oil over the next eight years, on top of the £9,152,000 required for normal consumption and a reserve of four months’ war expenditure. The benefit from reduced coal consumption was comparatively slight. The practicality of paying for it all was not considered by the Pakenham, a luxury the First Lord could not ignore.

A few weeks after his appointment, in November 1911, Churchill proclaimed that the ‘high water mark’ in naval spending had been reached, and from now on, the bills would go down. The financial implications of Pakenham’s report only intensified the recent disconcerting news of increased German warship construction. To sustain Britain’s superiority over Germany more money would now be required for additional ships. Vessels Pakenham’s already bleak figures did not include. If Pakenham’s recommendations were to become reality, an expensive programme would need to be put in hand immediately. However, Churchill knew that if he placed Pakenham’s programme before the Cabinet it would be an act of political suicide. To maintain deterrence, an unambiguous demonstration of the Government’s determination to retain Britain’s naval dominance had to take priority. An increase to the oil reserve, though critical to the Navy’s performance in war, was unable to send a clear political message. Only new warships could convey a clear warning to Germany, reassure Britain’s allies and hearten the British public. Even if the level of four month’s reserve was continued, as the number of oil burning vessels increased so too would the size of the oil reserve.

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66Ibid.

67To put the amount Pakenham proposed be spent (at least £17,231,000 at £2-13-9½ per ton) into context, the total gross naval expenditure for 1910-11 (the last complete year before the report) was £42,441,419 of which £1,591,950 (3.75%) was spent on coal. The total government revenue for the year was £203,851,000.

68Lambert, Naval Revolution, p. 244,
Churchill’s response to Pakenham’s unacceptably costly conclusions was to ask the same questions again, only this time of a more authoritative body, a Royal Commission.

To Churchill’s chagrin the Fisher’s Royal Commission also failed to come up with a politically satisfactory solution. Fisher was convinced that the submarine would prevent oil getting to Britain ‘nothing can stand against them,’ submarines will ‘sweep all surface warships from the seas.’ He reasoned that Britain’s salvation relied on a massive oil reserve built up in peacetime rather than the Navy keeping the sea-lanes open. His first report recommended that oil supplies could only be ensured with ‘absolute certainty in war’ by creating a massive oil reserve at home.70

A month after Fisher’s first report Churchill instructed a detailed study based on its recommendations be carried out into the financial implications of adopting oil.71 This revealed that savings would be made in construction costs; oil-fired vessels cost less - £150,000 (6%) for a battleship, £190,000 (40%) for a light cruiser and £50,000 (33%) for a destroyer - than their coal-fired equivalents. Savings would also be achieved through a 50% reduction in stokers.72 Using as a basis an annual construction programme of four battleships, three cruisers and twenty destroyers, and assuming that battleships burnt 12,000 tons, cruisers 5,000 tons and destroyers 2,000 tons of oil per annum, the D-of-S calculated that if all the ships of the 1913-14 programme burnt oil a reserve equivalent to four years’ peacetime consumption in 1919-20 would be 3,140,000 tons; however, if the battleships were dual-fired and just the cruisers and destroyers oil-fired, 2,196,000 tons would suffice.

The cost implications were calculated using twenty-three shillings per ton for the price of coal, and four different prices, fifty, sixty, seventy and eighty shillings per ton for oil. As fifty shillings was about the lowest price the Admiralty was then paying for oil, it suggests it regarded a price reduction highly unlikely. The figures gave the anticipated cost of oil on annual expenditure in 1919-20.

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69Memo. Fisher, The Oil Engine and the Submarine, February 1914, FISR 5/20 and HNKY 5/2A.


71Churchill to various heads of departments, 14/12/1912. ADM 116/1219; ADM 1/8328 and CHAR 13/23.

72The actual savings varied with type and class of vessel. ADM1/8328.
Table 4: Cost Implications of Oil for 1919-20

<table>
<thead>
<tr>
<th>Oil per ton (shillings)</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extra cost if all ships burnt oil.</td>
<td>£884,000</td>
<td>£2,741,300</td>
<td>£4,597,800</td>
<td>£6,454,300</td>
</tr>
<tr>
<td>Extra cost if only destroyers and light cruisers burnt oil.</td>
<td>(£1,745,950)</td>
<td>£754,450</td>
<td>£237,000</td>
<td>£1,228,550</td>
</tr>
<tr>
<td>The saving in 1920 if Battleships used coal instead of oil.</td>
<td>£2,630,750</td>
<td>£1,986,850</td>
<td>£4,360,750</td>
<td>£5,225,750</td>
</tr>
</tbody>
</table>

These figures showed that in the worst case examined the additional cost of £1,228,550 for destroyers and light cruisers was acceptable when placed against the benefits of oil. Indeed with oil at fifty shillings a ton they showed a saving. However, the best case for oil burning battleships was twice that of the lowest for flotilla craft and the possibility of facing an additional £5,225,750 proved unacceptable, especially as tactically this class of vessels benefited least from using oil. Consequently, for economic as well as supply reasons the ‘R’ Class battleships of the 1913-14 programme were ordered as coal burners.

Pakenham and Fisher’s conclusions produced the same result - a large bill that the Government was not prepared to pay. It is ironic that Fisher, the ‘Oil Maniac’s’, Commission strengthened the position of those who thought the Admiralty should not order oil fired battleships for the foreseeable future. Churchill made the best of a bad job in presenting the 1913-14 Naval Estimates to Parliament, arguing that there was no need for oil-fired battleships beyond the present five Queen Elizabeth Class. Building more fast battleships would be an expensive folly, conveniently ignoring all the benefits bestowed by oil he said:

Oil is only required in big ships when an exceptional speed has to be reached with vessels of exceptional quality. The ordinary speed can be effectively realised with coal as the main motive power. [...][...] the essence of the fast division consists in the
relationship of its speed to that of the enemy’s main fleet, and consequently to your own main fleet. Speed is only relative, and, if the general speed of the Line of Battle were raised until it was equal to the fast division, the fast division would, _ipso facto_, fall back into the ordinary category.73

The battleships’ speed in the main fleet was to remain at twenty to twenty-one knots,

Coal will continue to be the main basis of our sea power in the line of battle for the present. [...] this it must be admitted, is convenient in view of the very high prices now ruling for oil.74

In a memorandum, Churchill uses the same justification to his Cabinet colleagues for ordering no more oil-fired battleships without revealing his true aspiration for the battle fleet. The fast division, like all other battleship divisions, was originally planned as four ships. The Federated States of Malaya’s offer to pay for a battleship should have logically resulted in a coal-fired vessel. Churchill though hoped to create a second fast division of four ships, one for ‘either end of the line’ of battle, comprising the vessel paid for by Malaya and three paid for by Canada, that never materialised.75 If the cost of oil was not the deciding factor, three further oil-fired vessels should have been ordered to complete the second division. As Churchill explained eleven months later to the Commons: ‘The problem of oil supplies for the Fleet is not primarily a problem of war; it is a problem of peace and a problem of price.’76 This was confirmed shortly after the commencement of hostilities in 1914 when, with their construction well advanced, the ‘R’ Class were converted to oil-burning.77

A further, more practical, problem stood in the way of creating the massive oil reserves of Pakenham and Fisher - storage accommodation. Pakenham’s expectation that 471,000 tons of storage capacity would be ready by 1913-14 proved optimistic.78 Within a year, this had been revised down to 371,000 tons. His recommendation that a

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74Ibid.

75Memo. for Cabinet, June 1913. CAB37/115/39.

76Hansard 5:63:1136, 17/6/1914.


78Pretyman.
total of 1,500,000 tons should be erected by 1916-17 was reduced to a programme for 1,000,000 tons. To add Fisher's suggestion of a further 1,600,000 tons of tankage would be difficult, if not impossible. Indeed the D-of-W cast doubt on the Admiralty's ability to plan deliveries of the forward contracts under negotiation because of delays in completing tankage. He commented that the current contractors had not 'served us well as regards time [of construction]' and were fully committed with the present programme. Even if new contractors could be found, he thought completion rates would be highly unpredictable, and felt unable to guarantee completion in the time proposed or give even an estimated cost. Furthermore, in the early years of a new construction programme completions would be very few and any contract stipulating uniform rates of delivery would therefore be unworkable.

Although the Admiralty's study of the financial implications of oil may have shown that costs could be kept within manageable proportions for flotilla craft, the overall pressure on the budget was still immense both externally, from the Chancellor who wanted the money for social policies, and internally, for construction and new equipment such as radios and aircraft. Any attempt to create a large oil reserve was doomed to fail in Cabinet or inflict intolerable reductions within the service. Demonstrating that the cost was containable over seven years, if the cost of oil did not increase, was cold comfort to a Government that had to budget annually.

As Fisher, his old friend and mentor, had delivered unpalatable solutions to the supply problem Churchill was forced to seek backing from other authoritative sources. He referred the problem back to the Admiralty, specifically to his recent creation, the Naval War Staff (NWS). Informing the First Sea Lord that the NWS 'must be the prime authority for prescribing the reserve of oil fuel required for oil burning vessels' he tasked the NWS to produce a paper on how this should be best achieved. Churchill learnt from his experience with the Fisher Commission that granting inquiries a free hand only allowed them to produce absurdities. This time he guided the NWS into

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80 Ibid.
81 For details of how these figures were arrived at see ADM1/8328.
82 Ibid., p. 265.
83 Churchill to Admiral Prince Louis of Battenberg (FSL), 8/1/1913. ADM116/1209.
producing more palatable answers by personally setting tighter parameters. The NWS was not to concern itself with price, but assume:

That for a purpose so vital as the supply of oil to the fleet in time of war the British Government could afford to pay a price which, so far as commercial considerations go, would command a market. 

It was also to reject Fisher’s contention that Britain’s naval predominance could be questioned. Churchill wrote, ‘The basis of our whole defensive policy is command of the sea.’ The NWS was to base the reserve on estimated wartime not peacetime consumption, and like Pakenham to use the Russo-Japanese war as a model. It was also to rectify the absence of consideration given to transportation by Fisher. Finally, he added a word to the wise, warning that the NWS was to be cognisant of the prevailing political realities that he clearly thought the previous inquires had ignored:

The great utility and convenience of oil fuel and the desirability of our having the benefits of it, if they can be obtained without burdens on the Estimates disproportionate even to such great advantage should be borne in mind. The only consequence of prescribing impossible standards like those proposed by the Royal Commission will be to arrest the adoption of oil in the British Fleet with consequent loss.

As instructed, chief of the NWS Sir Henry Jackson assumed that the oil would be available in war despite the enemy’s best efforts and Britain would be able to move it. In light of this he recommended that:

[T]he Board of Admiralty would require arrangements to be made to cover with reasonable certainty the requirements of one year of war, and that at least half of one year’s estimated war expenditure must be at the commencement of war actually in reserve.

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84 Ibid.
85 Ibid.
87 Ibid.
Using the same consumption figures as the earlier Financial Implications study, but excluding provision for additional battleships as these were now to be coal-fired, the NWS presented figures on which plans for the purchase and storage of oil could be based. Jackson's study expected stocks to suffer greater depletion in the first few weeks of hostilities. However, over the longer period it considered the aim should be to balance issues by receipts and thereby maintain the reserves at six months' wartime consumption in war and peacetime. Its cost projections were based on a pound per ton for storage, and sixty shillings per ton for oil delivered to Britain. However, the D-of-C's scrutiny of possible sources in peace and war failed to identify enough oil to meet even Jackson's predictions. The First Lord requested that the study be conducted again 'assuming that the [oil] specification is altered' (sulphur content). The revised study showed that for the three years of 1913-16, the requirements could be met, but only just. For the two following years though, the calculations showed small shortfalls. The D-of-C admitted that he was taking a conservative view, and warned that although the figures given were shown as monthly estimates, irregular deliveries could mean shortages for brief periods.

Storage for the 1,000,000 tons at homeports already approved by the Board was not expected to be completed by the end of 1916-17. Although adequate to meet Jackson's six-month reserve criteria until 1914-15, thereafter it would need to be increased to cope with the requirements of 1916-20. The Accountant General of the Navy priced the Board's storage programme at £1,223,206. If oil and freight costs were added, the total was £5,672,482, of which £2,169,000 would have been spent or voted for by 31st March 1914, leaving £3,504,000 to find over the next three years. These reserves would still be less than the recommendations of Pakenham, Fisher and Jackson. Although this was the lowest estimate, Churchill still considered it more than he could obtain from the Treasury. In May Churchill questioned Jackson's wartime consumption figures; 'I doubt if it reasonable to assume that all the battleships of the British Fleet will steam at full speed for 18 nights and days during the first six months of a war,' nor did he think that sufficient allowance had been made for repairs and casualties.

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88 Appendix 7
89 Ibid. Enclosure No 2.
90 Churchill to FSL, 8/5/1914. ADM116/1219.
Jackson reappraised his figures and reduced the battleships' consumption, only to increase the destroyers', to leave the overall total little changed. The additional tankage to meet Jackson's target was to be all on the east coast, 31,000 tons at Felixstowe, 390,000 tons on the Humber, and 210,000 tons at the Firth of Forth. In the revision, for the first time, Scapa Flow was included with 250,000 tons to give a total of 1,881,000 tons at Home Ports.  

The figures Churchill presented to the Cabinet in his Memorandum in June 1913 were:

Table 4:2

<table>
<thead>
<tr>
<th>Date</th>
<th>Original Admiralty Standard [4 months]</th>
<th>Pakenham Committee (One year's Wartime Expenditure)</th>
<th>Fisher Commission (Four years' peacetime expenditure)</th>
<th>Standard now advocated (First six months' of war expenditure)</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 1st 1913</td>
<td>340,000</td>
<td>816,000</td>
<td>800,000</td>
<td>441,000</td>
</tr>
<tr>
<td>April 1st 1914</td>
<td>533,000</td>
<td>1,259,000</td>
<td>1,132,040</td>
<td>679,000*</td>
</tr>
<tr>
<td>April 1st 1915</td>
<td>766,000</td>
<td>1,792,000</td>
<td>1,548,000</td>
<td>965,000</td>
</tr>
<tr>
<td>April 1st 1916</td>
<td>956,000</td>
<td>2,230,000</td>
<td>1,820,000</td>
<td>1,200,000</td>
</tr>
<tr>
<td>April 1st 1917</td>
<td>1,127,000</td>
<td>2,623,000</td>
<td>2,076,000</td>
<td>1,412,000</td>
</tr>
</tbody>
</table>

* Against this figure it was not expected that a reserve of more than 415,000 tons could be provided under current Naval estimates.

Having finally convinced his Cabinet colleagues that an increase in oil expenditure was unavoidable Churchill used the figures to demonstrate that he had not blithely accepted the expensive predictions of the Pakenham and Fisher, but had fought doggedly against advice to bring the necessary expenditure down to manageable proportions. None the less, an increase would be required for oil, oil storage and investing in a secure source of oil. Indeed, to reduce the shortfall for 1913, immediate authority was required to purchase 50,000-100,000 tons to fill the completed tankage. Even if granted, this would still leave a discrepancy of 260,000 tons by March 1914.

91 Revised figures for oil storage. ADM116/1219.

92 Memo. June 1913. CAB37/115/39
Churchill’s announcement to Cabinet in December 1913 that he required a three million pound increase in the Naval Estimates for the financial year 1914-15 was greeted with consternation, and a group of ministers attempted to impose swingeing economies. Most of the literature that deals with the dispute over the 1914 Estimates concentrates on the construction programme. The Liberal press and a large backbench contingent clamoured for economies, and five Cabinet members wrote to the Prime Minister to express their ‘deep concern and uneasiness.’ Asquith told Churchill he would only survive if he threw ‘a baby or two out of the sledge’ as the ‘critical pack’ had, despite widespread support, ‘slackened their pursuit.’ Churchill replied that for the past few months he had been ‘striving by every means’ in his power to reduce costs, but was anxious ‘lest the necessary have been cut too low.’ Cuts in the construction programme would require an unacceptable change in naval policy. Instead he prepared evidence for Cabinet showing the parsimony of his tenure at the Admiralty and prove that even though his hands were tied over construction, after only two months in office he had instructed that fuel consumption be dramatically reduced. He compared the 871 ship average hours at sea of McKenna’s last full year in office, with the 747 hours during his first full year in office, a 14% reduction. Reductions in oil consumption were even greater at 24%, which he accomplished by rigorously cutting down on the C-in-C requests for sea-time ‘in a manner never previously attempted.’ He fully anticipated that at the end of 1913-14 oil consumption would be 60,000 tons less than the C-in-Cs estimated they required. Oil was restricted to instructional purposes only in battlecruisers and cruisers, battleships needed special permission to use oil for any purpose and no provision at all was made for manoeuvres in 1914-15. The reductions

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9 For details of the financial struggle in the Cabinet see Lambert, Naval Revolution; Marder, Dreadnought vol 1.; Churchill, Churchill vol. 2.

9* Letter from Lord Beauchamp, (Minister of Works) R. McKenna (Home Secretary), C. Hobhouse (Duchy of Lancaster), W. Runciman (Board of Agriculture and Fisheries) and J. Simon (Attorney General) to the Prime Minister II. Asquith 29/1/1914. Asquith mss., quoted in Churchill, Churchill vol. II, pp. 676-677.


did not always meet the First Lord’s targets, but they did effect considerable savings over the C-in-C and Admiralty’s estimates.

Table 4.3

<table>
<thead>
<tr>
<th>Year</th>
<th>Commander in Chief’s estimates</th>
<th>Estimate as amended in office</th>
<th>Provision approved by First Lord</th>
<th>Actual expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Oil Fuel</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1910-11</td>
<td>59,940</td>
<td>60,000</td>
<td>60,000</td>
<td>81,793</td>
</tr>
<tr>
<td>1911-12</td>
<td>157,512</td>
<td>140,000</td>
<td>140,000</td>
<td>125,444</td>
</tr>
<tr>
<td>1912-13</td>
<td>183,300</td>
<td>175,800</td>
<td>156,000</td>
<td>160,000</td>
</tr>
<tr>
<td>1913-14</td>
<td>220,700</td>
<td>200,000</td>
<td>150,000</td>
<td>160,000 Estimated</td>
</tr>
<tr>
<td>1914-15</td>
<td>274,509</td>
<td>253,000</td>
<td>166,000</td>
<td>--</td>
</tr>
<tr>
<td><strong>Coal</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1910-11</td>
<td>1,574,106</td>
<td>1,521,000</td>
<td>1,521,000</td>
<td>1,594,881</td>
</tr>
<tr>
<td>1911-12</td>
<td>1,755,171</td>
<td>1,690,000</td>
<td>1,631,000</td>
<td>1,644,572</td>
</tr>
<tr>
<td>1912-13</td>
<td>1,941,027</td>
<td>1,760,000</td>
<td>1,560,000</td>
<td>1,725,537</td>
</tr>
<tr>
<td>1913-14</td>
<td>1,904,878</td>
<td>1,810,000</td>
<td>1,660,000</td>
<td>1,820,000 Estimated</td>
</tr>
<tr>
<td>1914-15</td>
<td>2,069,684</td>
<td>1,910,000</td>
<td>1,613,000</td>
<td>--</td>
</tr>
</tbody>
</table>

The detrimental effect of the economies on training did not go unmentioned; Vice Admiral Prince Louis Battenberg, then the Second Sea Lord wrote Churchill that:

The reductions are serious and regrettable. What their precise result will be on the war training of the Fleet, both as regards tactical exercises and target practice of all kinds, can only be arrived at by analysing the logs.

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100 Minute by 2nd SL 11/1/1912. CHAR13/31.
Churchill himself warned the Cabinet, that the German Fleet spent more time at sea than the ‘best of the British Squadrons.’ His memorandum served its purpose, the pursuit slackened and the standard accepted for the Navy’s oil reserve was six months wartime consumption.

Churchill’s achievement of increasing the war reserve from four months’ wartime consumption in 1911, to six months in 1914 - the maximum the Cabinet would allow, and the maximum that could realistically be created – was very real. It had been a tortuous affair. Having rejected Pakenham and Fisher’s recommendations, and then having to guide the NWS to its conclusions, it is clear that it owed more to political expediency than any objective military analysis. Possessing the political skill and guile to implement a practical policy was one thing, ensuring the policy’s success is quite another. Only war itself would prove if a six-month war reserve was adequate and if the postulated six-months’ usage would actually last that long.

On the eve of hostilities, the First Lord informed the King that ‘The reserves of oil & the coal arrangements are satisfactory.’ For satisfactory read 688,655 tons of oil fuel, just 30,000 tons short of the six-month reserve level. After the war, Churchill, unsurprisingly, judged his efforts to have been both skilful and successful:

[In] repulse[ing] the excessive and, as I thought, extravagant demands of the Royal Commission and of my naval advisors, and on the other [hand] to wrest the necessary supplies from the Treasury and the Cabinet.

Only Persia promised significant quantities of oil for the Navy in peace and war that was not controlled by Standard or RDS and which, although not under Britain’s control, was in her sphere of influence. To the Admiralty it was important that Britain retained control and used whatever influence it had to ensure it remained in British hands, short of actual investment. To Churchill it was even more important that Standard or RDS did not get control, and if that took £2,000,000 then so be it. He

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103 Appendix 7.

104 Churchill, World Crisis, vol. 1, p. 137.
fundamentally disagreed with Fisher, believing that in wartime Britain had the military and financial power to acquire and transport oil, for if the Navy could not ensure oil supplies then neither could it ensure deliveries of food and the war would be lost, however large the oil reserve. Churchill main concern was that if oil was too expensive in peacetime the Navy would be unable to exploit its benefits in war. The APOC contract was principally to provide cheap naval fuel in peacetime and break the cartel of the big two.

Although the Admiralty had operated its own shipyards and factories for many years investing in a company that operated primarily outside British jurisdiction was a major new step. The Admiralty had never contemplated investing in a coal company, not because they were in Wales, but because they operated in a market environment that prevented price fixing. The Government's investment in APOC was not because it was overseas, but because it saw no other way to break the cartel of Standard and RDS. Churchill saw it as the only way to prove that oil-burning would not be ruinously expensive. In a period of Lassie-faire economics it was a bold step, one regarded as vital to the Navy and one that put Churchill's career on the line. For Greenway and his fellow directors, it was a golden opportunity. Having learnt at Burmah Oil the pitfalls of dealings with the Admiralty, they exploited it to the full. The Admirals were pleased with the deal as it guaranteed, they thought, supply in war and peace, and the Treasury were content because the oil price was cheap and predictable.

Churchill was shrewd enough to realise that if he had asked the Cabinet to fund a massive reserve, as recommended by Pakenham and Fisher, it would have invited rejection rather than compromise. His response was to order another inquiry and set clearer guidelines. Finally, the NWS came up with a figure Churchill considered the Cabinet could accept. Although the Cabinet was reluctant to spend money on oil his tactic to use all three studies, as they all recommend a large reserve, and personally recommend the cheaper option proved successful and resulted in an increase in the oil reserve from four to six months wartime consumption.  

It is clear without Churchill steering his own policy between the extravagance of the Admirals and the prudence of the Cabinet the progress of oil-burning in the Navy would have been far slower. He did not achieve all his goals; the return to combined fuels in the R class was a set back (although quickly reversed at the first opportunity).

105The postulated six months' reserve level lasted for more than eight months in the War.
His solutions owe as much to of the nature of the oil industry as to the extraterritorial sources of oil. Just as oil increased the Navy's role in industry, it also meant other Government departments, such as the Foreign Office and the Board of Trade became heavily involved in naval fuel policy, a process that, as will be shown in chapter six, was accelerated by the First World War.
Coal During the First World War

Notwithstanding the increasing use of oil, coal remained essential to the Navy 1914-18. This chapter examines how effective the pre-War plans to supply coal were in execution and the role the railways and collier fleet played in the supplying the Navy as well as the principal threats to naval coal supplies. To redress errors in the only published work on the subject it looks at the Grand Fleet's coaling procedures and consumption in detail. In 1914, two ideas dominated Britain's war thinking. First, that the burden of the land war would be borne by her allies, France and Russia, while her naval preponderance imposed an economically crippling blockade on Germany. Second, the domestic economic and social consequences should be mitigated as far as possible to preserve social cohesion, although some dislocation of trade would be inevitable, due to loss of markets and military priorities.¹

The Navy saw itself as the main prosecutor of the British war effort, and consequently took scant regard of how its planning might impinge on other areas of the economy. As the coal infrastructure was more than adequate to meet the anticipated requirements, the Navy considered that the War's duration would have little effect on its ability to supply the fleet. Problems were anticipated at the start, as the supply system bedded down. However, the activation of the Railway Executive Committee as prescribed in the War Book, went ahead smoothly and dealt with the priorities on the railways.² One unforeseen spanner in the works was a labour shortage. Contrary to the Board of Trade's prediction that the War would increase unemployment, mass enlistment quickly mopped up existing unemployment and created a shortage of labour.³ With no national scheme of reserved occupations, men employed in supplying the Navy's fuel rallied to the colours, creating shortages in the mines, ports, and railways. Another unforeseen burden on the supply organisation was the needs of allied nations. The duties of the ACA and the Admiralty departments responsible for the provision of

²Ibid. p. 174.
³Ibid. p. 99.
fuel increased in both scale and scope. From the outset, the ACA was responsible for the provision of Welsh coal to the French Navy, although initially the French provided the shipping.\(^4\) Following the German occupation of the Northern French coalfields, the British Expeditionary Force, French industry and railways came to rely heavily on British coal too, and its transportation was added to the remit of the Admiralty Transports Department (ATD).\(^5\) By early 1915, 850 vessels had been taken into naval service as colliers, oilers, supply vessels and auxiliaries.\(^6\) The entry of coal-deprived Italy into the allied camp in May 1915 further intensified the pressure on the ATD, ACA and collier fleet, as they were expected to supply Italy too. By 1917, coal deliveries to France and Italy combined averaged 1,500,000 tons per month.\(^7\)

Despite measures to utilise shipping more efficiently, the demand for colliers would permanently plague the War effort. The ATD became increasingly involved in proving tonnage for all commodities and other Government departments, such as the Board of Trade which required vessels to maintain Britain's overseas markets and earn foreign exchange. Coal, said Lloyd George, was 'everything for us,' the lifeblood of the country and its 'International coinage.'\(^8\) In 1916, coal accounted for 10% of exports by value, but 80% by weight, and consequently was more susceptible to shortages of shipping than other commodities.\(^9\) In December 1916, Lloyd George's new coalition Government sought to end the ad hoc growth of shipping controls with the appointment of a Shipping Controller with Cabinet rank to head a new Ministry of Shipping that would be responsible for the allocation, priority and construction of all merchant vessels.\(^10\) The ATD, which had overseen the shipping of 7,500,000 tons of coal to


\(^5\)2,950,000 tons of coal was shipped to the BEF during the war. The British Naval Effort 1914-1918, ADM 1/8559/149. (Hereafter Naval Effort)

\(^6\)Fayle, Seaborne Trade vol. II, p. 40.

\(^7\)J. A. Salter, Allied Shipping Control, (Oxford: Clarendon Press, 1921), p. 235. In the final eight months of the war 36% of coal sent to Italy went across France by rail.


\(^10\)Fayle, Seaborne Trade, vol. III. pp. 1-11. The first Shipping Controller was Sir Joseph Maclay; the Ministry was abolished in March 1921.
Britain’s allies, became an integral part of the new ministry, transferring its staff in February 1917.\footnote{Ibid., Naval Effort.}

The Navy had first call on the collier fleet. The policy of sending coal to the east coast naval bases by rail was clearly impractical for Scapa Flow, which received most of its coal directly from South Wales by collier. Nonetheless, use of Scapa Flow necessitated that a new railhead be established at Grangemouth, where the coal was transferred into colliers. The 1909 policy envisaged the main fleet base would be Rosyth not Scapa Flow. However, the facilities and defences of Rosyth were still incomplete in 1914, and even if Rosyth were ready, the fleet would still have coaled directly from colliers loaded at Rosyth. Nor were there any shore facilities for coaling at Scapa Flow. Jellicoe recorded:

There were no facilities at the base [Scapa Flow] for the storage of coal, either in lighters or on shore. Consequently, the whole of the coal required at the base was necessarily kept on board the colliers. The actual number of colliers which I deemed it necessary to keep at the base during the first two years of the war was determined by the necessity for coaling the Fleet and getting it to sea again with the utmost rapidity. We cannot contemplate such a situation as the Fleet arriving short of fuel and being delayed in completing owing to shortage of colliers, with the possibility of information being received simultaneously that the High Sea Fleet was at sea and covering landing on our coast! Rapidity of fuelling was of vital importance to the Empire.\footnote{John Jellicoe, The Grand Fleet 1914-16; Its Creation, Development and Work, (London: Cassell, 1919), pp. 83-84.}

It would be wrong to conclude from this that if storage facilities had existed at Scapa fewer colliers would have been required. The determining factor was speed of coaling of the whole fleet, this could only be achieved with a large number of colliers. Consequently, the number of colliers at Scapa Flow was determined by the number required to coal all the major units of the fleet simultaneously, one collier per unit, plus a number employed moving coal from Cardiff. Initially, due to the shipowners’ dissatisfaction with the level of remuneration the large numbers of necessary colliers proved difficult to charter. Jellicoe wrote that when the Grand Fleet first entered Scapa Flow ‘the fuelling of the Fleet was considerably delayed owing to the inadequate
number of colliers, many of those present being also unsuitable for the work of rapid coaling. The ACA reported in December 1914 that 'many owners are taking pains to avoid Admiralty employment.' Rates increases largely overcame the owners' grievances, but other demands for the colliers' services meant the fleet operated under constant pressure to use as few as possible. However, despite complaints in the press over the time colliers spent waiting to coal the Fleet, no attempts were made to replace colliers with shore installations at Scapa Flow.

As the War progressed the C-in-C managed to reduce the numbers of colliers attached to the Grand Fleet through changes in operational procedures; for example, in the first few months of the war the Grand Fleet maintained steam ready to sail at two to three hours notice. The success of Naval intelligence in warning of German fleet activity allowed it to maintain a lower state of readiness, reducing consumption and necessitating fewer trips to Cardiff, though this could only had a limited impact on the total number of colliers because this was determined by the size of the Fleet rather than its consumption. Nevertheless reductions were made in the colliers supplying the home fleets overall, from 163 in October 1914 to 126 in October 1915, then to eighty-six in November 1917. The need to satisfy all naval requirements, especially in the Mediterranean during the Gallipoli Campaign, increased the total colliers allocated to 'Fleet Service' in all operational theatres from 325 in 1914 to 365 in 1915. Most of the reductions at home ports were brought about by the greater use of shore facilities at non Grand Fleet bases such as Sheerness and Portland. Colliers authorised for the Grand Fleet bases of Scapa Flow, Rosyth and Cromarty, excluding vessels in transit, increased from seventy-five in August 1914, to eighty in July 1915. Significant reductions only occurred after July 1916 when savings were made first at Rosyth by use of lighters and

11 Ibid. p. 92.
12 ACA to D-of-T. 21/12/1914. MT23/334/T16778/1914.
13 Memo., D-of-S, November 1915. ADM 116/1514
15 Jon Sumida, 'British Naval Logistics, 1914-1918,' The Journal of Military History, 57:1. (January 1993), pp. 447-480. Marder states ships were at four hours notice to sail, but does not give a date. Dreadnought vol. 5. p. 131.
16 Appendix 8.
17 Appendix 10.
subsequently by the almost total withdrawal of colliers from Cromarty. By mid 1917, the Grand Fleet bases were only authorised fifty-four colliers, nevertheless, the Navy still required 100 colliers in homeports overall.\(^{20}\)

The average number of colliers employed by the Navy on all services in home waters at any one time during the War was around 200, with an aggregate capacity of about 470,000 tons. The maximum number employed at any one time according to the post-War Admiralty produced document *The British Naval Effort 1914-1918* was 563, with an aggregate carrying capacity of about 2,147,000 tons.\(^{21}\) However, ‘the weekly statement showing the distribution of Admiralty colliers at Home and abroad’ for 29\(^{th}\) April 1916 shows 651 vessels in use with an aggregate capacity of 2,474,770 tons.\(^{22}\) Losses of colliers on naval service during the War were severe, amounting to 253 vessels with a combined gross tonnage of 715,844 tons.\(^{23}\)

Citing the agenda of a conference held on the Grand Fleet Flagship in September 1914, Sumida wrote that it would take four days to coal the whole fleet ‘for extended deployment to the south into Heligoland Bight.’\(^{24}\) Sumida misread Jellicoe’s papers. It did not take four days to coal the whole fleet; indeed, it rarely took more than four hours. The four days referred to, include the estimated time a vessel required to return to Scapa Flow from patrol, coal and resume its station on patrol. Coaling speeds achieved during the War were almost double those of twelve years earlier, and the world record claimed in 1902 was frequently surpassed without additional labour. The 1903 view of C-in-C Portsmouth that 130 tons per hour ‘would not be much exceeded’ proved pessimistic, and by 1914 130 tons per hour was unacceptably slow. The average speed of the 108 coalings carried out during the War by the battleship *Hercules* was over 220 tons per hour, and on five occasions, she exceeded 300 tons per hour.\(^{25}\) From empty, and no ship in commission was ever completely empty, the *Hercules* could coal in less than fourteen hours.

\(^{20}\)Appendix 10.

\(^{21}\)Naval Effort.

\(^{22}\)Appendix 11.

\(^{23}\)Appendix 12.


\(^{25}\)Logs of *Hercules* 1914-18. ADM 53/44166-70
Several factors, such as the weather or collier, caused coaling times to vary. Ensign H. K. Oram, who served on the battleship *Orion*, wrote:

The time taken [to coal] depended to some extent on the workability of the collier allocated to us and there was general grousing if, as often happened, we were unfortunate enough to suffer an ancient, rust streaked vessel with narrow hatches and wheezing winches with barely strength to hoist the laden bags of coal.26

Following the Battle of Jutland, Jellicoe’s flagship, the *Iron Duke*, coaled at 203 tons per hour.27 The same day at Rosyth, Admiral Beatty’s flagship *Lion*, despite having suffered heavy damage, coaled at an impressive 378 tons per hour. Coaling commenced on both vessels as soon as they dropped anchor, and in the case of the *Lion* even before her wounded were taken off.28 Coaling immediately on return to port was in compliance with Grand Fleet standing orders that laid down the minimum bunkerage permissible before replenishment. Sumida’s contention that battleships only coaled up to 25% of their capacity is also wrong. He misunderstood Oram, who wrote:

Except in dire emergency stocks of coal remaining were never allowed to drop below 25 per cent of our full stowage of 3,000 tons and this restricted our operating ranges to six day’s steaming.29

Oram meant that 25% was the minimum level allowed at sea so the C-in-C could be confident that vessels at sea always had sufficient fuel for at least two days sailing without having to break radio silence. In the case of the *Orion*, about 1,000 miles at nineteen knots, or, in other words, she could reach any point in the North Sea where action was imminent, fight and return to port. The opposite of Sumida’s contention is correct; vessels never had less than 25% of full bunkerage. Grand Fleet Orders made it very clear for each class of warship the level bunkers were to be completed to, and what they were not to fall below when in harbour. The *Iron Duke*, for example, was to coal

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28 Log of *Lion* 2/6/1916. ADM 53/46846.

to at least 92% of full storage and not fall below 82%, for the Lion the figures were 95% and 80% respectively. Oil-fired battleships replenished to similar levels. Light cruisers bunkered to 100% and were not to fall below 90%. In dual-fired vessels, the oil stowage varied between bunkering to 40-60% of capacity and not falling under 37-50%. Consequently, the briefest of excursions involved immediate coaling on return to port, and vessels at anchor would frequently top up with small quantities to comply with Grand Fleet Orders.39 Again taking the Hercules as an example, her average wartime coaling was 552 tons, or 19% of full stowage.31

Although at the outbreak of the War coal stocks were at their authorised level, the majority was on the south coast. In line with the 1909 policy the Grand Fleet was wholly dependent on stocks afloat in colliers. There appears to be no evidence why, if the largest part of the fleet was dependent on coal to be delivered, large stocks continued to be maintained at southern ports. There are, however, a number of obvious reasons. First, although the Admiralty relied on underground reserves immune from enemy action and deterioration, they were not immune from industrial action. Strikes had disrupted supplies of naval coal on a number of occasions pre-War. A reserve securely in the hands of the Admiralty would be a useful buffer against industrial blackmail in peace and war. They were on the south coast simply because the facilities existed there and there was enough naval activity in peacetime to turn the stock over with sufficient frequency to prevent deterioration. Threat of industrial action did not though warrant the expenditure of large sums of money on new coal yards on the east coast, especially as they were not expected to be used in wartime.32

None the less, it soon became apparent that additional emergency reserves would be required in the north east to allow colliers to replenish more quickly during periods of exceptional fleet activity, obfuscating the twelve to fourteen day round voyage between Scapa and Cardiff. By December 1914, a shore stock of 50,000 tons

30Grand Fleet Orders. ADM 137/401.
31Logs of Hercules 1914-18. ADM 53/44166-70
32Major Industrial disputes, involving over 500,000 working days lost, occurred in South Wales in 1902, 1909 and 1910. Railway workers too were not averse to industrial action. Maintaining a stock of coal as insurance against industrial action was a common practice by the railway companies.
had been established at Grangemouth.\textsuperscript{33} As the German submarine campaign intensified, this reserve became increasingly vital and by 1917 the authorised shore stocks had risen to 113,000 tons at the Firth of Forth, 71,000 tons on the Humber and 9,000 tons on the Tyne.\textsuperscript{34}

The actual coal consumption of the Navy and the Grand Fleet specifically is difficult to arrive at due to a dearth of precise figures. However, there are enough statistics from which to calculate a fairly accurate picture. The post-War figures given as the amount of British coal shipped ‘for H M Ships, dockyards, transport and commercial vessels at Home and Abroad’ in the \textit{Naval Effort} paper is 36,000,000 tons.\textsuperscript{35} However, the total of this and the 6,300,000 tons the \textit{Naval Effort} gives as ‘despatched by rail, principally to East Coast Bases,’ 42,300,000 tons, was not, as accepted by Sumida, the amount of coal ‘delivered to the fleet,’ but the amount delivered by the Admiralty. A considerable proportion of the coal ‘shipped under Admiralty direction’ went to France and Italy.\textsuperscript{36} Pratt calculated, based on the 13,631 Admiralty coal trains between 27\textsuperscript{th} August 1914 and 31\textsuperscript{st} December 1918 from South Wales, that 5,452,400 tons of Welsh coal was delivered to all naval bases by rail.\textsuperscript{37} The Admiralty reached the higher figure of 6,300,000 for coal moved by rail in the \textit{Naval Effort} because not all vessels were supplied with Welsh coal. Many transports and auxiliary craft were supplied with a suitable local coal that was also moved by rail.\textsuperscript{38}

\textsuperscript{33}Admiral Lowry, Rosyth, to the Secretary of the Admiralty, 18/12/1914. ADM 137/1075. The standard ten ton coal wagon was 19 feet buffer to buffer; 15,000 tons would therefore require just under five and a half miles of sidings.

\textsuperscript{34}Appendix 10.

\textsuperscript{35}\textit{Naval Effort}.


\textsuperscript{37}Edwin A Pratt, \textit{British Railways and the Great War}, (London: Selwyn & Blount, 1921), pp. 488-492. The quantity of coal moved by rail for the Admiralty between August 1914 and March 1919 was 6,606,906 made up as follows:

Mainly for the Grand Fleet; Grangemouth, 2,346,879 tons; Glasgow, 717,459 tons; Burntisland, 309,209 tons, and Leith, 482161. - Total 3,855,789.

Other Ports; Thames, 316,721; Immingham, 851,890; Tyne, 488,008; Hull, 13,681; Chatham, 36,201; Southampton 283,353; Birkenhead, 302,522; Gosport, 213,224; Devonport, 109,645; Holyhead, 76,265; minor ports, 59,607. - Total 2,751,117 tons

\textsuperscript{38}Some ‘patrol bases,’ such at Aberdeen, were supplied with bituminous coal by rail ‘from the nearest source of supply’. ADM 1/9216. At Scapa Flow on average two colliers carried non-Welsh coal for auxiliary vessels. Report of Nathaniel Dunlop (Ministry of Shipping), March 1917. ADM 116/1514 (hereafter Dunlop).
In July 1917, the Chief of the War Staff, Vice-Admiral Henry Oliver, gave the approximate annual coal consumption at Scapa Flow as 900,000 tons.\(^\text{39}\) Depending on the level of Fleet activity, Scapa represented between 48-62% of the Grand Fleet's total consumption.\(^\text{40}\) This gives an approximate figure of 1.5-1.8 million tons per year, and a total for the fifty-two months of the War of 6.5-7.8 million tons. Figures supplied to the Cabinet in March 1917 give the average monthly consumption over the previous six months as 102,000 tons, with Scapa Flow representing 62% of total Grand Fleet usage between August 1916 and February 1917. It also gives the months of the Grand Fleet's highest coal consumption for 1915 (April, 228,000 tons) and 1916 (March 159,500 tons).\(^\text{41}\) These figures suggest that the Grand Fleet's coal consumption steadily declined throughout the war, and it is therefore reasonable to suggest that it burnt one million tons in 1914, when sea time was greatest, 1.8 million tons in 1915, 1.5 million in 1916, 1.3 million in 1917 and perhaps 1.1 million tons in 1918; a total of 6.6 million tons.

Another method of ascertaining the Grand Fleet's coal consumption is to look at the problem through the other end of the telescope, and extrapolate from an individual ship's consumption. The destroyers were all oil-fired, as were most of the light cruisers and the Queen Elizabeth and R class battleships, so they can be ruled out. So too can the auxiliary craft employed in the flow because, as we have seen, they had a separate supply of non-Welsh coal, this leaves on average forty to forty-five major coal-burning warships.\(^\text{42}\) Allowing for seasonable fluctuations while at anchor a battleship consumed around twenty-five tons per day.

\(^{39}\)Paper GT 1309, 5/7/1917. CAB 24/19. The actual consumption of Welsh coal at Scapa Flow in 1915 was 1,010,619 tons and in 1916 873,745 tons.

\(^{40}\)Dunlop.

\(^{41}\)Appendix 10.

Table 5: 1*

Average coal consumption of Hercules when not at sea.

<table>
<thead>
<tr>
<th>Month/year</th>
<th>Jan 1915</th>
<th>July 1915</th>
<th>Jan 1916</th>
<th>July 1916</th>
<th>Jan 1917</th>
<th>July 1917</th>
<th>Jan 1918</th>
<th>July 1918</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tons</td>
<td>34.9</td>
<td>19</td>
<td>32</td>
<td>17.7</td>
<td>29.4</td>
<td>17.8</td>
<td>21.8</td>
<td>17.8</td>
</tr>
</tbody>
</table>

Fig 5: 1

Sea time of the Battleship Hercules 1914-1918

Of the thirty-four full days the Hercules spent at sea in 1915, she burnt an average of 247 tons per day. For the whole of 1915, Hercules burnt 19,602 tons, an average of 53.7 tons per day. In 1928, the (then) First Sea Lord Admiral Sir Charles Madden stated to the Birkenhead Committee, that in the first year of the War the battleship King George V averaged 9.3 days and the battle cruiser Princess Royal


44 Log of Hercules, ADM53/44166. There is a gap for August 1914 and it is estimated at just over twenty days.
averaged 11.5 day a month at sea — 138 day a year at sea. In the same period the Hercules spent the equivalent of 108 days at sea. During the first twelve months of the War, however, the large fleet units were exceptionally active, for the remainder of the War days at sea rarely exceeded five per month (see Fig 5:1). Hercules' annual consumption for 1916 decreased to 16,906, dropped further in 1917 to 14,480 and increased in 1918 to 16,491 tons. Using Hercules as representative of the fifty-four large coal-burning units of the Grand Fleet in 1915, the Fleet burnt just over one million tons. There were less coal burners in succeeding years and, judging by Hercules, less activity. The known average monthly consumption between September 1916 and February 1917 was 102,060 tons, of which Hercules consumed 1.34%. If Hercules' total wartime consumption represented a similar proportion to the Grand Fleet's it consumed just over 5,000,000 tons during the war. Whether calculated from the top down or the bottom up, it is reasonable to conclude that the Grand Fleet burnt somewhere between 5,500,000 and 7,500,000 tons of coal during the war.

In numerical terms, the Grand Fleet represented a minority of the Navy. Vessels of the Channel Fleet, Harwich Force, patrol flotillas, armed merchant cruisers, colliers, oilers and the many hundreds of trawlers and auxiliaries of all kinds were not only more numerous, but in aggregate consumed more coal than the Grand Fleet. Of the 67,923 occasions during the War when Admiralty vessels used the Humber ports of Immingham and Grimsby, just over one in ten (7,799) was by a purpose built man-o-war. Regretfully, other than the paper prepared for the Cabinet in 1917, information regarding coal consumption of these vessels is even sparser. Nevertheless, for the six months referred to in the paper the average monthly non-Grand Fleet consumption was 243,230 tons of Welsh and 58,030 tons of other coals supplied through forty-four different British ports. To base any calculation on coal consumption by naval units and auxiliaries on these figures would be an extrapolation too far, but it is noteworthy

45Admiral Sir Charles Madden to the Naval Programme Committee, 2/2/1928. CHAR 22/174. For reasons that become apparent in chapter 9, these two vessels were most likely chosen by because they spent the most time at sea of the whole Grand Fleet

46Although imprecise it is a far more accurate figure than Sumida's back of an envelope calculation suggesting the Grand Fleet consumed 14 million tons. Sumida, Naval Logistic, p. 477-478.

47Report on the administration of Immingham and Grimsby 1914-18, 17/7/1919. RAIL 226/191. Naval traffic accounted for two thirds of the total movement through the port during the war. At these two ports 2,113,544 tons of coal was loaded on the Admiralty's account, into 13,392 vessels.

48Appendix 10.
that combined they consumed one and a half times more coal than the Grand Fleet in the same period. Furthermore, the ratio between Welsh and other coals - just over four to one - is similar to the ratio of coal cargoes lost in the colliers sunk while on Admiralty service.⁴⁹

However, if the Grand Fleet’s maximum consumption and, say, twice that amount for the coal used by other naval forces in home waters are deducted from the 42,300,000 tons of coal shipped or railed under ‘Admiralty direction,’ nearly twenty million tons remains to be account for. The surviving monthly coal requirements statement produced in December 1915 (table 5:2) goes along way to providing an answer, as this shows where Admiralty coal was intended. It is an average requirement predicated on 1915, a year of heavy use at home and dominated overseas by the Dardanelles campaign. These factors make the monthly total of 1,024,000 tons on the high side for the War as a whole and in excess of known usage for 1916. With this in mind, the difference between this figure and the average 829,411 tons actually shipped each month by the Admiralty throughout the entire War is not disproportionate. It should also be borne in mind that this is a statement of requirements and not actual quantities delivered.

⁴⁹Appendix 12. In only 182 out of the 253 total collier sinking is the origin of the coal given (29 were empty).
### Table 5: Monthly Coal Requirement for December 1915

<table>
<thead>
<tr>
<th>Naval Requirements</th>
<th>Welsh Home</th>
<th>Welsh Overseas</th>
<th>North Country Home</th>
<th>North Country Overseas</th>
<th>Scottish Home</th>
<th>Scottish Overseas</th>
<th>Total Home</th>
<th>Total Overseas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fleet</td>
<td>280,000</td>
<td>315,000</td>
<td>24,000</td>
<td></td>
<td>8,500</td>
<td></td>
<td>322,000</td>
<td>315,000</td>
</tr>
<tr>
<td>Dockyard</td>
<td>3,500</td>
<td>1,000</td>
<td>14,000</td>
<td>500</td>
<td>5,000</td>
<td></td>
<td>22,500</td>
<td>1,500</td>
</tr>
<tr>
<td>Transports</td>
<td>121,000</td>
<td>31,500</td>
<td>31,500</td>
<td>116,000</td>
<td>10,500</td>
<td>15,000</td>
<td>163,000</td>
<td>162,500</td>
</tr>
<tr>
<td>War Office</td>
<td>-</td>
<td>5,000</td>
<td>-</td>
<td>16,000</td>
<td>-</td>
<td>16,000</td>
<td>-</td>
<td>37,000</td>
</tr>
<tr>
<td>Total</td>
<td>404,500</td>
<td>352,500</td>
<td>79,500</td>
<td>132,000</td>
<td>24,000</td>
<td>31,000</td>
<td>508,000</td>
<td>516,000</td>
</tr>
<tr>
<td>Estimated total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1,024,000</td>
</tr>
</tbody>
</table>

*The Admiralty is not concerned with War Office requirements at home, except in respect to canal requirements, at certain homeports where supplies are met from naval stores.

Naval coal reserves were not based on anticipated consumption but on the time required to supply enough coal to sustain the fleet at its maximum level of activity. Consequently, the level at the different bases varied depending on their circumstances. At Scapa Flow, there was at least one collier for every major fleet unit and the colliers' average size was 3,200 tons. A normal battleship sortie lasted less than three days, and one day's steaming by the battleships alone consumed 6,000 tons of coal, therefore on return to the Flow they replenished with about 20,000 tons of coal. The capacity to repeat this every five days, at least for short periods, would therefore be the basis of the reserve, although, as we have seen, in reality the number of days at sea was considerably less. In early 1915, there were twenty-four coal-burning battleships at Scapa and an authorised reserve of 80,000 tons in thirty-five colliers. This gives up to ten colliers in transit to or from Cardiff, a fourteen-day trip, with a capacity of just under one million tons a year. The actual reserve fluctuated with the level of fleet

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50 Statement for information of the Foreign Office, on average basis. December 1915. ADM1/9208
51 Dunlop.
52 Dunlop. Not all colliers went to Cardiff, a small proportion collected their coal from Grangemouth, which would account for the small discrepancy in the total used at Scapa and collier capacity if all coal was moved from Cardiff by sea.
activity, however when at the authorised level there were twenty-four colliers, each with enough coal for four to five average coalings. In essence, each collier had the coal for just under thirteen days steaming for each battleship based on 250 tons consumption per day, almost the same time it took a collier to replenish at Cardiff. The authorised reserve was a maximum based on the capacity of the colliers required to coal the Fleet simultaneously, though not all the colliers were at full at any one time. The presence of the emergency reserve at Rosyth reduced the colliers' turnaround time, so in a period of high activity more colliers would be nearer their capacity at any one time. In the period of highest consumption, April 1915, reserves fell to a low of 51,500 tons, however within eleven days stocks were above the authorised level.\(^5\) If, after coaling, a collier had insufficient coal for another complete coaling, its load was transferred to the only Admiralty-owned collier - the 6,000-ton capacity *Mercedes* - which remained at the base throughout the war.\(^4\)

At Rosyth, it was unnecessary to maintain more colliers than major units as colliers replenished from the Grangemouth coaling terminal. Without the need to rotate colliers to South Wales each warship could be allocated its own collier. Familiarity between supplier and host may account for the *Lion's* coaling speed on 2\(^{nd}\) June 1916, also at Rosyth some colliers carried a proportion of their coal ready bagged. The largest replenishment at Rosyth was 20\(^{th}\) April 1915, when 20,673 tons were issued.\(^3\)

Overseas, the greater the distance from South Wales, the larger the reserve and number of colliers required. In April 1916, only 10\% of the colliers allocated to homeports were in transit, compared with over a third of those allocated to the Mediterranean Fleet. Similarly for the East Indies, albeit on a smaller scale, more colliers were in transit than on station.\(^6\)

The importance of coal, of all kinds, to the British and allied War effort was crucial; any interruption in production or supply would have had very serious consequences. The priority for British coal was:

\(^3\)Highest day was 21/4/1915 when 29,382 tons were issued at Scapa. ADM 1/9208. When the Fleet coaled after the Battle of Jutland, 2/6/1916, 24 major units took on a total of 20,810 tons an average of 867 tons per vessel. Dunlop.

\(^4\)Dunlop.

\(^5\)ADM 1/9208

\(^6\)Appendix 11.
A major threat to the coal supplies was the unsatisfactory state of industrial relations in the coalfields. From the start of the War the Admiralty pressed for greater output from all the Admiralty pits, even if this necessitated Sunday working. However, production fell as army recruitment drained the work force of 250,000 (13.5%) of its fittest miners in the first year of hostilities. Organisational adjustments blunted the full effects, nevertheless across the coalfields production dropped by 11% and shortages were reflected in increased prices. In early 1915, discontented South Wales' miners rejected a 10% war bonus and on 1st April gave three month's notice to terminate the existing 1910 wage agreement. Fresh terms were turned down and the Welsh pits became idle on 15th July. The miners returned to work six days later following a visit by a Cabinet delegation led by Lloyd George, the newly appointed Minister of Munitions.

L. G. [Lloyd George] has been in Wales settling the Coal Strike in which I am glad to see he has been successful — not that

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57 Coal in War, POWE 16/176. p. 24.
58 Supple, British Coal, p 46. Many pits not on the list went on to a three-day week.
59 Ibid. p. 48.
60 The strike dates refer to the period when the whole coalfield ceased production. However, in the period between end of the notice expiration and the strike proper, industrial action occurred in some pits on the Admiralty list. On 2nd July of the thirty-seven pits that supplied Admiralty coal, four were idle and four were partially idle. With a bit of juggling of shipments any shortfall was overcome by the ACA. Correspondence between ACA and the Directors of Stores, Contracts and Transport, 1-2/7/1915. MT 23/382.
success was very difficult, seeing that the men have got most of what they asked for. 62

The Government’s desire for a speedy return to work and its acquiescence to the miners’ demands was no doubt strongly motivated by the high naval consumption that spring; consumption had exceeded supply and reduced the reserves to two thirds of their authorised level in less than a fortnight. 63 Despite the return to work, industrial relations in the valleys remained unstable. The President of the Board of Trade, Walter Runciman, wrote in September 1915: ‘South Wales being South Wales, it is impossible to say what other causes of unrest may not arise at any moment.’ 64 Crisis point was reached again in November 1916 when, following a price increase, the miners accused the mine-owners of profiteering. 65 Supported by the Admiralty, the Board of Trade proposed a draft regulation to the Cabinet:

The recurrent disputes and unrest in the coalfields which practically every three months threaten an interruption in essential supplies of coal for the Navy, for munitions, and for other national industry, can in the judgement of the Board of Trade be put an end to in no other way by assuming control over the coal field in the national interest. 66

Next day, under the Defence of the Realm Act, the Government took control of the South Wales coalfields. The precedent set, other coalfields soon came under the Government’s wing in March 1917. As this was provoked by labour unrest rather than any ‘direct problem of supply’ they were a unique case of state intervention during the war. 67 To manage the coalfields, the President of the Board of Trade appointed an Interdepartmental Committee with a representative each from the Board of Trade, the


63Variations in reserves at fleet bases 15th April - 6th May 1915. ADM 1/9208.

64Runciman papers, in Supple, *British Coal*, p. 73.


67Supple, *British Coal*, p. 76.
Home Office and the Admiralty (assistant D-of-C).supplementary_text

The Admiralty's direct leverage was soon lost however, when in less than a month the Interdepartmental Committee was replaced by a single Coal Controller at the Board of Trade. Occasional relations between Admiralty and Coal Controller became tense, but no more than with other departments of Government. Welsh coal production did sag during the war, although never enough to pose a substantial threat to naval supplies.

In 1917, the increase in collier sinkings by submarines posed a grave threat to coal supplies. Those at the bottom of the pecking order for coal felt the shortages worst of all. Although the Navy had priority, it suffered indirectly as the losses induced a closer examination of alternative forms of transport, and pressure increased on it to release more colliers. The relocation of the main body of the Grand Fleet from Scapa to Rosyth, in April 1918, reduced the number of colliers it required but intensified the strain on the railways. The largest movement of coal by rail was in early 1918 when, in preparation for the Fleet's move, over a 109 trains a week or 44,100 tons was moved. The scale of the conflict meant the Navy's wartime coal consumption vastly exceeded its pre-War predictions and placed unforeseen stresses on its logistical infrastructure, the Navy was not though hampered in its operations for lack of coal. On occasion, the level of the reserves became disconcerting but never desperately critical.

Pre-War plans to supply coal to vessels operating from the east coast gave an increased role to the railways. It also changed the main role of the collier fleet from transporting coal from South Wales to coaling warships directly. In its aim of coaling the Grand Fleet rapidly, the policy was outstandingly effective. With coaling times averaging over 200 tons per hour the Grand Fleet was replenished ready for sea again in a few hours. However, idle colliers waiting to coal immediately the Fleet returned to base was not an effective use of vessels designed to transport fuel. The need to supply

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68 Redmayne, Coal Mining, p. 63.
69 Supple, British Coal, p. 80.
70 Correspondence between FL Geddes and Albert Stanley at the Board of Trade, regarding deficiency in supplies, August and September 1918. Geddes mss. ADM 116/1809.
71 Supple, British Coal, p. 43.
72 Appendix 12.
73 Marder, Dreadnought vol. 5, p. 130.
74 Pratt, British Railways, p. 491.
coal to French and Italian industry had not been anticipated before the War. It placed a strain on the collier fleet and consequently pressure on the Navy to employ a minimum of colliers. Losses to submarine attack exacerbated the problem, while on the other hand more efficient use of the French rail system helped to alleviate the situation, but greater use of railways could not alleviate it altogether. Also, when the Ministry of Shipping came into being it produced an alternative assessment of the number of colliers the Navy required, and, as the Ministry had its own agenda, it inevitably came up with a lower figure. A major threat to the Navy’s coal supplies was industrial action, which had to be warded off with increased wages and ultimately Government control of the mines. However, as with many other industries, labour shortages were to bedevil mining for the duration of the war. The Navy, as planned, depended on the commercial infrastructure for its coal supplies. At the head of the queue, it was never in any danger of running out, but its pre-War plans took no account of the coal requirements of other sectors of the economy. Only the huge capacity of the commercial collier fleet prevented the knock on effects of the unexpected burdens of War being disastrous to those at the end of the queue.
Chapter Six

Oil During the First World War

Before 1914, the two main sources of power in Britain were horses and coal; use of oil fuel was almost totally confined to the Navy. From 1914, most of the major warships joining the fleet were oil-burners and naval consumption had almost quadrupled by the end of the War; during which a total of 9,100,000 tons of oil were issued to the Navy. This chapter looks at the Navy’s oil supplies during the First World War, and examines how pre-War predictions compared with actual wartime consumption and the difficulties experienced in ensuring the Navy’s oil supplies. The War stimulated the development and use of the internal combustion engine and consequently increased the overall demand for liquid fuels. By the Armistice, the Army had 60,000 mechanical vehicles and the RAF 22,000 aircraft. Demand for petroleum products on the home front for the manufacture of explosives and agricultural machinery also increased dramatically. By 1918, the Navy was one of many consumers of petroleum products, albeit still the largest and most important one.

At the outbreak of War, the Navy’s oil stocks were at their authorised level of six months wartime consumption, and contracts were in place to provide the foundation for the next twenty years’ peacetime requirements. It was anticipated RDS and Mexican Eagle would underpin peacetime supplies for the next two years, thereafter, once Persian production was in its stride in 1917, it would be based on the APOC contract. The War clause in APOC’s contract was similar to that in the standard coal contract. Unlike coal though, for which the reserves and infrastructure existed, oil required refining before use and APOC had only a very rudimentary infrastructure. Churchill did not regard acquiring oil in wartime would be a major problem. He wrote: ‘If we cannot bring oil, how can we bring corn,’ furthermore, ‘in time of War money

1Naval Effort.

2Jones, British Oil Policy, p. 177.


4Appendix 8.

5Minute, D-of-C, 21/2/1914. ADM116/1687C.
would be no object.' The reserve was, therefore, to allow a breathing space for the Navy to adjust to wartime conditions.\(^6\)

In order to recommend a reserve based on wartime consumption, Pakenham and NWS had to predict wartime requirements (Fisher had evaded the question by basing his recommendation on peacetime consumption). Jackson postulated 13,784,000 tons, while Pakenham came closest with 11,146,000 tons. Neither took into account increased warship construction or bunkers for tankers, and both were wide of the mark in regard to tankers requirements.\(^7\) Pakenham ignored vessels needed for fleet attendance and calculated only transport requirements based on wartime sources as 100,000 tons per annum each from Scotland and Rangoon, 150,000 from Persia (after 1913-14), the balance made up by 80% Gulf of Mexico, 10% Black Sea and 10% Borneo. Jackson based his tanker requirements on what the D-of-C thought was likely to be available in wartime, which fell far short of the predicted requirements as he excluded Texas as a possible source of supply.\(^8\)

Table 6:1

<table>
<thead>
<tr>
<th>Year</th>
<th>Pakenham Voyages</th>
<th>Pakenham Tankers</th>
<th>Jackson Voyages</th>
<th>Jackson Tankers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1913-14</td>
<td>244</td>
<td>46</td>
<td>31</td>
<td>1916-17</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>570</td>
</tr>
<tr>
<td>1914-15</td>
<td>354</td>
<td>65</td>
<td>37</td>
<td>1917-18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>680</td>
</tr>
<tr>
<td>1915-16</td>
<td>463</td>
<td>83</td>
<td>47</td>
<td>1918-19</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>791</td>
</tr>
</tbody>
</table>

What was clear, however, was that the Admiralty's existing tankers were woefully inadequate and the Navy depended on commercial vessels, for both delivery and fleet attendance.\(^9\) Churchill had promised the Commons thirteen oil transports ready 'before

\(^6\)Memo., 'Oil fuel Supply for His Majesty's Navy,' June 1913. CAB37/115/3 9.

\(^7\)Pakenham. The 11,146,000 tons total is based for the part years of 1914 and 1918 on monthly averages for those years. NWS figures, using January figure for each year as an average for the six-month period either side arrives at the total of 13,784,000. ADMI 16/1219.

\(^8\)Short of what was required as regards oil, but not as regards what Churchill wanted for his case to the Cabinet for the purchase of APOC shares.

\(^9\)ADM265/29; ADM 116/1219.

\(^10\)Of the forty-four tankers lost on 'Admiralty Service' only three were RFA vessels. Appendix 12.
the end of 1914. However, by January 1915 the Navy had received only three small attendant vessels. To cope with demand an expansion of the Navy’s tanker fleet was put in hand once War was declared. Two principal types were required - fleet attendant vessels and cargo tankers - although the Admiralty called both ‘oilers.’ As with colliers, the small 1,000 to 4,000 tons attendant vessels drew alongside a warship at anchor to refuel it. Because they could complete their task more rapidly than colliers could, they were not required in the same numbers. Nevertheless, in November 1915 the Grand Fleet included sixty-six oil-burning and sixty-six dual-fired warships. Ideally, to refuel them required twenty-eight oilers permanently on station. This was not always possible, and destroyers at Invergordon refuelled from shore facilities while some colliers carried oil in their double bottoms.

In 1914, there was no immediate consternation over supplies. The world’s supply of tankers had caught up with demand and freight rates were low. On the North Atlantic, rates had fallen from seventeen shillings and six pence a ton in January to fourteen shillings in July. In August 1914, including the Admiralty’s vessels, there were 190 British flagged tankers, with a gross tonnage of 818,000. Initially a few small oilers were requisitioned as Non-Commissioned Mercantile Fleet Auxiliaries (MFA) and the eight tankers already on single voyage or short-term Admiralty charter had their engagements extended. Resistance by their owners, who had already found their boats other employment, was overcome by requisitioning, though this was regarded as heavy-handed and only adopted as a last resort. Charter was the preferred

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12Appendix 5.
13Sigwart, RFA, p. 76.
14Dittmar, Warships, p. 296. Because they are distinctly different types of vessels in size and purpose this work will use ‘oiler’ to refer to the small harbour craft that attended on vessels, and ‘tanker’ when referring to the large bulk carriers.
15Minute, Director of Mobilisation Division, 19/11/1915. MT23/456/T56351.
16Minute, D-of-S, 3/12/1915. MT23/461/T57478.
17Lane and MacAndrew, shipping brokers, to D-of-T, 8/1/1917. MT23/737/T22827.
18Memo., OB23, CAB50/3.
19Minutes and correspondence August 1914. MT23/304/T6349-T6355; Cohen to D-of-C, 12/8/1914. SHELL GHS/3A/1.
method of employing tankers when they were available.\textsuperscript{20} Indeed, owners whose trade had been disrupted by the War offered their boats to the Admiralty for charter.\textsuperscript{21} Demand soon caught up with the available tonnage. Rates on the North Atlantic reached fifty shillings per ton in June 1915, and it became increasingly difficult to find tankers to charter.\textsuperscript{22} To avoid requisition some owners re-flagged their vessels in neutral countries.\textsuperscript{23} Their precaution was justified as the D-of-C noted ‘the growing needs of the Navy will make it necessary to requisition a large number of additional steamers.’ By spring 1915, the D-of-T had already requisitioned ninety-one tankers, and the Board was given the power to prevent re-flagging.\textsuperscript{24} With nearly half the British flagged tanker tonnage requisitioned by June and demand still raising, the Board took over or ‘converted on the stocks’ to tankers eleven vessels for naval use.\textsuperscript{25} Churchill’s fleet of dummies - facsimiles of battleships and battlecruisers created from elderly liners - were also converted into oilers for fleet attendance.\textsuperscript{26}

Shortages continued and were reflected in the North Atlantic rates, 100 shillings per ton in December 1915 and in January 1917 145 shillings - a ten-fold increase since the start of the War.\textsuperscript{27} In response, the Admiralty initiated a number of solutions. First, create more tanker capacity; allowing for losses, by mid 1916 330,000 tons capacity had been added, a 16% increase on June 1914, with the prospect of another 700,000 during 1917;\textsuperscript{28} insufficient, however, to cope with rising consumption. Reducing losses was useful, but, given the low losses up to 1917, not significant. Indeed losses of tankers on Admiralty service were less in 1916 (6)\textsuperscript{29} than in 1915 (8) and demand for oil increased

\textsuperscript{20}Minute, D-of-S, 21/8/1914. MT23/307/T 7031.

\textsuperscript{21}Lane and MacAndrew to D-of-T, 14/8/1914. MT23/305/T6505.

\textsuperscript{22}Lane and MacAndrew to D-of-T, 8/1/1917. MT23/737/T22827.

\textsuperscript{23}Minute, D-of-S, March 1915. MT23/358/T4709.

\textsuperscript{24}Correspondence between Secretary of the Admiralty, D-of-T and Foreign Office, June and July 1915. MT23/380/T17169.

\textsuperscript{25}Dittmar, Warships, pp. 297-8; Sigwart, RFA, pp. 92-95.

\textsuperscript{26}Churchill, World Crisis, p. 714.

\textsuperscript{27}Lane and MacAndrew to D-of-T, 8/1/1917. MT23/737/T22827.

\textsuperscript{28}Ibid.

\textsuperscript{29}Only four of these were lost to enemy action, two accidentally. MT25/67.
to such an extent there would have still been a shortage if there had been no enemy predation of the tanker fleet. Because commercial consumption was small, any relief on tonnage by squeezing it was limited. Increasing domestic petroleum production had limited potential, and will be examined in the next chapter. More efficient use of existing tonnage offered the best immediate solution.

The pattern of tanker ownership differed from that of colliers. Tankers were owned and operated by a handful of companies. The oil companies Standard and RDS dominated the world's tanker market. Both operated vessels under more than one flag; though in 1914 over half the world's tankers flew the red ensign. They both also operated their fleets through wholly owned subsidiaries. Standard Oil's (New York) British flagged tankers were operated by the Anglo-American Oil Company - its British marketing arm, and the Anglo-Saxon Petroleum Company operated RDS's tankers. The other significant players were Mexican Eagle that operated a fleet in conjunction with Bowrings, and Bowrings that also operated some tankers independently. To fulfil Greenway's goal of a vertically integrated company APOC formed the British Tanker Company (BTC) in April 1915 and placed orders for seven vessels in British yards, these entered service in 1917. When APOC acquired British Petroleum (BP) in 1917, it added a further seven tankers to its fleet.

Between July and December 1914, 811,000 tons of petroleum products were imported into Britain, requiring a small fraction of the world's tankers. Considerable

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30Britain imported well under two million tons of petroleum products in 1913. By 1917 imports were well over four million tons, and rose to six and a half million by June 1918. Oil Control During the Great War, Oil Board (OB) memo., 23, August 1927. CAB50/3.

31Minute, D-of-T, 14/9/1915. MT23/437/T52473. For example, in 1915 Anglo-Saxon operated 44 tankers of which 26 were British and 18 Dutch registered. Standard Oil had 38 German flagged ships, as well as many more registered in Britain and USA.

32Keir, Bowring, pp. 233-4; Young, Mexico, p. 125. Although Mexican Eagle had absorbed Bowring's English fuel oil and kerosene business by 1919, Bowring continued to operate some tankers independently. Burmah Oil also owned a few boats.

33Ferrrier, BP, p. 292-293; Greenway to Secretary of the Navy, 20/4/1916. BP70326.

34Ferrrier, BP, p. 295. British Petroleum was British marketing arm of the Europaische Petroleum Union of Bremen, which, after Standard Oil's Anglo-American company, had the largest distribution network in Britain. Because of its German ownership the Government took it over and sold it to APOC. Ibid. p. 218.

35Anglo-Saxon Petroleum Co. to Assistant D-of-T, 27/5/1915. MT23/394. 490,000 tons by Anglo-American, 145,000 tons by British Petroleum, 67,000 tons by Mexican Eagle/Bowring and 109,000 tons by Asiatic.

36MT23/737/T 22827.
parts of both Standard and RDS’s trade, even in British flagged tankers, never touched British or European shores, and their commercial rivalry continued across the globe throughout the War. Each was determined to hold onto its markets. An eye to the post-War position was not confined to the oil companies. The Board of Trade also took into account the post-War trading position in its dealings with companies and countries, and procurement policies were implemented with a view to minimising the detrimental effects of the War on Britain’s share of world trade. The Government, though, had no wish to help one British company at the expense of another when it intervened through price controls, pooling arrangements or direct control. Companies coerced into pooling arrangements were guaranteed payments and assets returned in relation to the pre-War or pre-pooling situation. Legislation was introduced to control inflation and profiteering; in the case of the Petroleum Pool Board, prices were prohibited from exceeding the average for 1914-16.37 Price control was also a feature of tanker requisition. Reimbursement to owners - the ‘blue book rate’ - was generous in 1914.38 However, by early 1915 increases in commercial rates meant payment of the blue book rate was less than normal charter. Owners faced the frustration of seeing their requisitioned vessels’ former trade being taken by a competitor, or if a vessel had been employed under contract on a fixed service the owner was obliged to hire a replacement at the higher market rate.39

The Admiralty requisitioned so many tankers for its own use that inadequate tonnage remained to import petrol. The national stock, that had stood at thirty-six million gallons in January 1916, tumbled to twelve and a half million by the end of July. Remedial action came in the form of petrol rationing, introduced by the Petrol Control Committee appointed by the Board of Trade. Stocks improved until they stood at thirty-seven and a half million gallons in December. However, the committee ran foul of a Ministry of Munitions’ committee formed to examine all petroleum products as it was reluctant to pass on information ‘which might result in the Admiralty taking back any tankers which have been furnished for the conveyance of petrol.’ To provide coordination an inter-departmental committee was created in February 1917 under the

38Fayle, Seaborne Trade, vol. 2, p. 44.
chairmanship of Pretyman, Civil Lord of the Admiralty. He failed, however, to end the acrimony.\textsuperscript{40}

To reduce tanker journey times, and consequently the numbers of tankers required, oil was moved north to Canadian ports by both train and pipeline in North America.\textsuperscript{41} Before the war, as with coal, rail transportation was seen as one way of moving oil in Britain.\textsuperscript{42} It allowed tankers to discharge at west coast ports, reducing journey times and eliminating the need to enter the increasingly dangerous North Sea. In addition, destroyers and smaller vessels could readily be refuelled directly from railway wagons at the quayside, permitting small ports to support flotilla craft. To overcome the railway companies lack of tank wagons the Admiralty started a building programme its own and had about four hundred tank wagons by the end of the War.\textsuperscript{43} Use of pipelines in Britain was not overlooked and four major schemes were considered by the Admiralty. Most ambitious was one from Manchester to Killingholm the largest wartime oil depot, however only one, from Clyde to Grangemouth, received the go ahead. Formerly oil had been moved in scows along the Clyde-Forth canal, but this proved incapable of keeping pace with the increasing demand at Rosyth, and if the main body of the Grand Fleet were to move there, more oil would be needed.\textsuperscript{44} Designed to move 15,000 tons of oil per week, it would have catered for all the Grand Fleet's oil needs at Rosyth; however, problems with the pumping equipment delayed completion until 10\textsuperscript{th} November 1918.\textsuperscript{45}

Although the Admiralty had access to APOC’s total production in wartime, APOC supplied only 1,231,000 tons of oil fuel during the War. Slightly over one eighth of total naval consumption, and only two thirds of the total production of the Abadan refinery; less than a fifth more than what the Admiralty was obliged to take in peacetime. Even if the Admiralty had taken all the oil fuel the company produced, it

\textsuperscript{40}Jones, ‘Oil Companies,’ pp. 655-6.

\textsuperscript{41}Black, War Problems, p. 13.

\textsuperscript{42}Pratt, British Railways, vol. 1, p. 499.

\textsuperscript{43}Ibid.

\textsuperscript{44}A distance, as the crow flies, of over 75 miles.

\textsuperscript{45}History of the Scottish Pipeline, USN Naval Historical Section, Office of Naval Intelligence, December 1920. NARA, RG.45 ZY Box 1006; Descriptive Illustrated Account of the Admiralty Oil Fuel Pipe Line Connecting the Firths of Clyde and Forth. (HMSO: London, 1919); Petroleum Times 19/7/1919.
would still have only amounted to one fifth of naval requirements. Why APOC failed to provide a greater proportion of naval fuel oil was due to a number of factors. Production at Abadan expanded five-fold during the War, no mean achievement in face of wartime conditions - shortages of skilled labour, late delivery of equipment, shipping shortages and enemy action all on top of the difficulties inherent in the region. Turkey's declaration of War on the 5th November 1914 put Abadan under threat, although the timely arrival of a small expeditionary force and a couple of gunboats quickly secured it. However, incited by German agents, in February 1915 the Bawi Arabs cut the pipeline connecting the wells to Abadan. It took until June to repair and the lost production was substantial, and accounts for the company's ability to barely exceed the minimum contracted peacetime delivery for 1915.

Abadan also had a serious problem with viscosity. In November 1914, referring to the eight cargoes so far received the D-of-C wrote APOC:

You will note that practically in every case the oil has failed to comply with the specification as regards viscosity and that in some instances this defect is accompanied by a flash point below the minimum allowed in the contract... The Admiralty will be extremely reluctant to cancel fixtures of tank-vessels to lift cargoes under your contract, but you must see that it is quite impossible to take delivery of oil which may cause serious difficulty in use during cold weather.

Rather than suspend shipments the Admiralty exercised its right under the contract for a price abatement. Greenway protested, suggesting if the Admiralty wanted better quality it should pay for a new refinery in Britain using a different process, but if the it suspended collections from Abadan he would 'be compelled to shut down the

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46Ferris, BP, p. 289; Appendix 13.
48In 1916, the Company asked the Admiralty to bring pressure to bear on the suppliers of refinery equipment, as they were 'very dilatory in executing our orders.' Garrow (Director APOC 1914-24) to D-of-C, 30/5/1916. BP78503. Also one set of boilers and stills were sunk by submarine en route to Abadan. BP85998.
49Longhurst, Adventure, pp. 35-36.
50 Appendix 13.
51D-of-C to APOC, 5/11/1914. BP71341. This problem was apparent in December 1913, before the contract was signed.
refinery. Persian oil was satisfactory for use in the warmer Mediterranean and Eastern waters, and the pipeline’s severing relieved the Admiralty of deciding whether to suspended collections. By the time it was repaired restricting use of Persian oil to warmer climates made sense in light of the tanker shortage and deliveries continued even though it never fully complied with the Admiralty specification until after the War. The D-of-C wrote APOC that from July 1915:

In view of the very heavy calls on available tanker tonnage it is essential that the Admiralty should freight its oil as far as possible from the nearest source of supply. In these circumstances it is desired not to exceed the quantities provided for in the contract and draw not more than 8/10,000 tons monthly from Persia.

A tanker could complete only four round trips a year to Abadan compared to six to the Gulf of Mexico. Towards the end of 1916 Persian production exceeded the Navy’s consumption in the Mediterranean. Tanker shortages had become even more acute and passage through the Mediterranean had become especially hazardous. Moving Persian oil to Britain was risky, expensive in tankers and on arrival it required blending prior to issue. The solution came from RDS, which, due to tanker requisitioning, was unable to supply its Egyptian customers. In September 1916 Anglo-Saxon’s Managing Director, Robert Waley Cohen proposed that RDS sell surplus Persian oil in Egypt and in exchange would supply the Admiralty with North American oil pro rata. The Admiralty agreed and widened the scheme to include RDS delivering Borneo oil to Colombo. When the scheme ended, in May 1919, the Admiralty had shipped 118,290

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52 Greenway to D-of-C, 12/11/1914. BP71341.
53 Assistant D-of-C, to Redwood, 30/4/1918. BP71571. ‘I am sorry to say the quality of the oil is not very good, the viscosity being unsatisfactory in many cases and the flash point almost invariable low.’
54 D-of-C to APOC, 3/7/1915. BP78503.
55 ADM265/29.
tons of oil fuel to RDS in Egypt, and in return, RDS had shipped 54,214 tons to the Navy at Colombo and 59,961 tons of American oil to Britain.60

It was the practice of oil companies to refine petroleum as near to its source as was practical as transportation costs were a significant component of the final price. The nature of the petroleum, not the market, dictated the ratio of refined products produced and over seven per cent of the petroleum was used up during refining. Unless there was a market for all the products, moving petroleum of which only a portion would be sold did not make economic sense. This changed when a new refining process - cracking - allowed petroleum to be refined in line with market requirements with no wastage. Now, it made economic sense to place the refinery near the markets instead of the source. Although cracking technology was in its infancy in 1915 Greenway was aware of its potential.61 Eager to extract advantage from adversity he realised if APOC had an operational cracking plant in Britain at the end of the War his ambition of challenging Standard and RDS would be significantly advanced.62

Greenway's proposal that APOC could only meet the oil specification with a new refinery was not greeted with alacrity in the Admiralty. Under the chairmanship of Slade its standing Fuel Co-ordinating Committee examined the issue. The committee recognised the advantage of erecting a refinery in Britain, as it would allow any petroleum to be refined into naval fuel.63 At the inaugural meeting of its successor body, also chaired by Slade, the Standing Committee on Liquid Fuel in July 1915, Slade said:

One of the main objects of the Committee will be to co-ordinate Admiralty policy and to assist the Admiralty representative [Slade] on the Board of Directors of the company [APOC] to bring its policy of development &c into line with Admiralty requirements.64

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6090,000 tons of which was during the War. SHELLGHC/UK/A1/8/1.

61Yergin, Prize, pp. 112-3. He credits the development of 'thermal cracking' to William Burton, the head of manufacturing at Standard of Indiana, in 1913. Greenway was aware of the process at least by November 1914. Greenway to D-of-C, 12/11/1914. BP71341.

62Greenway to Cargill, 22/6/1916. BP85998. Greenway hoped that wartime conditions would provide a favourable climate for speedy clearances of rights of way and priority for labour thereby saving 2-3 years on the project.

63First Interim Report of the Standing Committee on Liquid Fuel (SCOLF) 20/2/1915. ADM265/37.

64SCOLF, 20/7/1915. ADM265/37. Although this Committee was called the Standing Committee on Liquid Fuel it was meant to continue the work of the Fuel Co-ordination Committee.
The committee was informed that APOC had agreed to build a refinery at Swansea to supply ‘improved fuel oil,’ provided the Admiralty agreed to take 250,000 tons of oil per annum in Britain rather than Abadan. Support for the project was not universal; RDS was, of course, against it. Not even all APOC’s board were in favour. The Treasury too were less than thrilled, and took pains to point out to the Ministry of Munitions ‘the heavy requirements of labour and material’ it would entail. Originally expected to take two years to build, design changes to allow for toluene extraction for the manufacture of explosives delayed the project. By June 1916, no progress had taken place due to labour shortages and rights’ of way problems. Greenway asked the Admiralty to grant the project ‘War emergency work’ status under the “Defence of the Realm Act.” Admiralty approval was given and the project granted a priority certificate in January 1917. Progress continued to be sluggish and the Admiralty began to have second thoughts. Greenway promised the Navy 800,000 tons of oil fuel a year from Swansea. However, Swansea needed petroleum, and shipping shortages were to inhibit the movement of Persian petroleum beyond the Mediterranean for the remainder of the War. With no petroleum in sight, the project risked having its priority certificate revoked by the Ministry of Munitions. Still Greenway would not let go, shifting his ground to argue that the refinery would be essential to process home produced petroleum. If the search for oil in Britain had proved successful, there would undoubtedly have been a shortage of refining capacity. Nevertheless, following the

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65Cohen to Inchcape, 6/3/1917. BP85998.


68Cargill to Greenway, 14/6/1916. BP85998.

69Permanent Secretary of the Admiralty to APOC, 7/6/1916. BP85998.

70Draft letter to be sent to Admiralty by Greenway, 14/6/1916, BP85998. It is not clear if it was sent. However, as the refinery was given War emergency status the Admiralty were no doubt aware of the views expressed in the draft.

71History Ministry of the Munitions, vol. 7, Pt. 3, p. 146.

72Ministry of Munitions to APOC, 4/7/1917. BP85998.

73Kemball-Cook to L. J. Thomas, of the American Delegation, 17/2/1918. MT25/18. Britain’s domestic refining capacity was at that time 650,000 tons of petroleum per annum. 200,000 by London & Thames
creation of the Petroleum Executive (PE), in December 1917 the Swansea refinery had its certificate withdrawn. Ten days after the Armistice APOC asked permission to proceed with the refinery and, with Admiralty backing, the Swansea finally came on stream in 1921.

From the War's outset Marcus Samuel pledged RDS to Britain's cause and placed its tankers at the Admiralty's disposal. Stung by Churchill's pre-War attack on RDS in the Commons, Samuel went further and declared 'that Shell would make no profits out of the hostilities' - a commitment viewed cynically by the press. On a personal level, Marcus Samuel was undoubtedly a patriot and supported Britain's War effort - losing one of his two sons in action. Deterding spent the War in Norfolk, and was knighted afterwards by the Government for his contribution, although his attitude to the conflict was essentially commercial. Deterding, and even less Samuel, involved themselves in the day-to-day running of the tanker fleet; that fell to Cohen the managing director of Anglo-Saxon. When the Admiralty made a request, if it did not impinge greatly on the company's business, Cohen readily agreed. If it adversely affected business, Cohen put his case to the Admiralty, later the Ministry of Shipping, and then usually acquiesced. Though he thought, the Admiralty did not understand his position and was irritated, for example, by the D-of-S saying that his charter prices were high. Cohen pointed out that Anglo-Saxon's fleet existed solely to carry 'the produce of their allied companies to the consuming markets.' Loss of a tanker also meant loss of trade, which different for companies whose sole business was charter. Although a requisition order had to be obeyed, the authorities preferred cooperation and listened to any case a

Haven Co., 150,000 tons by Asiatic Co. Shell Haven and 300,000 tons by the combined Scottish Shale companies.

74Correspondence between Greenway, Walter Long, and the Ministry of Munitions, 9-11th January 1918. BP85998.

75D-of-C to Tothill, 21/11/1918. Ferrier, BP, p. 466

76Henriques, Marcus Samuel, p. 591. Just how stung Samuel was by Churchill allegations is shown by the record of Shell's AGM, The Times, 23/6/1914. Henriques does not record the reaction of the Dutch shareholders to this declaration. In fact Shell paid the same 35% annual dividend to its shareholders 1913-20. Ferris, BP, p. 625.


78Deterding, Oilman, p. 91.

79Memo., Cohen, 15/9/1914. SHELLGHS/3A/1.
company made in its defence, albeit with a degree of scepticism. Cohen complained that he was repeatedly kept in the dark about the reasons for the Admiralty’s action. If made aware of the initial problem his response was more cooperative and constructive and he frequently came up with an alternative that achieved the Admiralty’s intention and minimised the deleterious consequence to Anglo-Saxon.

On the outbreak of War, the Admiralty requested that their oil contracts with RDS be brought forward. In August 1914, the company was committed to supply 24,000 tons of oil fuel f.o.b. Tarakan Borneo at thirty-five shillings per ton before the end of the financial year, and 230,000 tons c.i.f. Britain between 1st April 1915 and 30th June 1916 at seventy shillings per ton. The original contract for the 230,000 was c.i.f., rather than the normal f.o.b. so the company could supply Admiralty specification oil from any source. Or so it thought, when Anglo-Saxon wanted to increase the proportion of American oil in place of Rumanian, the Admiralty informed Cohen that it wanted much less viscous oil than in the original contract, and only Borneo oil would do. Cohen wrote ‘It became thus a question not of fulfilling the contract in any sense whatever, but of meeting a wholly new need on the part of the Admiralty.’ The only new need the Admiralty had for thinner oil was to mix it with the viscous oil supplied by APOC. It appears that Anglo-Saxon was unwittingly being made to pay for APOC’s failure to meet the Admiralty specification. If the Admiralty had been forced to cancel APOC’s contract early in the War it would have signalled the end of any coherent Admiralty fuel policy, and probably the end of Churchill’s political career too. Although the War brought APOC’s failure to a head, it also provided the secrecy necessary for the contract’s survival. Unaware of the reason for a lower viscosity, Anglo-Saxon duly presented the Admiralty with a revised delivery programme for Borneo oil. Cohen, though, was concerned that if the Dutch authorities became aware, at least officially, that the sudden increase in oil shipments from Borneo was for the British Navy it would compromise their neutrality: ‘I think it is of the utmost importance that we should mask in every possible way’ the ‘large supplies we are delivering to the

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81The War made RDS’s sources in Romania and Russia inaccessible to the Western Allies.

82Memo., Cohen 15/9/1914. SHELL-GHS/3A/1
Admiralty. Masters, Cohen recommended, should be instructed to deny acting for the Admiralty and have orders to ship to Singapore only. The Admiralty agreed.\textsuperscript{43}

Shortly before the War, trinitrotoluene (TNT) had replaced Lyddite as the explosive in artillery shells.\textsuperscript{44} Lord Moulton, charged with increasing the supply of high explosives for munitions production, was informed by Samuel that RDS's Rotterdam works had manufactured toluene for explosives from Borneo oil for sale to Germany before the War. In January 1915 the Rotterdam installation was completely dismantled and re-erected at Portishead near Bristol and by early April was working at full capacity twenty-four hours a day.\textsuperscript{45} A contract to refine 5,000 tons of oil per month for toluene was signed, and to relieve RDS from having to find additional shipping the Admiralty agreed to take the same quantity of their contract f.o.b. Borneo.\textsuperscript{46} However, once the contract for 260,000 tons of oil fuel was completed in 1915, the Admiralty declined another large contract because of the deteriorating tanker situation and requested instead that the company supply 'casual cargoes' as 'required from time to time.'\textsuperscript{47} At Cohen's suggestion general cargo steamers returning from the Far East filled their 'double bottoms and deep tanks with liquid fuel,' as these were often empty or filled with water ballast.\textsuperscript{48} Using double bottoms allowed the Admiralty to take 100,000 tons of Borneo oil over the next year, in addition to the toluene contract.\textsuperscript{49} Transportation problems, however, precluded further large contracts for Borneo oil fuel being placed during the War.\textsuperscript{50}

\textsuperscript{43}Correspondence between Cohen and D-of-C, 13/11/1914-20/11/191. SHELL-GHS/3A/1.


\textsuperscript{45}The move of the refinery from Rotterdam has become part of the company's mythology. See Deterding, Oilman, p. 90; Howarth, Oil, p. 102; Henriques, Samuel, pp. 598-602 and Cohen, pp. 202-205; History of Munitions Vol. 7, Pt 4 Chapter 2 p.24-25. The refinery's transfer to Britain was indeed a major contribution to the War effort; it was also a very profitable use of a company asset that would otherwise have remained redundant for the remainder of the War.

\textsuperscript{46}D-of-C to Cohen, 27/1/1915. SHELL-GHS/3A/1.

\textsuperscript{47}D-of-C to Cohen, 17/9/1915. SHELL-GHS/3A/2.


\textsuperscript{49}D-of-C to Cohen, 3/11/1915. SHELL-GHS/3A/2.

\textsuperscript{50}Summary of Anglo-Saxon's Government contracts as of 6/5/1916. SHELL-GHS/UK/A1/1/2.
As already noted, Admiralty oil reserves were at their authorised level of six months' wartime usage at the start of the War. Consumption in 1915 at 1,110,500 tons was below predictions, and with few serious difficulties with supplies the reserves averaged nine and a half months during 1915. This happy situation was in large part due to the United States' view that:

> It is the enemy's duty to prevent articles reaching their destination, not the duty of the nation whose citizens have sold them. If the enemy of the purchasing nations happens for the time to be unable to do this that is for him one of the misfortunes of War.

America would sell any 'article of commerce' including munitions and oil to the belligerents, provided they could collect it. Once it was clear of the 'abundance and cheapness of American fuel oil,' the War clause in the Burmah Oil contract was not enforced and the 'R' class battleships could confidently be completed as oil-burners. In 1916 the home fleets' oil consumption increased to 1,689,000 tons. Although in absolute terms the reserve grew quite steadily until the spring of 1916, and a healthy level, as a proportion of usage, was maintained until the summer, the peak had been reached in December 1915, when the Navy had over a year's wartime consumption of in reserve.

Indications of the crisis to come were, however, first discernable in 1916. Each month the Admiralty reviewed the oil situation for the next twelve months. By expressing the level of the reserves in terms of time, calculated monthly, the headline figure was a function as much of use as of the oil held in store and fluctuated accordingly. A month of heavy or low fleet activity had a disproportionate affect on the level of the reserve. For example, between November and December 1915 in tonnage the reserve increased by just 8¼% but because of limited fleet activity in December in terms of time it increased by over 43%. In 1916 although in tons the reserves fell by

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91MT25/1 in Jones, *Oil Companies*, p. 216.


94Appendix 14.
12.7%, when expressed in time, due to the Navy’s increased consumption, it fell by
42%. The reserves only fell below the six-month mark in the final quarter of 1916; alarms bells should have sounded though when deliveries consistently failed to match consumption - from the first quarter of 1916.

Lloyd George’s elevation to the premiership in December 1916 did not leave the Admiralty unscathed. A new Board of Admiralty, described by Marder as ‘on the whole, more youthful, and one that promised a more vigorous administration,’ was appointed. The position of Fourth Sea Lord, however, remained unchanged until April 1917, when Rear-Admiral Hugh Tothill replaced Commodore Lionel Halsey. Although in Beatty’s estimation, Tothill was ‘a worthy officer without high qualifications’ it was only following his appointment that decisive action was put in train to address the looming oil shortage. Stocks had continued to fall in 1917 until by April they stood at less than four months consumption. Tanker shortages, that had begun to bite a year earlier, now became critical. Tothill warned that if the present policy of maintaining a stock of six months was adhered to on present consumption stocks should be 1,350,000 tons. The actual level was 747,000 tons and consumption was still rising. He ventured that as the United States was now a belligerent it was acceptable to maintain four months’ reserve. The Army was fairing even worse, and in June 1917 was reduced to only four weeks reserve of petrol. Its precarious position forced the Admiralty to temporarily accept three months’ oil reserve until the Army’s

95Tothill to Jellicoe, 24/5/1917 (dated 1916 but must be 1917). MT25/1/39837.
96MT25/1. One could argue that as deliveries were arranged and known in advance the writing had been on the wall even earlier.
97This is based on observing the trend as it happened. Viewed from the perspective of predicted use, which was higher than actual, the crisis should have come to a head three months earlier. Predicted use as of 1/7/1916 by the D-of-S. MT25/20.
98Marder, Dreadnought, vol. IV, p. 61.
99Tothill completed, unlike many other Board members in this period, the usual two years in post. He was replaced by Captain Ernle Chatfield in June 1919.
101Appendix 14.
103Minutes of meeting 8/6/1917. MT25/1. In addition to the Navy’s needs the other petroleum products required each month were, spirit 46,000 tons, Kerosene 45,000, Gas Oil 22,000, fuel oil 5,000 and army petrol 18,000 tons; total 136,000 tons.
crisis had passed. Although it never wavered from the belief that six months remained
the ‘irreducible minimum’ for safety.\textsuperscript{104}

Heavy buying by the Allies had put an increasing strain on production and an
upward pressure on prices. American oil fuel prices rose by 106\% 1916-1918, twice the
rate of US inflation.\textsuperscript{105} In response, President Wilson created an advisory committee of
American oilmen, headed by the president of Standard Oil (N. J.), A. C. Bedford.\textsuperscript{106} The
problem was not oil production, but moving it to where it was needed in Europe. By
1917, nearly every British flagged tanker had been requisitioned and the Grand Fleet
had surrendered all the oilers it thought it could spare.\textsuperscript{107} Sixty-nine oilers with an
aggregate capacity of 158,000 tons were attached to the fleet,\textsuperscript{108} thirty-nine tankers were
employed on ‘overseas freighting’ with a combined capacity of 300,700 tons, and
twenty-seven more were released to their owners or employed on freighting aviation
fuel, petrol, lubricating oil or petroleum for toluol. Around 135,000 tons of oil fuel was
shipped each month, some 110,000 of which originated in North or Central America.\textsuperscript{109}
In the first six months of their unrestricted submarine campaign the Germans destroyed
more tankers on Admiralty service than in the previous thirty months of the War.\textsuperscript{110} The
Director of Sea Transport (D-of-ST) made the dire prognostication that unless more
tanker tonnage could be found, if losses continued at the same rate as March 1917, by
April 1918 ‘receipts would be half expenditure and no stock.’ He strongly urged a
supplementary building programme be put in hand immediately. In addition to the
thirty-six tankers already built or due for completion in Britain during 1917, he
proposed at least eighteen of the standard cargo boats already under construction be
completed as tankers.\textsuperscript{111} Nevertheless, even if the U-boats had stayed at home the

\textsuperscript{104}Tothill to FL Geddes, 5/12/1917, Geddes mss. ADM116/1806.

\textsuperscript{105}George Sweet and Evelyn H. Knowlton, History of Standard Oil Company (New Jersey), vol. 2, (New

\textsuperscript{106}Gerald D. Nash, United States Oil Policy 1890-1964, (Westport, Connecticut: Greenwood Press, 1976),
pp. 23-25.

\textsuperscript{107}Tothill to Beatty, C-in-C Grand Fleet, 14/2/1917, Beatty Papers vol. I, p. 402.

\textsuperscript{108}Memo, D-of-ST, 7/5/1917. MT25/20; minutes of meeting at the Admiralty, 8/6/1917. MT25/1.

\textsuperscript{109}Statement, D-of-ST, June 1917. MT25/20.

\textsuperscript{110}Appendix 12.

\textsuperscript{111}Memo., D-of-ST, 7/5/1917. MT25/20.
Navy's consumption was running ahead of delivery, and by the spring of 1917 had been doing so for a year. The U-boat campaign turned what was already destined to be a crisis into a panic.

Although militarily very unprepared for war America did have oil and the tankers to move it. The first British War Mission to America arrived on 21st April 1917. Led by former Premier and First Lord A. J. Balfour, it soon reported that its major headache was the very chaotic state of the administration. Lord Northcliffe, despatched as the head of a second British War Mission, was given responsibility for co-ordinating allied purchases, including oil, to avoid competition that would push up prices. The Admiralty first requested American help on 13th April 1917, in the shape of eight tankers. On 5th May, this was increased to twelve tankers, totalling about 118,000 tons, and again three days later to 178,000 tons - more than was lost in 1917. Delay by the US Congress in requisitioning shipping compelled the Admiralty to continue trying to charter vessels. Only two were forthcoming by the end of May, and used to relieve the petrol shortage. When the power of requisition was finally granted tankers under construction for Britain were requisitioned on the slipways, further compounding Britain's tanker deficiency.

Northcliffe was told the full extent of the oil crisis in July 1917, which he thought if disclosed 'would cause a jump in the oil market as had never been known.' To forestall this he met with Bedford, and divulged the full extent of the crisis and what was required. Northcliffe wrote that Bedford said: 'If it can be done, it will be done,' and later recalled that Bedford 'was very pro-English. I felt sure he would not take advantage of me as to price or in any other way.' Cohen, a member of Northcliffe's mission, had a rather different view, he summed up Standard's stance to his wife: 'We

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117 Ibid. p. 564.
are competitors, and if owing to the war we can get some advantage out of you [Britain], we want to do it."\textsuperscript{118}

Jellicoe, now the First Sea Lord, sought American help too, despite describing Northcliffe as 'that terrible person,'\textsuperscript{119} he employed the same tactic of frank disclosure and revealed the sorry state of the shipping situation to Rear Admiral Sims, the senior USN officer in Europe. Sims did all he could, but he too ran up against a sluggish administration in Washington. Not everyone at the Admiralty was as keen as Jellicoe to place their faith in America. The D-of-T thought it prudent 'that we make up our losses by building, and not become more and more dependant on the them [U S A] for oil supplies.'\textsuperscript{120}

Shortages of all petroleum products threatened Britain's war making capacity across the board. Aware of the problem, on 22\textsuperscript{nd} May 1917, the War Cabinet gave the Secretary of State for the Colonies, Walter Long, overall responsibility for petroleum products. His Cabinet position bestowed a degree of ministerial neutrality, but, as he admitted to the Prime Minister, he 'knew nothing about the question.'\textsuperscript{121} Two days later Jellicoe revealed to the Cabinet the 'extreme seriousness' of the oil fuel situation and that the Grand Fleet's movements had been restricted.\textsuperscript{122} He cited losses from enemy action and unexpected delays in tanker construction for imports being 500,000 tons less than expected. Combined with more oil-burning ships and greater fleet activity, this created a recipe for disaster. Jellicoe presented three forecasts ranging from the gloomy to the catastrophic. He added that the United States had been informed it was essential that, in addition to the 59,000 tons they had already promised and had yet to deliver, 200,000 tons of oil was needed by the end of August. To be followed by a further 400,000 tons by the end of the year.\textsuperscript{123} Remedial actions recommended by the Admiralty included restrictions of sailings and speeds of oil-burning vessels, acceleration of tanker

\textsuperscript{118}Henriques, Cohen, p. 233.

\textsuperscript{119}Jellicoe papers, vol. 2. p. 181.

\textsuperscript{120}Minute by D-of-T, June 1917. MT25/20.

\textsuperscript{121}Jones, Oil Companies, p. 217. He wasn't the only Minister ignorant of the technicalities of his role, FL Carson also professed his ignorance of naval matters to all and sundry. Marder, Dreadnought, pp. 55-56.

\textsuperscript{122}Cabinet, 24/5/1917. CAB23/2.

\textsuperscript{123}Memo., to Cabinet by Tothill, 30/6/1917. CAB24/18.
construction and repair, additional measures to ensure the safe passage of tankers, greater use of double bottoms in the North Atlantic and increased production of home produced oil. To monitor the situation the Cabinet requested fortnightly updates on oil stocks and available shipping.\textsuperscript{124}

Tothill produced the figures requested;\textsuperscript{125} Maurice Hankey, the Cabinet Secretary, collated the information and in October brought to the Cabinet’s attention a tabulated summary of the previous three months.

Table 6:2\textsuperscript{126}

<table>
<thead>
<tr>
<th>Date</th>
<th>Estimated Stock under Statement ‘C’ [Least gloomy of Jellicoe’s forecasts]</th>
<th>Approximate Actual Stocks.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tons</td>
<td>Tons</td>
</tr>
<tr>
<td>31\textsuperscript{st} July</td>
<td>512,000</td>
<td>614,000</td>
</tr>
<tr>
<td>31\textsuperscript{st} August</td>
<td>444,000</td>
<td>655,000</td>
</tr>
<tr>
<td>30\textsuperscript{th} September</td>
<td>413,000</td>
<td>700,000</td>
</tr>
</tbody>
</table>

In light of these figures and increases in available shipping, Tothill was informed the Cabinet would dispense with further oil returns ‘unless the position again becomes acute.’\textsuperscript{127} The situation continued to improve and by the end of October oil stocks stood at 839,000 tons. This was partly due to the introduction of convoys on the North Atlantic routes from July, cutting tanker sinkings from three per month in May and June to an average of one per month.\textsuperscript{128}

Statistics aside, the role of Jellicoe in the oil crisis was fundamental. As First Sea Lord and as a member of the War Cabinet it was his job to tell it as he saw it. Jellicoe’s reports were often at odds with the more optimistic and often misleading ones that emanated from the War Office. Lloyd George became acutely aware of the General Staff’s ability to ‘twist their facts and estimates to suit their arguments.’\textsuperscript{129} On the other

\textsuperscript{124} Ibid.

\textsuperscript{125} Tothill to Cabinet, 10/7/1917-2/10/1917. CAB29/19-27.

\textsuperscript{126} Hankey to Cabinet, 10/10/1917. CAB24/28.

\textsuperscript{127} Ibid.

\textsuperscript{128} Appendix 12.

hand, Jellicoe's more dour pronouncements came to be regarded as a sign of personal pessimism. Jellicoe was aware that his situation reports and analyses were regarded as pessimistic; he put it down to blaming the messenger and part of a scheme to get rid of him. If the Cabinet thought him pessimistic, he thought their outlook unrealistic. 'In my opinion the War Council [Cabinet] fails entirely to realise the position, in spite of the repeated efforts which I have made to explain its gravity,' he wrote Carson, the First Lord. The figures he presented to the Cabinet were the worst he could find. Not because he believed them to be accurate, 'all such forecasts are utterly useless' he wrote of the shipping losses, and he knew the D-of-S had historically overestimated consumption. He was convinced there was a shipping crisis; whether the Cabinet and America would act in time without the severest of jolts, he was less than sanguine. His forecasts were pessimistic, but they had the desired effect - General Haig recalled that Jellicoe's news was 'a bombshell' to the Generals. Jellicoe's reputation for pessimism also had as much to do with his failure to provide answers for the problems, as with the magnitude of the problems he presented. His initial reaction to the U-boats' early successes was retrenchment by reducing imports as far as possible. The story of the introduction of convoys has been covered in many works and deserves more space than can be apportioned here. Nevertheless, Jellicoe's bleak predictions provoked action on both sides of the Atlantic that otherwise may have come too late.

By September 1917, the British War Mission had managed to engage American tankers for nineteen voyages and was negotiating for more. Tanker construction in Britain was accelerated, and more oilers were added to the fleet to cope with the increase of oil-burning warships and relieve larger vessels for overseas transport service. Six large, 5,800 tons, fast tankers were launched in 1917 and fifteen standard dry cargo vessels redesigned as oil tankers entered service with RFA as the 'War' Class. Two types were built, the 'ZO' that on average took 314 days to complete, and the 'AO'


132 A fact that made the Admiralty's late response to the crisis even more culpable.


135Ministry of Shipping to Treasury, 13/9/1917. T1/12083/30505. Of these 2 sailed in June, 7 in July and 8 in August; two were lost, one in July and one in November.
pattern that averaged 411 days. However, of the fifty-two ‘cargo tankers, with a combined capacity of 380,000 tons, added to the fleet during the War the majority only entered service in the final months of the War. A further twenty-one ‘Z’ type tankers were completed for commercial owners. Shipping oil in double bottoms was introduced on North Atlantic routes in June and by November 443 ships had delivered 243,519 tons of oil using double bottoms - the equivalent of fifteen tankers. Fayle gives the monthly average, until the practice was stopped shortly before the Armistice, as around 100,000 tons. It was not though an expedient adopted lightly, the Shipping Controller estimated that using double bottoms for oil entailed a reduction in dry cargoes of 1,250,000 tons.

Pre-War arguments over the size of the oil reserve proved sterile. The D-of-C’s prediction that insufficient oil would be available was wrong, as was Fisher’s view that delivery would be prevented by enemy action. Churchill and Deterding’s opinion that there would always be sufficient oil, if the price were right, proved correct, but only because of America’s policy to sell to belligerents f.o.b. Without American oil, the crisis would have occurred far sooner than 1917, been far more severe and probably catastrophic.

Despite the warnings of relying on foreign oil companies Standard Oil and RDS’s contributions to the allied victory were substantial. Northcliffe’s opinion of Standard was as naïve as Cohen’s attack was disingenuous. All parties kept an eye on the post-War situation and weighed every decision with it in mind. None the less, the American Government’s reaction to the tanker crisis was tardy and may well have been even more so without Jellicoe’s shock tactics. Even with an abundance of tankers, the war clause in APOC’s contract would have proved ineffective due to the poor quality of the oil. Nevertheless, Greenway tried to exploit the company’s failure and its favoured position with the Admiralty to his advantage — a theme that will occur in later chapters.

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137 Naval Effort.
138 Sigwart, R FA, pp. 86-102.
139 Cabinet paper G T 1704, CAB24/23.
141 Shipping Controller to FL, 13/8/1917. ADM116/1804.
In one sense the critics of Churchill’s oil policy were correct, the move to oil removed control of the Navy’s fuel supplies from the Admiralty, not just because the sources were overseas, but also because the Navy was dependent on too few tankers. The high degree of dependence on America was partly a product of the tanker shortage. If there had been more tankers, more oil could have come from Burma and Borneo. The pre-War predictions of consumption were if anything excessive and they failed, as with coal predictions, to take into account other users. Overall, they were not too wide of the mark, but they over estimated early consumption and under estimated the acceleration in consumption by the Navy and other users in later years, leading to the Admiralty’s early complacency and the poor coordination of policy of the numerous departmental committees with limited responsibility. Long’s appointment was long overdue.

If the Admiralty had adopted a different method of assessing its oil stocks, the need for emergency action would have been manifest earlier. At the heart of the oil crisis was the Admiralty and Churchill identifying the wrong differences between the supply of oil and the supply of coal. In their desire, in the case of the Admiralty, to build a massive reserve and in the case of Churchill to create a diverse market, they both ignored that one vitally important inherent strength of coal was its mature and extensive transport infrastructure. Allied oil consumption rose faster than the means to deliver it. Although the Admiralty had the figures predicting disaster in the spring of 1916 it put in train emergency measures ‘to secure adequate importation of petroleum and proper economy of privately controlled tank steamer tonnage’ in January 1917, before the German unrestricted U-boat campaign commenced.142 In August 1916, First Lord Balfour identified the problem:

There seems to be no difficulty in the Admiralty obtaining, both in Peace and War, as much oil as they want, provided—

(a) They can carry it; and
(b) They can pay for it.

The shortages in the present War is not one of oil but tonnage.

142OB23, CAB50/3.
Shortage of tankers was the principal obstacle in supplying the Navy with oil, not a paucity of oil itself.\textsuperscript{143} As the war drew to a close, the Navy was dependent on American oil. The implications for Britain post-War did not go unnoticed. However, it was anxiety over company ownership, fostered by Slade and Greenway, not the provision of adequate shipping that dominated the oil policy agenda of the Admiralty and the Government, and, consequently, is the subject of the next chapter.

Chapter Seven

The All-British Oil Company and Domestic Oil Production

Although there was no difficulty in buying oil during the War, the Government, nevertheless, thought it undesirable to rely on foreign sources and oil companies for supplies. The formation of an all-British oil company to rival Standard and RDS with control over more than one source of petroleum was regarded as fundamental to the long-term security of Britain’s oil supplies. This chapter looks at the wartime manoeuvring to create an all-British oil company, the success of utilising the existing domestic sources, attempts to increase them, and the effect of these activities had on the Admiralty’s control of its own oil supplies.

The location of the world’s oil resources ensured that any British company would have to operate in territory beyond Britain’s suzerainty. This is not to say that there were no advantages to an all-British company; clearly there were. British power could dissuade those minded to take over any British-owned oil wells in their jurisdiction. It is, for example, inconceivable that Britain would have sat back and watched Persia nationalise APOC, particularly during a war. In addition, as oil companies were multi-national entities, even if the source was beyond Britain’s control this did not preclude pressure being exerted on the parts of a company that were under British jurisdiction. It was also more likely that a British Company would have a British flagged tanker fleet and finally, not to be underestimated, was the ability to call on the owners’ patriotism. For the oil companies British control, be it by a majority private British or Government holding, had advantages too. Identifying the company’s aims with the national interest could bring Government financial and diplomatic assistance, which could prove crucial, and a guaranteed British majority shareholding would protect it from a hostile foreign takeover.¹

Although Greenway objected to the creation of an all-British company through merging APOC with a foreign oil company, not all his fellow directors shared his passion for independence and were more amenable to the various amalgamation schemes put forward.² Greenway might have accepted a minority foreign holding,

¹The APOC-Admiralty contract, for example.

²Ferrier, B F, p. 206. For example Cargill and others, who also sat on the board of Burmah Oil.
provided it had no links with other oil companies, though his most fervent ally, Admiral Slade, aspired to expunge all foreign interests. Greenway’s aims found strong support within the Admiralty, but not all his methods. Some of his more devious and ‘immoral’ schemes were attacked for being ‘blatantly dishonest.’ Slade’s position was highly anomalous; a Government appointee on the board of APOC charged with protecting the state’s interests while at the same time a serving officer involved with the creation of Admiralty and national oil policy. Although he stood down as a Government director in January 1917, to become APOC’s vice-chairman and actively involved in running the company, he, nevertheless, continued to advise the Admiralty on oil matters and passed up no opportunity to vilify RDS. His distrust of RDS was shared by the DNI, Rear-Admiral Sir Reginald Hall, and by the Foreign Office officials who had supported the Government’s involvement in APOC, and who, as the War wore on, became increasingly convinced that the Government should support APOC’s challenge to Standard and RDS’s duopoly. The D-of-C, F. W. Black, took a less ardent standpoint and summed up the Admiralty’s attitude towards RDS:

The Admiralty in all its dealing with great concerns such as “Shell” has endeavoured to treat them equitably and fairly as contractors, regarding them as good servants but bad masters. The “Shell” Companies’ directors are adepts at driving a one-sided bargain. They are nevertheless excellent contractors whose usefulness we appreciate.

All the oil companies sought to use the Government’s aspiration for an all-British Oil Company for their own ends, citing security of naval oil supplies as why

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4Slade to Bradbury, Treasury, 20/1/1917. T1/12047. Also Correspondence in ADM116/1687B concerning possible replacements for Slade. F. W. Black, the D-of-C was selected, however, until he returned from America where he was serving with the British war mission W. St. D Jenkins, one of the assistant D-of-C, was appointed in May 1917. Black took over in February 1919. In June 1919 he became the Managing director of APOC. Slade continued to lecture at Greenwich on oil’s importance as a strategic commodity until shortly before his death in 1928, aged 69. See ‘Fuel in War’ 13/12/1927. Slade mss. MRF/39/3. He retained his position as Vice-Chairman of APOC until his death.

5Jones, British Oil Policy, p. 183 and p. 197.

6Ibid. p. 185.

7F. W. Black, D-of-S 1903-06, D-of-C 1906-14 and 1918-19, Director General of Munitions supply 1915-18, acting chairman British War Mission to USA 1917-18 and Director APOC 1919-1923.

their particular scheme should be adopted. Consequently, the Admiralty became active in the formulation of national oil policy, though it was not the only Government department involved. The Board of Trade, Ministry of Munitions, Foreign Office and of course the ubiquitous Treasury all had their own views how an all-British oil company might best be accomplished. The first serious suggestion came from RDS in the summer of 1915, it made 'a very tempting offer' to merge with Burmah Oil and create a company with a 51% British majority on the board. RDS argued that completing military contracts had left them with a surplus of kerosene and Burmah Oil's Indian market was the ideal place to dispose of it. Predictably Slade objected, regarding the merger as an attempt by RDS to use Burmah Oil as a Trojan horse to acquire seats on APOC's board and access to Middle East oilfields: the Foreign Office concurred. The Board of Trade was more amenable and thought that no effective agreement to secure oil supplies could be reached without involving RDS. Slade, characteristically, summarised the options as between APOC, wholly British 'with the object of displacing the present foreign control in the petroleum trade in the British Isles,' and 'a combination which while being nominally British is in effect completely under the control of foreign groups including German interests.' Slade and Black agreed to present a point-by-point rebuttal of the Board of Trade's reasoning and an alternative scheme to the First Lord, Balfour. Slade prepared the alternative paper, which was rapidly conceived and ill thought out. He argued that the Government should take control of all Empire's petroleum production by merging APOC with Burmah Oil, the Scottish shale companies and Trinidad Oil. The new company, financed by the Government, would control the distribution of all petroleum products. It amounted to the nationalisation of the Empire's oil industry. Balfour submitted the

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9Jones, British Oil Policy, p. 189.


11Cohen to D-of-C, 30/12/1915. SHELLGHS/3A/2

12Corely, Burmah Oil, p 248.


15Slade's observations on Board of Trade memo., 24/8/1916. CAB37/154/16.

scheme to the Cabinet, but undermined it with his accompanying observation that 'there
seems no difficulty in obtaining oil.' Neither plan made further headway.

Next, Cowdray and Greenway threw their hats into the ring proposing that
Mexican Eagle and APOC merge, with possibly Burmah Oil as well. Cowdray agreed
with Greenway 'that a strong English company, not only selling oil but producing it in
various parts of the world, is a British necessity.' In a memorandum, Cowdray hoped
Hopwood would submit to the Cabinet, he urged the Government to take positive action
to secure and develop the oil requirements of the Empire. At the time Mexican Eagle
was under severe pressure from American oil companies, whose government, Cowdray
wrote, 'look upon the oil industry as their particularly their own, and in consequence
they do not hesitate to bring diplomatic pressure' to bear on Latin American
Governments. In his opinion:

Such an amalgamated British company must be a commercial
company and unfettered in its operations. No Government
department could carry on so intricate and difficult a business as
the oil business.

As the Navy depended on American oil, the Government shied away from any scheme
involving Mexican oil for fear of an American backlash.

In November 1916, with the expiration of Mexican Eagle's contract to supply
Standard approaching the following June, Mexican domestic politics in ferment and no
Government backing, Cowdray began negotiations to sell the company to Standard.
On hearing the news, Pretyman threatened to prevent the sale by invoking the Defence
of the Realm legislation. Despite assurances that the Government had no powers to
prevent the sale, Standard refused to continue negotiations while legal difficulties

17Balfour to Cabinet, August 1916. CAB37/154/16.
18Cowdray to Sir George Barnes (Board of Trade), 6/12/1915. Pearson box C44 file LC 1/120.
20Jones, British Oil Policy, p. 191.
21Agreement between Pearson and Standard Oil for Pearson to supply 10,000,000 barrels over five years,
1/7/1912. Pearson box C43.
existed.\textsuperscript{22} Cowdray finally extracted his company from Mexico by selling Mexican Eagle to RDS in April 1919.\textsuperscript{23}

Having already conceded overall control of shipping, the appointment of Walter Long in May 1917 to co-ordinate petroleum supplies further undermined the Admiralty's control of its oil supplies. Long found the petrol question 'an awful tangle,' and appointed Professor John Cadman as his advisor.\textsuperscript{24} Although Pretyman's Inter-departmental Petroleum Committee was inter-departmental in membership, Pretyman was an Admiralty Minister and naturally, Admiralty interests were at the forefront of his mind. Long dissolved Pretyman's Committee and the Pool Board, and re-organised the control of petroleum products into four bodies; a new Inter-Departmental Committee, a Petrol Committee,\textsuperscript{25} a new Pool Board and a Products Department to 'to stimulate home production, which was [formally] under the Ministry of Munitions;' all answering directly to Long at the Colonial Office.\textsuperscript{26} In December, they were grouped together to form the Petroleum Executive (PE) with Cadman as director. The PE was to collate all departmental requirements and give the Shipping Controller a clear picture of the total shipping requirements. Cadman and Long soon found, though, that they were unable to fully eliminate trade disputes between companies and inter-departmental squabbles within Government.\textsuperscript{27}

One of Cadman's first moves was to improve the Government's relations with RDS. This was like a red rag to a bull to Slade and Greenway. Greenway's subsequent reference to an all-British oil company free from foreign interests and foreign control at APOC's AGM irritated Cadman.\textsuperscript{28} It incensed Marcus Samuel, who wrote Cadman:\textsuperscript{29}

\begin{itemize}
\item \textsuperscript{22}Pearson box C43, file LCO23/3.
\item \textsuperscript{23}Ibid. RDS had first expressed an interest in Mexican Eagle in March 1912.
\item \textsuperscript{24}Jones, 'Oil Companies,' p. 663.
\item \textsuperscript{25}The Petrol Committee was soon replaced by a Petrol Controller who was a member of the Inter-Departmental Committee.
\item \textsuperscript{26}Memo., Pretyman, 31/10/1917. Geddes msss, ADM116/1806.
\item \textsuperscript{27}Jones, 'Oil Companies,' p. 665.
\item \textsuperscript{28}Cadman to Batterbee, 24/7/1917. POWe33/3
\item \textsuperscript{29}Cadman to Batterbee, 17/12/1917. POwe 33/42; Times 5/12/1917, Financial Times 8/12/1917 and Saturday Review 15/12/1917.
\end{itemize}
It appears to me quite monstrous that the enormous taxation contributed by the Group [RDS] should be devoted by the Government to promote and encourage trade opposition to them.  

Samuel threatened to withdraw the company’s administration from Britain. To calm the situation he received a personal assurance and the press were informed that the Government was not ‘at present considering, or intending to consider, the formation of an all-British Oil Company.’ To publicly refute Greenway’s allegations Samuel offered the Government a seat on the board of Anglo-Saxon, it was, however, declined.

The PE became confined to settling disputes as arbitrators, rather than implementing of an agreed policy. Convinced that the Government’s petroleum policy was in disarray, Cadman advised Long that a committee of the PE should be created to clarify and focus the Government’s oil policy. Long agreed, and appointed Viscount Harcourt as chairman of a Petroleum Imperial Policy Committee (PIPC). Harcourt’s brief extended beyond the immediate wartime needs and addressed the unpleasant truth that the Empire depended on American sources for 80% of its petroleum, giving America the power to place the Britain ‘in an impossible position should they wish to be unfriendly.’ The PIPC was to address the level of oil reserves Britain should maintain, provision of oil at bunkering stations, use of oil substitutes by industry in wartime ‘so as to set free oil supplies for Naval purposes,’ the interests of the consumer and to advise the Government:

What steps should be taken to secure control of as much as possible of the world supply of natural petroleum, and also what policy should be adopted to ensure development of an industry

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30 Samuel to Cadman, 6/12/1917. POWE33/42.
31 Ibid.
32 Ibid.
33 Minutes of meeting held at the Colonial Office, 14/3/1918. Geddes mss. ADM116/1807. Present were Long, Geddes, Stanley, Cadman and Pretym. Although treated seriously by the Government, without Deterding’s agreement Samuel’s offer was no more than a gesture and could have at best extended only to Shell Transport and Trading and Anglo-Saxon, not to RDS. Deterding’s evidence to the Harcourt Committee, 11/10/1918, suggests he would not have agreed. POWE33/13
34 Ibid. and Cadman to Batterbee, 4/3/1918. POWE33/12.
for the manufacture of oil in this country on a large scale from coal and other materials.\textsuperscript{35}

At the PIPC's first meeting Cadman defined the problem as whether the Government treated:

\begin{quote}
APOC and the Royal Dutch Shell as separate competing bodies or as a combination we must bring them in as a whole against the American interests.\textsuperscript{36}
\end{quote}

The formation of an all-British oil company was back heading the agenda.

In July 1918, in his 'special service' role at the Admiralty, Slade produced a memorandum on the oil situation.\textsuperscript{37} Rather than submit it to the PE he used his Admiralty connections to place it directly in front of the Cabinet. The First Sea Lord, Admiral Wemyss, who was commercially naive and easy prey for Slade's polemic, showed Hankey the memorandum.\textsuperscript{38} Encouraged by Hankey and Wemyss, First Lord Geddes added a forward and submitted it to Cabinet.\textsuperscript{39} The memorandum contained Slade's predictable invective against RDS, and identified APOC's post-War ambitions, especially access to Mesopotamian oil, as synonymous with the national interest. That Geddes endorsed it and presented it to Cabinet without consulting Long is remarkable.\textsuperscript{40} Slade gave his reason for not showing Long as the PE's close relations with RDS. To the chagrin of Long, Slade accused Deterding of boasting that he could 'do anything he liked with the PE' and of being constantly at their office.\textsuperscript{41} Cadman, 'in a very straight

\textsuperscript{35}Letter of appointment from Prime Minister (written by Long) to the Harcourt Committee, 29/5/1918. POWE33/12. (italics mine)

\textsuperscript{36}Harcourt Committee, 29/5/1918. POWE33/13.

\textsuperscript{37}Jones, Oil Companies, p. 667.

\textsuperscript{38}Admiral Sir Rosslyn E. Wemyss, FSL, 10/1/1918–1/11/1919. An example of Wemyss' commercial naively was his involvement with the British Oil Development Company, which appointed him chairman in 1929, paid him in worthless shares and, as his wife wrote, took 'advantage of Lord Wemyss' ignorance of all matters financial'. Wemyss mss. WMY13/2.

\textsuperscript{39}Roskill, Hankey, vol. 1. p. 585.

\textsuperscript{40}Slade's paper was sent to the PE for their comments 2/8/1918. CAB21/119. Copies of Slade's 29/7/1918 memo. are in CAB24/59 (G. T. 5267), ADM1/8537/240, Geddes mss. ADM116/1810 and POWE33/45. The latter is Long's copy and retains his caustic marginalia.

\textsuperscript{41}Long to Slade, 6/9/1918. POWE33/45.
talk’ with Slade pointed out that the bulk of allied oil supplies came from Standard and RDS; alienating them by showing favour to APOC was not, therefore, very astute.  

As well as raising Long and Cadman’s hackles, Slade’s memorandum re-opened an old wound in the Admiralty’s organisation between the ‘Operational’ and ‘Maintenance’ sides. Both Presyman and Tothill were ‘up set’ at not having sight of the memorandum before it was placed before the War Cabinet.  

Although Geddes and Wemyss ‘worked together with unmistakable cordiality,’ they did though differ on material matters. Geddes regretted the partisanship for APOC contained in the memorandum and, under Pretyman’s persuasion, withdrew his blanket endorsement. It was, Geddes explained to Long, ‘dealt with purely as a staff matter here, and not as a supply matter.’ None the less, Geddes reaffirmed his view ‘that the oil bearing districts of Mesopotamia and Persia are of very great national importance to us.’ Hankey had little time for Slade’s commercial manoeuvring, though he was persuaded that ‘oil in the next war will occupy the place of coal in the present war.’ Moreover, as the Americans ‘will consume all the oil that they produce’ Britain will have to obtain it elsewhere, and Persia and Mesopotamia were the only significant sources Britain had any prospect of acquiring control over. Oil’s role in the Government’s Mesopotamian strategy had been secondary up until then. Hankey sought to upgrade it and make control over the oil regions ‘a first class British War Aim.’ Balfour (Foreign Secretary) regarded Slade’s aims as too blatantly imperialistic, particularly to an American audience. Although the Cabinet rejected Slade’s recommendations, his memorandum did lead to a policy review. Thanks largely to Hankey, access to

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42Cadman to Long, 7/9/1918. POWE33/45.
43Ibid.
44Marder, Dreadnought, vol. 5. pp. 10-11.
45Geddes to Long, 13/9/1918. POWE33/45.
46Geddes to Cabinet, 17/9/1918. ADM1/8537/240
47Hankey to Balfour, 1/8/1918. CAB21/119.
48Hankey to Geddes, 30/7/1918. CAB21/119.
49Kent, Oil and Empire, p. 119.
50Hankey to Balfour and Lloyd George, 1/8/1918. CAB21/119.
Mesopotamian oil moved up the agenda, though it was to be secured by diplomatic rather than military means.31

Other frictions between the Admiralty and the PE existed. Decisions regarding petroleum products were predicated on statistics provided by Pretyman's Interdepartmental Committee - effectively the Admiralty. When Long removed Pretyman's Committee's executive functions he also deprived it of the responsibility for collecting and recording statistics, creating a small section of his own to provide the necessary information, while assuring the Admiralty that it would have full access to the figures.32 Pretyman was convinced that without its own statistics Admiralty's influence on oil policy would be weakened. His suspicions proved well founded when, after the War, Long revealed that the PE kept the information 'closely guarded,' only he, Cadman and his clerk ever knew the real picture.33 It is now clear that Pretyman was over egging the cake over loss of Admiralty influence. His personal influence did undoubtedly suffer, but any weakening of the Admiralty's was more than compensated for by Geddes strong position in Cabinet.

Throughout the War, the Admiralty fought a continuous rearguard action to maintain control over its oil supplies as the Ministry of Shipping, new Government departments and inter-governmental committees steadily eroded its autonomy. One skirmish was over oil purchases in America. Her entry into the War placed the Allies' purchases of American munitions and material on a more formal footing and to reduce competition Lord Curzon (Lord President) advocated the creation of an Inter-Allied Conference to co-ordination the Allies' purchases.34 The Admiralty supported the idea, but thought oil should be excluded, as it had bought sufficient ahead for about eight months. The Cabinet rejected the Admiralty's case.35 Geddes and Tothill challenged this decision, pointing out that the Admiralty was by far the largest British consumer, supplied all the oil fuel requirements of France, most of Italy's, was destined to supply

31Kent, Oil and Empire, p.126. The reappraisal of policy led to the abandonment of the Sykes-Picot agreement between Britain and France.

32Correspondence between Long, Pretyman and Geddes, November-December 1917. Geddes mss. ADM116/1806.

33Long, Memories, p. 262.

34Cabinet minutes, 5/7/1917. CAB23/3.

35Ibid.
the USN when it arrived in European waters and already performed this role satisfactorily. The Cabinet reversed its decision, and, pending agreement on the Inter-Allied Conference's constitution, the Admiralty kept control of oil purchases.

Refining and supply of petroleum products were complicated by the different specifications used by the Allies. To agree a common specification and co-ordinate supplies, an Inter-Allied Petroleum Conference was created. Each country submitted its requirement to the Conference, which then calculated the total requirement and organised transportation. Chaired by Cadman, it first met in February 1918, but, until the American representative could attend, was only able to perform preparatory studies. When the first formal session was eventually held in May, the Conference was informed of the anticipated petroleum products required by the Allies in Europe and the Mediterranean for the twelve months from April 1918. These showed that, despite the massive increase in the use of petroleum products by industry and the other armed services, the Navy used two thirds of all the petroleum products consumed by Britain and was expected to consume 47% of all petroleum products used by all the Allies combined in Europe. Not surprisingly, the Admiralty felt it was on firm ground when it suggested that its specification should be adopted for all oil fuel. As all her supplies came via Britain, France had little choice but to agree. Italy, who drew most of her oil from the eastern sources, could go it alone without disrupting supplies. The main points of disagreement were between the Navy and the USN, with the chief differences being flash point, sulphur content and viscosity. The Navy conceded the higher sulphur level, as ships' furnaces could cope with it, but remained intransigent as regards flash point and viscosity. Fearing an increased risk of fire, it rejected the USN's 150°F flash pointed and stuck with 175°F, and contended that as the USN's specification had no

56Geddes and Tothill to War Cabinet, 11/7/1917. CAB24/20. They estimated the oil fuel requirements for 1917 to be 4,000,000 tons for the Admiralty, 90,000 for the French Navy, 120,000 tons for the Italian Navy and 750,000 for the USN. Of this 2,800,000; 20,000; 40,000 and 750,000 tons respectively would come from America.

57Cabinet minutes, 19/7/1917. CAB23/3.


59Appendix 15.


61IACSPP, 3/9/1918. ADM265/43.
‘cold test’...‘there was no certainty that oil which was satisfactory at 70°F would be sufficiently fluid at 32°F.' Unlike their US counterparts, not all British warships had heated fuel tanks, and a programme to fit them with heaters had been abandoned as the vessels could not be spared. Although the Conference failed to agree a common specification for naval fuel, its successes in rationalising tanker tonnage and settling standards for other petroleum products were substantial.

In January 1918, while serving with the British War Mission in America Black wrote Churchill, then Minister of Munitions, of:

The extreme importance of sparing no effort by day or night in getting all possible supplies of fuel oil from shale and suitable coal in the United Kingdom

Petroleum had been extracted from Scottish shale since the 1860s. Other shale deposits were known to exist in Dorsetshire, Derbyshire, Flintshire and Norfolk, but were not commercially viable. Shale was mined in a similar fashion to coal, though it was generally found closer to the surface. It was processed by being heated in retorts to produce sulphate of ammonia and petroleum, the latter being refined principally into kerosene, petrol and lubricating oils. Compared to imported petroleum, shale oil was expensive, but of high quality and particularly suitable for diesels. Pre-War estimates of how much shale oil could be relied on in an emergency varied considerably. In 1913, the D-of-C anticipated 280,000 to 300,000 tons per annum, although this would require constructing additional retorts. Pakenham reckoned on possibly 130,000 tons a year in wartime, more cautiously, Fisher postulated only 96,000 tons of shale oil per year.

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62IACSPP, 29/7/1918. POWE33/8.
63IACSPP, 3/9/1918. ADM265/43.
64Black to Churchill, 4/1/1918. CHAR15/160/80. In 1917 the Navy consumed 3,310,000 tons of oil fuel, met from the following sources; USA 2,367,000 tons (71.5%), Mexico 251,000 tons (8%), Trinidad 69,000 tons (2%), Persia 332,000 tons (10%), Borneo 41,000 tons (1%), Home production 250,000 tons (7.5%).
65Pretyman.
66Appendix 6.
68Pakenham.
When informing the Commons of the oil burning fast division Churchill hoped that 'no spirit of exaggeration will enter into the mind of anyone who approaches this question,' continuing 'it is calculated that Scottish shale alone, if developed to their fullest capacity would yield between 400,000 and 500,000 tons for 150 years - at a price.'\textsuperscript{70} He neglected to name the price and who performed the calculations.

Scottish oil interests were no less keen than other sections of the oil industry to benefit from any Government largess. However, the industry's offer to devote itself exclusively to the production of naval fuel in return for a long-term contract was not accepted.\textsuperscript{71} Nor was a suggestion to the Fisher Commission that the Admiralty acquire a shale field of its own.\textsuperscript{72} As the mines were situated close to the new naval base of Rosyth, during periods of high shipping costs shale oil could compete price-wise with imported oils.\textsuperscript{73} However, even the most pessimistic forecast failed to be realised during the War as all the predictions ignored other sectors of the economy. As over 300,000 tons of the 350,000 tons of oil fuel derived from home sources during the War was creosote,\textsuperscript{74} shale's contribution was very small.\textsuperscript{75} So long as imported oil supplies kept up with demand the shale industry concentrated on producing paraffin wax and ammonium sulphate,\textsuperscript{76} the latter a valuable alternative fertiliser to imported sodium nitrate.\textsuperscript{77}

Other sources of domestic oil fuel considered pre-War as suitable for use in an emergency were blast furnace oil, coal tar, tar oil and creosote, all residues of coal produced by the production of town gas, coke, chemicals or steel.\textsuperscript{78} Creosote had been

\textsuperscript{70}Hansard, 5:55:1472. 17/7/1913.


\textsuperscript{72}Mid Scotland Ship Canal Association to Fisher, 13/8/1912. FISR1/12/600

\textsuperscript{73}Report of the American Consulate Edinburgh, 5/2/1914. NARA, RG 38, E-10 Box 838. The distance from the oil works to the new Admiralty tankage at Blackness on the Firth of Forth was only about four miles.

\textsuperscript{74}Naval Effort,


\textsuperscript{76}Ibid.

\textsuperscript{77}Dewey, \textit{Agriculture}. p. 165.

\textsuperscript{78}Pretyman.
tested in the early oil fuel trials and its properties were well known. It had a lower calorific value than oil, produced skin irritations, obnoxious fumes and presented a number of logistical difficulties, as it had to be collected from numerous places of manufacture and taken to a suitable facility had to be mixed with other oils at 100°F for three days before being issued. Nevertheless, in 1913, the D-of-C informed Fisher that he could reasonably expect to obtain 4,000 tons of creosote per month in wartime. For the first two years of the War, as in peacetime, creosote continued to be exported to North America as a wood preservative, where it fetched a higher price than American fuel oil and proved a useful return load for tankers. From mid-1916, however, the Admiralty re-considered creosote as a naval fuel and planned to purchase 35,000-70,000 tons a year. In June 1917, creosote exports were suspended and the Admiralty and Ministry of Munitions guaranteed to take the same quantity at sixty-seven shillings and six pence per ton. Even so, creosote manufacturers could obtain better prices domestically and consequently in July a licensing system was introduced to restrict sales and maximise the quantity available for the Navy, which burnt 3,342 tons of in 1916, 102,578 tons in 1917 and 199,340 tons of the 396,000 tons available in 1918.

In February 1917, anxiety over oil shortages led to a reappraisal of all domestic petroleum resources. Sir Boverton Redwood's Admiralty Petroleum Research Department examined shale deposits in Dorset and Norfolk and in the laboratory obtained oil yields twice that of Scottish shale, although the oil contained a high level of difficult to remove sulphur. He recommended that, despite the risk of translating laboratory results into a practical full-scale system, work should commence

79Pakenham.

80Memo. 'Use of Creosote in HM Ships,' for Admiral A. B. Cunningham, 13/5/1941. POWE33/1290. See also ADM265/45.

81Statement by the D-of-C to Fisher Commission quoted in Fisher Commission memo. to First Lord, 8/3/1913. ADM116/1208. Also used by NWS, enclosure No. 2. ADM116/1219.

82130,000 -140,000 tons, just under half the total production, was exported per annum in 1913 and 1914. In 1915 it fetched £4 per ton f.o.b. Britain compared to £2 per ton for oil fuel f.o.b. US. However, it was a dirty cargo and could not be shipped in tankers used for petroleum spirit without cleaning afterwards, a long and expensive procedure. Memo., Anglo-Mexican Oil Company, 12/6/1916. MT 23/519.


84History of Ministry of Munitions, vol. 7 pt. 3 Chap. 10 pp. 144-52.

85Ibid. p. 144. 'The Petroleum Research Board was at first a branch of the Munitions Petroleum Supplies Department, though later it came for a time under Admiralty control.'
immediately on the necessary plant. The Admiralty and Parliamentary Secretary to the Minister of Munitions agreed and in light of the oil shortage recommended that work should start immediately on utilising suitable shale deposits. Sir George Beilby, Director of Fuel Research, ventured that oil production could be significantly increased if shale retorts were used with cannel coal as only 770 tons of cannel coal would be required to produce 100 tons of oil instead of the 4,000 tons of shale. Following a survey by Redwood of cannel coal deposits in November 1917, he recommended the construction of ninety-eight batteries of retorts, built as near to the sources of coal as possible. Each capable of producing an average of thirty-five gallons per ton of coal, yielding in total ninety-eight millions gallons of petroleum per annum, of which sixty to sixty-five million would be oil fuel (approximately 275,000 tons).

In light of the novelty of the process, Price, of the Ministry of Munitions and the Coal Controller wondered if allocating resources to Redwood’s scheme was prudent. Sir Arthur Churchman, controller of mineral oil production at the Ministry of Munitions, thought Redwood’s calculations too optimistic - it would cost over a million pounds and anyway the cannel coal was not available. Instead, he suggested utilising the existing gas works during the summer, as the facilities and trained staff already existed it could be up and running much sooner and the smaller quantity of coal necessary would be readily available.

In the meantime, Redwood’s department was transferred back from the Admiralty to the Ministry of Munitions to form part of the new PE. To settle the matter Long and Churchill agreed that a committee on Home Production of Oil chaired by Lord Crewe should consider Redwood’s report. While waiting for Crewe’s verdict,

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87Cannel coal was normally used to produce town gas.

88Report by the Petroleum Research Department, 10/11/1917. MUN4/5178.

89Sir Arthur Churchman, took over as Controller of the Munitions Mineral Oil Production Department in September 1917. MUN4/5178.

90Memo., Churchman, 7/12/1917. MUN4/5178. Cadman, his technical advisor, probably wrote Churchman’s memo. The disagreement came to be regarded in the press as a Redwood-Cadman affair.

91Ministry of Munitions vol. 7 pt. 3 Chap. 10 p. 149.

92Churchill to Long, 4/2/1918. CHAR15/160/104. Churchill was allowed to select the members, lest it be thought it was an inquiry into his department. It commenced work in the March.
the Cabinet approved Churchman's scheme to produce 50,000 gallons (approximately 210 tons) of oil a day at the present gas works.\textsuperscript{93} The resultant oil, however, proved to be unsuitable for issue directly to warships, and in April, the Admiralty and the PE jointly offered £2,000 to the first person who before 1\textsuperscript{st} August 1918 could find:

\begin{quote}
[A] fuel oil suitable for Admiralty use by admixture of dehydrated coal tar with mineral petroleum oil...[P]roduced by gas-making retorts or coke ovens following the normal gas making or coke oven practise now in use.\textsuperscript{94}
\end{quote}

The reward stimulated a great deal of activity, but no solution; the best process devised only managed to utilise 25% of the coal tar for naval fuel.\textsuperscript{95} Crewe reported in July that Redwood's recommendation was indeed impracticable and endorsed the alternative to use the existing gas works.\textsuperscript{96} Churchman's scheme failed to make a significant impact on oil supplies during the War, producing just three hundred tons a week by November 1918 - less than one quarter of one per cent of Britain's consumption.\textsuperscript{97}

Pretyman, Pakenham, Fisher and Jackson never seriously explored the possibility of oil being found in the British Isles. Traces of petroleum, usually in the form of surface seepages or viscous tar oozing from faults in coalmines, had been found in Britain for many years but were never deemed commercially viable.\textsuperscript{98} Only Cowdray was alive to the possibilities of viable quantities being discovered in Britain. Geologists employed by his company, Messrs. S. Pearson and Son, by February 1917 had identified suitable sites for exploratory drilling, however, he feared that if successful, rivals would drill alongside his wells to tap into the oil, as had occurred in many American oil fields where drilling had became a race to extract all the oil.\textsuperscript{99} Leading initially to gluts and low prices, only to be followed, when the wells ran dry,

\textsuperscript{93}Memo., for Cabinet by Ministry of Munitions GT 3595, 8/2/1918. CAB24/41.

\textsuperscript{94}The Petroleum Review, 13/4/1918, p. 229.

\textsuperscript{95}Inter Allied Petroleum Conference, Appendix I 'Notes on the Production of Fuel Oil in the United Kingdom,' 24/6/1918. POWE33/8.

\textsuperscript{96}Crew Committee's report on the production of fuel oil from home sources. GT 5058. 8/7/1918. CAB24/57.

\textsuperscript{97}Submission on the PE's work for the Cabinet 1918 report, Cd 9128. POWE33/150.

\textsuperscript{98}The Petroleum Review, 24/11/1917. p. 325.

shortages and high prices. Consequently, until he had the mineral rights over sufficient area to secure his investment and drilling licences were introduced Cowdray stayed his hand. To institute drilling licences and give the Government exclusive rights to any petroleum found in Britain Long introduced a Petroleum Production Bill. Landowners were to be compensated with a fixed royalty payment of nine pence per ton of oil. Largely because of objections to the payment of royalties, the Bill fell at the first hurdle. With his drillers about to arrive from America and no new legislation in sight, Cowdray wrote the Government that pending an understanding 'active work cannot be commenced.' Fresh legislation was introduced in August to prohibit drilling without a licence, leaving the question of the oil's ownership in abeyance. To expedite matters, the company contributed its staff free of charge to the search for oil and became the Government's 'Petroleum Development Manager,' with permission to drill at thirty sites.

The first oil well was at Hardstoft, in Derbyshire. The Petroleum Review heralded its opening:

Tuesday, October 15th, 1918, will go down in the annals of history as a red letter day, for it was the day that the inauguration ceremony took place around the first well drilled for oil in the United Kingdom - it was the birth of England's crude oil industry.

At the ceremony were a host of dignitaries, including Cowdray, Redwood, Churchman and the E-in-C, Admiral Goodwin. The euphoria proved to be somewhat premature.
Of the eight bore holes completed by March 1920, only Hardstoft had produced any oil - just 2,300 barrels.\textsuperscript{107}

Cooperation between the Government and the oil companies was essential, but it was not considered enough while one country dominated British oil supplies. The concept of an all-British oil company to rival Standard Oil came to monopolize Government thinking. Ideally, the Government wanted to control as much oil as possible physically, but failing that exercise as much control as it could financially. In no small part due to Slade’s influence, with Admiralty support APOC continued to carve out its own independent niche, jealously guarding its Persian concession and ambitions in Mesopotamia. With Persia the only sizable known oilfield under British control, for the Admiralty survival of the APOC was crucial. Although of limited wartime utility, the APOC contract guaranteed naval supplies in peacetime and consequently APOC’s independence. Moreover, as oil prices increased the fixed price contract became increasingly valuable to the Admiralty.

When it was clear to all in the spring of 1917 that oil supplies were in jeopardy, the lack of coordination was supposed to be resolved by the appointment of Long. He, with Cadman, managed to reduce the multi-departmental nature of the problem into a two-side affair between the PE and the Admiralty.\textsuperscript{108} They also attempted by creating Harcourt’s PIPC to devise a national oil policy. However, as the next chapter will show, post-War the notion of the all-British oil company and interdepartmental strife persisted.

For the first two and a half years of the War, utilisation of domestic oil sources was not a priority. Anxiety over supplies in early 1917, before the effects of the U-boat campaign were known, encouraged the Admiralty to make greater use of domestic sources. In spite of its operational drawbacks, creosote was the most significant. Schemes to increase the output of oil from shale and cannel coal threatened to disrupt other sectors of the economy and highlighted the disparate nature of fuel research. Home produced oil was regarded as a potentially useful additional source, rather than a remedy for the oil crisis. Overall, domestic sources represented a very small proportion of consumption, and their slow development further illustrates the messy nature of the

\textsuperscript{107}Hansard, 5:126:873 8/3/920. 2,300 barrels is less than 350 tons. See Times 26/5/1919, for some of the problems faced by the drillers.

\textsuperscript{108}Although Long was Colonial Secretary, for administrate purposes the PE was part of the Ministry of Munitions.
wartime organisation. The lack of urgency with which alternatives were pursued in 1918 confirms that the oil crisis had passed and was not expected to reoccur. This is supported by the pedestrian pace with which oil exploration was pursued in 1917-1918. Cowdray’s exploration efforts, however futile, further underline the Government’s dependence of commercial companies for expertise and supply, and how the companies used this to extract preferential treatment, albeit with mixed results.
Chapter Eight

The Oil Companies and Post-War Government Control

In the previous chapter we saw how the Government regarded the creation of an all-British oil company to equal Standard Oil as the key to securing national oil supplies, but had been frustrated due partially to the Admiralty’s support for APOC. This chapter examines this policy post-War and then looks at the Admiralty’s relations with the oil companies. The War had demonstrated that oil was indispensable to a modern industrialised society’s ability to wage war. Britain’s dependence on American for 80% of her wartime oil was disconcerting for the policy makers. Even though this dependence was exaggerated, by the tanker shortage that necessitated taking supplies from the nearest source, the alternative sources of Persia, Trinidad, Mexico and Borneo combined could not have met the 7,500,000 tons or so the European Allies required in 1918. American oil represented 65% of the world’s production; in contrast, the British Empire produced just 2%, all of which was consumed locally,¹ and even with Persia, it was only 4%.²

The 1916 and 1919 American naval building programmes, if completed, would, give America a fleet superior to Britain. An Anglo-American conflict had been unthinkable by Britain even when the Navy relied on coal, now, post-War, with an oil-burning Navy, the Cabinet prohibited even planning for such an eventuality.³ America’s command over oil gave it the power not just to defeat Britain, but also prevented Britain defeating anybody else. Harcourt’s committee started to address the problem in May 1918. Its first recommendation was that Britain secured the Empire’s existing oil reserves.⁴ During the War, aliens had been prohibited from acquiring shares in existing oil companies without the Board of Trade’s consent. Post-War the sale of shares ‘in certain companies not British Controlled, to foreigners’ was allowed. Although not mentioned by name, this clearly referred to RDS. The Admiralty took exception to even

¹80% of this was Burmese oil consumed in India.
²Harcourt Report, March 1919. POWE33/13. (hereafter Harcourt)
³Imperial Conference, 20/6/1921. CAB32/1.
⁴Harcourt recommended the Colonial Secretary carry out a geological survey of the Crown Colonies.
this limited liberalisation, as it could dilute the British component of RDS, and urged a rethink as the ‘naval interest involved appeared paramount.’ Harcourt disagreed, considering the exclusion of foreign investors unwise, as it could invite retaliatory action, particularly by the American government.  

In 1904, the Admiralty had already successfully confined the granting of oil concessions in India and British controlled territories to British subjects. Harcourt tried to persuade the Dominions to introduce prospecting licences. Not to prevent foreigners prospecting, that would create a legitimate grievance, but to restrict licences to plots that were not contiguous to a river or the sea as a form of clandestine control:

The proprietor of oil is therefore obliged to come to Governments for compulsory powers to construct his pipeline through other persons’ land...[,]...and can easily be refused where British control of the undertaking is not shown to exist.  

The delegates to the 1918 Imperial War Conference agreed to recommend Harcourt’s idea to their Governments for ‘serious consideration.’ Ultimately though the Dominions were free to do as they wished and no common Empire policy on oil exploration was implemented. South Africa, New Zealand, Australia and parts of the West Indies had no restrictions on foreign development. India and Trinidad, confined entry to British capital, while Canada and Nigeria took a middle way.  

Harcourt’s aim for British control over as much oil as possible was limited, if by control it meant jurisdiction over petroliferous regions. However, greater financial control over some of the oil companies was possible. Naturally, this aim was not revealed to the world at large. Only RDS had the necessary size, was already partially British owned, and under the right conditions was willing to accept British control. This could be achieved either by enlarging the British shareholding at the expense of the

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5Harcourt suspicions were proved correct when America passed the 1920 Mineral Leasing Act, prohibiting drilling rights to foreign interests of countries that did not practise an Open Door policy.  


7Memo., Harcourt to Imperial War Conference, 4/7/1918. Powe33/13.  

8Harcourt.  

9Davies, British Oil Policy, p. 68.  

10Memo. appointing Harcourt Committee by PM (written by Long), 29/5/1918. Powe33/12.
Dutch, or by expanding the British component in relation to them. Whether the British majority consisted of Government or private shareholders did not appear to trouble Harcourt, which assumed in an emergency British shareholders would inevitably rally around the flag. Although the support for Britain's War effort by RDS had been no less enthusiastic than APOC's, that, post-War, ownership was still considered crucial, demonstrates the success of Slade and Greenway's propaganda. Ironically, the only asset the Government had to tip the scales of RDS shares in Britain's favour was its holding in APOC. Deterding's terms for 51% British ownership of RDS was that RDS would get 49% of APOC, this, the Government rejected.  

The collapse of Turkey, British control of Mesopotamia and the Government's purchase of Deutsche Bank's shares in the Turkish Petroleum Company (TPC) affected a change in RDS's attitude. Without Government backing, RDS would lose out to the Americans, French and APOC in the race for Mesopotamian Oil. It became apparent to Deterding that RDS also required the diplomatic support of a great power to resolve its post-War problems in some of its other oil fields. Negotiations were reopened based on access to Mesopotamia in exchange for British control. The coup that had previously eluded so many came in January 1919, when Deterding and Harcourt initialled a provisional agreement for British ownership of RDS that did not entail the Government sacrificing its APOC holding. (Indeed, the Government increased its APOC holding by £2,000,000 in 1919). In return, RDS gained access to parts of Mesopotamia. Approved by Cabinet in May 1919 the arrangement was, however, stillborn. The complicated nature of Middle East politics frustrated the creation of a clear Government policy towards Mesopotamia and consequently prevented a final settlement with RDS. Deterding's enthusiasm began to wane, and as the negotiations dragged on, he began to reflect on the disadvantages. The recent Anglo-French San Remo (1920) oil agreement had antagonised the Americans, into whose markets and oil fields RDS was also expanding. RDS's recent acquisition of Mexican Eagle could also

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11 Harcourt.

12 Jones, British State, p. 209. RDS was facing serious problems with its Romanian and Russian oil fields.

13 Harcourt.


15 Harcourt.

16 PE to Admiralty, 11/10/1921. ADM116/3452.
be threatened by America if the Company appeared to be under British control. Eventually Government tardiness allowed Deterding to pull out of the arrangement.

The 1919 prediction by the director of the United States Geographical Survey that American oil reserves would be exhausted in ten years had a major impact on American oil policy. Consequently, in the immediate aftermath of the War, both Britain and America were convinced that their future security lay in the exploitation of foreign oil fields. Tensions were heightened by intemperate speeches on both sides of the Atlantic. Long was reported in *The New York Times* as saying to the Institute of Petroleum Technologists, 'if we secure the supplies of oil now available in the world we can do whatever we like.' In London, the American Secretary of State was reported to have said that 'the United States will have to look to Great Britain for much of its oil in the future.'

American exploitation of foreign oil fields was not to ensure a supply once domestic sources had run dry but to fulfil her immediate needs and conserve domestic oil for an emergency, adding even greater immediacy to the task. Fear of domestic exhaustion became 'almost an obsession,' and consequently American companies expected government backing for an 'Open Door' policy, ensuring equal rights for American nationals doing business overseas. From the British perspective, America's policy amounted to keeping all its own oil while demanding equal shares in everyone else's. The Anglo-French San Remo agreement, excluding American companies from the Middle East, became a target for Hughes, Secretary of State in the Harding Administration. At first he refused to recognise the agreement, later adopting a more conciliatory line, which Nash suggests was to secure British co-operation at the Washington Arms Limitation Conference. Whatever his motive, it paid dividends.

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17 Jones, *British State*, pp. 213-7. Jones, 'Oil Companies,' p. 670. By 1918 RDS's American oil production was 27,500 barrels per day in comparison to Standard's (NJ) 18,800.

18 Nash, *US Oil*, p. 43.


22 Unsigned Memo, 9/12/1921. POWE 33/93.

Britain, anxious to retain American goodwill, reciprocated and Standard obtained concessions in Northern Persia. In 1921, Curzon, the Foreign Secretary, tried to lower the temperature by making public a memorandum he had sent to the British Ambassador in Washington explaining Britain’s position. Curzon pointed out that Britain consumed one-sixth the amount per head of population compared to America and relied totally on imported oil. He denied that the British Empire conducted a ‘closed door’ policy; in most parts of the Empire, foreigners were free to operate, and in the parts that restricted ownership to British citizens, the oil produced was insufficient to meet local needs. In contrast, Curzon continued, the US Government, ‘appears to be adopting the very policy, and probably for the same reason, for which Great Britain has been so loudly condemned.’

America’s ‘Open Door’ policy was central to its oil policy. Oil finds in the late 1920s in Bahrain and British Guiana led the American ambassador to seek a statement on British policy on concessions in British territories. In the consequent policy review by the CID fears that a company once granted a concession might prevent exploration to manipulate market prices, were replaced by concern that American companies would ship the petroleum to America for refining. None the less, British companies had already had many years to find oil, and if foreign interests were willing to search for it, it seemed foolish to prevent them as undiscovered oil fields were of no use to anyone. The CID recommended foreign capital should be allowed to search for oil in British territories, with the proviso that if oil was found, 50% was to be refined on British Territory and the refinery should be capable of producing oil suitable for the Navy. The Cabinet endorsed the CID’s findings.

In 1921, the climate again seemed ripe for the creation of an all-British oil company. Greenway’s success in expanding APOC’s sales encouraged RDS to make further proposals to combine the two groups. Cargill endorsed a Burmah Oil memorandum, informing the Board of Trade that ‘I now see the chance of obtaining a

24Nash, US Oil, pp. 43-57.
25'Great Britain’s Oil Policy, Lord Curzon’s Memorandum to America,' 21/4/1921. The Petroleum Times, 9/7/1921.
27CID, 29/91930. CAB 2/5.
28Jones, ‘Oil Companies,’ p. 671.
really effective British control for this great combine. The Admiralty's attitude also shifted, the defence of APOC's independence was maintained, but a fallback position was also prepared - whatever the new arrangement the Admiralty's oil fuel contract should continue with the new company. Since 1914, the price of oil had increased dramatically. The political situation in Persia had become precarious, and the severing of the pipeline during the War had demonstrated its vulnerability. If a new combine could supply oil from numerous sources at the contract price, the Admiralty might support it. However, as regards the scheme on offer the D-of-C had reservations and correctly detected the hand of RDS behind it. He also doubted if the small British majority in the group would make much material difference to supply; it might instead lead to 'further friction with the U. S. A.' The Admiralty's submission to the Cabinet committee that reviewed the proposal took a pragmatic view - 'It does not seem clear to the Admiralty how the combination can actually secure greater British control of oil produced in Foreign Territory.' The oil companies too were aware of the fallacy that underpinned the Government's thinking, but were prepared when opportune to play on it, Cohen wrote:

The whole question of control [is] very largely nonsense. It is a matter of sentiment, but if by transferring control to the Hottentots we could increase our security and our dividends I don't think any of us would hesitate for long.

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29 Cargill to Home (Board of Trade), 31/7/1921. T 161/142 /S12612.

30 D-of-C to Treasury, 22/11/1921. T161/142/S12612. In 1923 the Admiralty had standing contracts for 835-885,000 tons of oil fuel, of which 475,000 tons was with APOC.

31 In 1920 RDS quoted the Admiralty one hundred and fifty shillings per ton, Cohen to D-of-C, 10/9/1920. SHELLGHC/UK/A1/8/1.


33 Memo., for Board, 8/2/1922. ADM167/66.


35 Admiralty views to the Cabinet Committee on Oil Company Amalgamation (hereafter Baldwin), 11/3/1922. T161/142 /S12612.

36 Cohen to August Philips, 27/12/1923, in Jones, 'Oil Companies' p. 671.
Nevertheless the Fourth Sea Lord, Admiral Boyd, objected to the amalgamation because he "was not satisfied that British [ownership] control [could be] effectively arranged." Admiralty opposition was supported by the India Office and the Department of Overseas Trade. The Treasury's view, that the Government should get out of the oil business and sell its APOC shares, received the support of the Foreign Office and Colonial Office - no party though endorsed the original proposal and it was rejected. However, the news of the renewed attempt to create an all-British oil company centred on RDS rekindled American antagonism.

None of the major powers wanted to enter into a financially crippling naval race, but the naval building programmes of Japan and the United States threatened the status quo. The solution was an armament limitation conference in Washington. Success at this conference at minimal cost was vital for Britain, as she could not afford to let the Navy fall into second or even possibly third place. As the first large international conference to be held in America, the hosts, and particularly the conference chairman, Hughes, placed great store in its success. One threat to its success was the Anglo-American oil dispute. Led by Balfour, the British delegation was instructed not to discuss oil, as it did not appear on the agenda. When Pretyman expressed his concerns to the Prime Minister, he was informed:

"Your anxiety as to the possibility of the oil being raised at Washington has been shared by all who know the subject. There has been no indication of this [raising the subject] from the American Government, and they are so anxious for our assistance on making the conference a success that I doubt their being tempted by the Standard Oil people to raise any side issues specially so controversial as this one."

37Baldwin, 7/4/1922. Any amalgamation with no restriction on share ownership might be only temporary.

38Ibid.


41Times, 5/11/1921.

42Lloyd George to Pretyman, 25/11/1921, POWE33/93.
The British Ambassador in Washington reduced the oil dispute to two elements. First, American misunderstanding regarding the Government's role in APOC and its influence over RDS, and second, commercial jealousy of RDS expansion and growth. For the purposes of maintaining good relations with America he thought it prudent that the Government not merge APOC with RDS 'yet awhile.' RDS again was caught in the middle; prevented from reaping the benefits of being British by the Admiralty vetoing a merger with APOC, and, on the other hand, its American rival using American ignorance of its British connections to attack it. For example, Senator Cabot-Lodge claimed in April 1921 that control of RDS was vested in the British Government.

The notion of an all-British oil company was not dead yet though. Cohen still hankered after APOC's Persian oil and in August 1923 approached Churchill, now out of parliament, with a scheme concocted with Burmah Oil along similar lines to the one previously rejected. Financially overextended, Churchill agreed to lobby on RDS's behalf for £5,000. As Ferrier wrote, Churchill 'became the paid hack of those interests which he had previously opposed.' Corley, charitably, argues that Churchill was persuaded by the merits of the case. APOC was going through a lean period; its share price had tumbled from six pounds to two pounds ten shillings. Lord Southborough, an APOC director, was leaking details of board meetings to Churchill. APOCs independence was again under attack, this time by its former ally, and was being...
undermined from within by a director. The Chancellor of Exchequer, Neville Chamberlain, admitted that however strong the case, the Government’s approval hinged on the Admiralty being satisfied with the arrangement.

Aware of this Churchill directed his fire accordingly, writing a lengthy confidential letter to the First Lord, L. S. Amery, to enlist his cooperation. It proved futile; the Admiralty could not be swayed from its support for APOC. However, before the Cabinet could examine the scheme the Prime Minister called and lost a General Election. The incoming Labour Government immediately accepted the Admiralty and Treasury’s advice that the scheme should be ‘unhesitatingly rejected.’ Churchill failed to enter Parliament at that election, but was elected in the October and was appointed Chancellor in Baldwin’s new Conservative administration. To the consternation of Greenway, Baldwin’s return to Downing Street was accompanied by renewed speculation over oil company mergers. To finally put the matter to rest, the Permanent Secretary to the Treasury, Sir Warren Fisher, wrote Greenway in November:

That the Prime Minister desires me to inform you that His Majesty’s Government have no intention of departing from the policy of retaining these shares.

The corrosive effect of the oil issue on Anglo-American relations was negated in 1924 when new oil discoveries in America transformed a potential shortage into a real glut. Naturally, commercial rivalries continued unabated, and Standard, RDS and APOC all invoked the support of their respective governments’ in their struggles with each other.

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52 Ferrier, BP, p. 383.
53 Churchill to Amery, 29/10/1923. CHAR2/128.
54 Board, 10/1/1924. ADM167/69.
55 Memo., Amery to Cabinet, 10/1/1924. ADM116/3452; memo., Snowden, (Chancellor, written by George Barstow, Treasury) to Cabinet, 26/1/1924. ADM1/9799.
57 Greenway wrote the Admiralty for clarification following newspaper articles such as ‘Leave well alone’ Morning Post, 11/12/1924 and ‘Mr. Baldwin and the Oil Shares’ Daily Express, 11/11/1924. ADM1/9799
58 Fisher to Greenway, 14/11/1924. ADM1/9799.
By 1918, APOC was 'unrecognisably stronger.' Its production had increased eight-fold and the quality of its products improved. It had acquired a marketing organisation and a tanker fleet. Greenway, who was to remain Chairman until 1927, implemented ambitious post-War plans that stretched the company's finances almost to breaking point. Although the Admiralty zealously guarded APOC's independence, its relations with the company were not always cordial. Disagreement over the Admiralty's abatement entitlement dragged on until the late twenties. The 1914 contract set the oil price at thirty shillings per ton, and, provided the company made a net profit and paid a dividend of at least 10%, entailed the Admiralty to an abatement on the contract price in the following year of up to a quarter of the net profit, of up to ten shillings per ton. There were a number of points of dispute between the parties; did oil drawn as bunkers fall within the terms of the contract for the calculation of the abatement? During the War the company had been subject to an excess profits tax, so what constituted profit for the basis of the calculation? Was the company's claim for compensation for loss due to readjustment of method of manufacture justified? What, if any, reserve stock should the company maintain? And, should the Admiralty's option to the company's excess production remain? The latter being the most important for APOC in light of the high post-War oil prices; APOC director, Duncan Garrow, wrote in 1920; 'nothing is more certain as the years roll on this [Admiralty] contract will become more and more onerous.'

To discuss all these issues, the Admiralty held a conference with APOC in February 1921. It was not successful, and to resolve matters arbitration, as laid down in the original contract, was resorted to. Mention of arbitration and an examination of the company's books by government accountants, however, had a salutary effect on the company and a number of issues were quickly settled before the arbitrator began work.

Although the level of rebate up to March 1921 was agreed, the Admiralty remained highly suspicious that the company was disbursing its profits among its subsidiaries to avoid paying the rebate. APOC would only permit accountants to

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60 APOC Contract, May 1914. ADM7/948.


62 Correspondence between Treasury Solicitor, D-of-C, Accountant General of the Navy, Spring 1921. ADM116/2318B; memo. D-of-C, 7/6/1923. ADM116/2318B. In 1925 fifteen companies comprised the
examine the books of the companies administered from London. For 1922/23 the company offered a rebate of five shilling and four pence per ton when the Admiralty calculated the full ten shillings was due. Before this was resolved, APOC announced no rebate for 1923/24. At the time, the company needed every penny to finance its expansion and under the contract the Admiralty was paying about half the current market price even before receiving any rebate. The dispute rumbled on for years with the Admiralty convinced that the company were "excreting every effort and seeking every device to pare down the rebate." By 1926, no rebate had been agreed for the previous three years. To end the impasse, following the D-of-C's threat to go to arbitration again, the company offered £466,000 in full settlement. As it was more than the Admiralty anticipated, it was agreed to.

Both parties were dissatisfied with the rebate arrangement and wanted a new simpler pricing structure. The contract, unless terminated by the Admiralty after 1934, could remain in force until 1961, the whole period of the Company's Persian concession. The high oil prices of the early twenties had fallen by the end of the decade to an abnormally low level. An ideal time, the D-of-C thought, to replace the abatement arrangement with a fixed price system; in response, in 1927 APOC offered twenty-two shillings a ton. The D-of-C recommended acceptance to the Treasury. The Secretary to the Admiralty, not wishing to jeopardise the Admiralty's objective of keeping APOC independent thought the Admiralty should refrain from driving too hard a bargain. He recommended fixing the price for ten years, rather than thirty-four, giving both parties a fair deal and the company a guaranteed income on which to base its expansion plans vital for fending off RDS and Standard. The Treasury agreed and confirmed the arrangement. In the event this price held for just six years, as the company was forced

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APOC. Government directors did not sit on the boards of all the subsidiary companies as some were not registered in the UK.

63 Treasury Solicitor to Secretary of the Admiralty, 4/9/1923. ADM 116/2318B.
64 Memo., D-of-C, 20/1/1925. ADM116/2318B.
66 Correspondence between APOC and Admiralty, 1927. ADM116/2318C.
67 Memo. Secretary of the Admiralty, 30/11/1927. ADM116/2318C.
68 Note D-of-C, 6/3/1928. ADM116/2318C.
to make further reductions during the Depression; from 1934/35 until 1938/39 the Admiralty paid twenty two-shillings for the first 300,000 tons per annum and twenty shillings per ton for the contracted balance of 200,000 tons.\(^{69}\)

On their own long-term contracts could not ensure supply. The late twenties saw a rise in Persian nationalism, and the company could not afford to ignore the volatile political situation, Greenway's successor, Sir John Cadman, planned to grant the Persians a greater role in the company in exchange for a twenty-year extension to the concession.\(^{70}\) Cadman explained his proposals to the Government, which agreed to support him, provided it included an extension of the Admiralty contract and safeguarded its terms.\(^{71}\) However, he failed to reach agreement before the deteriorating economic climate led the Persians to withdraw all previous offers. Frustrated by four years of futile talks, in November 1932 the Shah of Persia cancelled the company's concession. The Government, particularly the Foreign Office, favoured a robust response to force the Shah to back down. Cadman chose to follow a conciliatory approach, which allowed APOC to retain control over its assets and carry on with oil production. Eventually in April 1933 Cadman reached a new agreement that extend the concession to 1993, albeit over a reduced area. In 1935, to reflect the changes in Persia APOC changed its name to the Anglo-Iranian Oil Company (AIOC). Relations between the company and a resurgent Iran remained bumpy throughout the thirties, however Cadman skilfully managed to smooth over disagreements and maintain oil supplies.\(^{72}\)

In 1927, oil was discovered in Iraq and a pipeline from Iraq to the Mediterranean was contemplated. When completed it would relieve tankers delivering to Europe the 3,200-mile voyage down the Gulf of Oman and up the Red Sea, as well as the heavy burden of Canal tolls (£900,000 in 1927). However, the Iraqi concession was in the hands of the TPC, which was only 31.375%, British, the remainder was owned by RDS, French and American oil companies.\(^{73}\) Exactly where on the Mediterranean coast the pipeline would terminate was a matter of particular concern to the Navy. Conscious of

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\(^{69}\) Memo., June 1941. ADM116/4668.

\(^{70}\) Ferrier, BP, p. 588-631.

\(^{71}\) Conference of Ministers, 20/11/1928. CAB 21/261.


\(^{73}\) Monroe, Middle East, p. 101.
the strategic value of Iraq's oil Cadman contacted the Admiralty to get their opinion, 'from the sole point of view of naval interests, [where] the oil from these fields should be brought to the sea by pipeline.' From the security perspective egress in the Persian Gulf, avoiding French territory was safest. The decisive factor for the Director of Plans (D-of-P) was tanker availability, saving twenty-seven days on the round trip to Abadan tipped the scales in favour of Palestine, and as the DNI noted as 'we already have the Persian outlet,' it was important to have a second outlet 'on the “home” side of the Suez Canal.' Reducing reliance on the goodwill of Iran at a time of increasing nationalism was thought advisable too.

The Oil Board (OB) also examined the strategic implications of the pipeline, estimating that if the pipeline terminated at Haifa Britain would have access to at least 2,000,000 tons of petroleum per annum, 10% of her estimated wartime needs as of 1937. If, however, it terminated at a Syrian port under French control, Britain could not rely on any. Consequently, the route became the subject of fierce wrangling involving the Governments of Britain, France and Iraq, as well as board members of the TPC. The solution was simple; two terminals of equal capacity, one at Haifa and one at Tripoli in French Syria. Although petroleum commenced flowing through the pipeline in 1934, until a refinery was completed at Haifa it was unsuitable for naval fuel, and from the C-in-C Mediterranean's point of view, became just one more port to protect. Hope of a refinery lay behind the Admiralty's support for the terminal at Haifa, AIOC though were 'indifferent' about it, and there was no prospect of the Iraq Petroleum Company (IPC), TPC's successor, building one. If, for strategic reasons, the Colonial Office inquired, the Admiralty wanted a refinery, they would encourage AIOC

75Kent, Moguls and Mandarin, p. 156.
76CID 234th, 29/3/1927. CAB2/5. See below re. OB.
78Colonial Office to Cabinet, C. P 80 (29), March 1929. CHAR22/230. This gives the history to date, from the British perspective. See also ADM116/2692.
81Chiefs of Staff Sub-Committee paper C.O.S. 151, May 1928. CAB53/16.
to build one. It is not clear who was manipulating who; Cadman, who knew the Navy wanted a refinery and used it to secure concessions from the Colonial Office and the Palestinian Government, or the Navy, who used the Colonial authorities to entice AIOC to do its bidding. After prolonged negotiations AIOC finally constructed a refinery at Haifa and for the privilege signed a pre-emption agreement granting the Admiralty first call on all its stock and production in an emergency. The agreement was extended in 1937 to include RDS, when it took a 50% share in an enlarged refinery. Its completion however, was not contemplated before the autumn of 1940.

Post-War the APOC contract was the foundation of the Navy's oil supplies and it increased its take by 50,000 tons per annum until 1923/24 when it contracted to take the maximum 500,000 tons per annum. In 1921, the Admiralty required 1,550,000 tons of oil for steaming and the reserve; under standing contracts, 765,000 tons of oil was available from Persia, Mexico, Trinidad, Burmah and Borneo. The balance had to be purchased on the open market but with certain, sometimes conflicting, provisos. Preferably, it had to be cheap, not paid for in US dollars and a substantial amount had to be suitable for mixing with the heavy Mexican oil and Persian oils. Only Texas and Borneo oils were suitable for mixing, Texas meant dollar expenditure and although some Borneo was used in the Far East, most was sent to Britain as an admixture involving high transportation costs. By 1924, there were at least fourteen oils and oil mixtures acceptable for issue to the Navy as furnace oil. Some were also suitable for use in diesel; more were reserved exclusively for diesels.

When commanding the BCF during the War Pakenham commented on the operational drawbacks of using mixed oils, pointing out that different oils and mixtures had different calorific values; best was Texas at 14.79 lbs and worst was creosote at 12

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82 Correspondence between the Admiralty, Petroleum Department, Government director of APOC and Colonial Office, 1934. ADM116/3999.

83 Admiralty and APOC pre-emption agreement November 1935. ADM116/3999; Admiralty memo. on Haifa Refinery, OB 203, 15/6/1937. CAB50/6.

84 APOC to Colonial Office, 13/1/1937. ADM116/3999.

85 Memo., Garrow, APOC Director. 23/6/1920. BP78503.


87 Appendix 6.
lbs. He accepted that wartime conditions made mixtures inevitable, but was concerned that if issued with an inferior oil his ships would be unable to attain their maximum speed. Moreover, as ships refuelled, over time, they would have different oils in each of their bunkers, and ‘in no boiler is best combustion obtained until after experience which may no longer hold good when a new tank is drawn upon.’ His immediate solution was that each vessel should maintain adequate stocks of Texas oil ‘for a long full speed run’. In the longer term, he called for the greater standardisation of mixtures and better-designed boilers able to achieve full power on mixed fuels.⁸⁹

Non-renewal of the Mexico contract simplified the supply situation post-War. It also allowed the Government to adopt a more relaxed attitude when the Mexicans nationalised their oil fields in 1938.⁹⁰ From 1929, two large contracts, APOC’s and Trinidad Leasehold’s, totalling 830,000 tons per annum, covered the major portion of the Navy’s fuel requirements. Trinidad oil was suitable for direct issue to warships and the quality of Persian had improved following improvements at Abadan and the opening of the Swansea refinery.⁹¹ All naval oil fuel imported into Britain from 1932 (and probably from at least 1929) until 1939 came from either Persia (54%) or Trinidad (46%).⁹² In 1932, for example, APOC sold 559,819 tons of oil fuel to the Admiralty⁹³ of which 138,110 tons was landed in Britain.⁹⁴ Less a small quantity the East Indies Station and 56,000 tons for tankers’ bunkers, the balance was used in the Mediterranean (there was no addition to the reserve that year).⁹⁵

The War had shown the greatest impediment to oil supplies was the limited capacity of the oil industry’s infrastructure, especially a shortage of tankers. Ownership of APOC had not produced any advantage for the Admiralty in its wartime dealings

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⁸⁸The weight of water one pound of oil can boil.


⁹¹Admiralty to Treasury, 29/8/1929. T161/963/S17116/3. The small Burmah Oil contract for 10,000 tons was still in force, and around 50,000 tons per annum was obtained by ad hoc local purchases, plus just over 26,000 tons of Californian distillate or shale oil for submarines.

⁹²Appendix 16.

⁹³Appendix 13.

⁹⁴POWE33/212.

compared to RDS. Physical control was far more important than share ownership as RDS discovered to its cost when the Bolsheviks nationalised its Russian oil fields.\footnote{Clarke (Petroleum Department), to Lloyd Grahame (Department of Overseas Trade), 25/10/1921. POWER33/92.} None the less in lieu of physical control, financial control was seen as better than nothing and the Government, with Harcourt’s blessing, persisted in trying to create an all-British oil company to break away from reliance on American oil. Until alternative sources of oil could be found and developed, any British foreign and defence policy was obliged to take into account America’s reaction, a fact British policy makers were happy to keep quiet about. This also weakens the case of those scholars who maintain Britain was the only truly global power in the 1920s because she ‘still possessed the world’s largest and most modern fleet.’\footnote{Christopher Bell, The Royal Navy, Seapower and Strategy Between the Wars, (Stanford: SUP, 2000), p. 25. Another scholar that ignores the debilitating effect of dependence on America oil in the 1920s is John Robert Ferris in Men, Money and Diplomacy (Ithaca: Cornell UP, 1989).} A navy’s power is far more than the sum of its ships, and to ignore other contributory factors can lead to simplistic and erroneous assertions.

The oil companies realised national ownership of a trans-national companies held scant advantage for the Government and was a double-edged sword for themselves. The only release from bondage to America oil was non-American oil not an all-British company. However, while the all-British oil company remained on the agenda the Admiralty had a significant say in national oil policy formulation, indeed in some aspects a veto. Once it realised physical control alone could guarantee supplies the Admiralty’s support of APOC became support of the APOC-Admiralty contract and the Persian concession. Nevertheless, without the Admiralty’s support at some point in the 1920s RDS would have swallowed up APOC. Ultimately the Admiralty’s power came of course from its defence role, but its post-War position as a consumer remained significant. No longer the largest British consumer of petroleum products, it was still, nevertheless a very substantial one, and in 1921, 20% of all petroleum products imported into Britain were for naval purposes.\footnote{Admiralty views to the Cabinet Committee on Oil Company Amalgamation, 11/3/1922. T161/142/S12612. Total imports of all petroleum products were 4,435,702 tons of which 883,511 tons were naval oil fuel.}

Despite owning APOC, as the abatement dispute shows, what little say the Government had in its running was, if possible, circumvented. Originally touted as a method to prevent the Navy paying too much, in reality abatements provided the
company with interest free loans. From a purely financial perspective, by 1919 interest and dividends payments had already exceeded the Government's original investment. After Greenway retired as Chairman Admiralty-APOC relations improved. Although Cadman preferred cooperation, he proved just as adept as Greenway in securing Government help when necessary.

\*The Government received £4,665,000 in interest and dividend payments alone from APOC up to 31/3/1919. CHAR2/107.
Chapter Nine

Naval Oil Reserves 1919-39

As the War drew to a close, the question of post-War oil supplies was addressed by the Admiralty. In the previous chapters, we have seen how the ‘all-British’ oil company continued to be regarded as one solution. This chapter examines the other strategy adopted by the Admiralty to ensure wartime oil supplies, the creation of a large oil reserve, and how the Admiralty arrived at and justified its size; along with the Treasury’s objections and level of success in restricting its size in the 1920s and early 1930s. It then goes on to look at the Admiralty’s underground storage programme of the late 1930s.

Instructed by the Board to use the 1914-15 estimates as the ‘arbitrary and hypothetical’ basis for post-War planning, the Admiralty Reconstruction Committee (ARC) submitted a memorandum in October 1918 on post-War fuel requirements.1 Admitting its recommendations could only be conjectural before the War finished, it nevertheless felt confident enough to make certain assumptions. The main one being that oil would inevitably supplant coal, first in the Navy and eventually in the Merchant Marine. Both services would require bunkering facilities throughout the Empire and a three months’ stock was necessary overseas.2 The degree to which the Navy could rely on commercial stocks would depend on the specification of the fuel. It was therefore thought ‘important to stipulate that the stocks laid down should conform as nearly as possible to the Admiralty specification.’3

Parallel with the ARC’s examination, the First Lord, Admiral Wemyss, asked the Fourth Sea Lord and Civil Lord to ‘set forth their views upon the various aspects of the Oil situation.’4 They responded that, apart from America, Persia was the only source of large quantities of oil, but in wartime it would be insufficient and they saw no

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2 ADM 167/53.
3 ADM 167/57.
4 ADM 167/53.
'alternative to a very large reserve.' Regarding the size of the future home reserve, the D-of-S stated in a memorandum for the Board that in 1912:

[T]he maximum standard advocated was the equivalent of 12 months' war expenditure, but the war was in fact started with a standard equivalent to only six months' war expenditure.⁴

Although not inaccurate and rather innocuous, the D-of-S continued on the assumption that the standard advocated in 1912 should be the basis for any post-War calculations, although he admitted it was never accepted. He neglected to mention that the actual policy in 1912 was four months' reserve, which had been increased to 'only' six months in 1914. With this tergiversation, the D-of-S guided the Board into adopting the policy of creating an oil reserve equal to twelve months' wartime consumption, and set the agenda for the next twenty years. Although post-War the Navy had a better idea of what constituted wartime consumption, a new variable entered the calculation - the size of the fleet. Before this was settled though, the D-of-S forecast that an oil reserve of 4,500,000 tons would be required in Britain, and with only 1,750,000 tons of storage available it would involve the construction of 2,750,000 tons of tankage. For a nation impoverished by war his proposal was utterly unrealistic, nevertheless the Fourth Sea Lord wrote:

I am strongly of the opinion that it is most necessary that we should have a large reserve of oil fuel, in my opinion this should not be less than twelve months, on the basis of wartime expenditure. At present we are so largely dependent on the USA that they have the power to place this country in an impossible position, should they desire to be unfriendly.⁷

The Board approved the D-of-S's proposal,⁸ as well as the ARC's recommendation for three months' oil reserve at various colonial ports sufficient for two battlecruisers and

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⁴Memo. ⁴th and Civil Lords, December 1918. ADM167/57. There also remained a residue of hope that home production might still produce the goods.

⁶Admiralty memo. Oil Fuel, 23/12/1918. ADM167/55.

⁷Ibid.

⁸Board, 28/12/1918. ADM167/54.
six light cruisers, amounting to an additional 336,000 tons of oil and 290,000 tons of storage.9 Cleary the Board did not fully appreciate the need for economy. 

The policy received a boost in January 1919 with the appointment of Long as First Lord. As he had been in charge of national oil policy for the last eighteen months, his support for a twelve months' reserve was difficult to challenge in Cabinet. Long was also cognisant of the dire financial situation, and advised the Cabinet:

[I]t was not possible to furnish accurate figures until the future standard of the navy was decided on, but in all probability the expenditure, spread over a considerable period, would not be more than about £400,000 a year.10

Wisely, Long sought approval for a large reserve in principle rather than for its immediate creation, and he did not object to the Chancellor suggesting that any spending decisions would be subjected to further consideration with the estimates later in the year. His conciliatory approach succeeded and the Admiralty's recommendation of a twelve months' oil reserve received Cabinet approval.11

One immediate post-War challenge for the Admiralty was to regain control over its fuel supplies from the plethora of wartime organisations. As the country slowly adjusted to peacetime the same Admiralty departments that had managed fuel supplies pre-War assumed the responsibility again.12 As the number of vessels determined the fuel required, the oil question could not be settled until the size and disposition of the post-War fleet had been settled. On the other hand, fuel costs were a significant factor in a vessel's overall running costs and therefore a factor in determining the number of vessels - particularly how many would be in full commission. For example, a Queen Elizabeth Class battleship burnt £61,000 worth of oil per annum in commission with the Atlantic Fleet, but only £12,200 in the Reserve Fleet.13 Reductions in the overall size of the fleet would though have disproportionally less impact on oil consumption, as the brunt of any reductions would be borne by the older coal-burning vessels.

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9Board, 31/10/1918. ADM167/54.
10Cabinet, 17/1/1919. T1/12344.
11Ibid.
12Admiralty memo., 21/2/1919. ADM167/57.
13Memo., Estimate Annual Cost of up keep of Certain Vessels, 1919. ADM167/59.
Placing vessels in reserve was regarded as the only feasible way to save significantly on oil consumption.\textsuperscript{14}

With no political guidance, the Admiralty's version of the post-War fleet in February 1919 - namely thirty-nine capital ships, sixty-five cruisers and 318 destroyers - was massive, and unacceptable to the Treasury.\textsuperscript{15} After learning of the difficulty in implementing economies 'until it was known what specific duties the Navy of the future would have to perform,' the Cabinet decided, in August 1919, that plans should be based on the assumption that there would be no major war within the next ten years.\textsuperscript{16} Naval expenditure was to be cut back to the pre-War level. Long explained to the Board that this was to prevent any comparison with the USN, which had been omitted in pre-War comparisons and against whom war was unthinkable.\textsuperscript{17}

Although the Dominion Prime Ministers rejected the Admiralty's notion of a unified Imperial Navy they, nevertheless, requested advice on naval matters, and in February 1919 Jellicoe was despatched to advise India and the Dominions.\textsuperscript{18} His sojourn lasted eighteen months, and, like those of the ARC, Jellicoe's recommendations were made in a strategic vacuum. He identified Japan as the greatest threat to Imperial security because it had a Navy, and recommended accordingly.\textsuperscript{19} For Pacific operations he envisaged the main fleet operating from Northern Australia,\textsuperscript{20} and suggested that a fuel reserve of 138,104 tons of coal, and 415,230 tons of oil be created in the Pacific region.\textsuperscript{21} Considering Jellicoe's recommendations unrealistic, and with any significant financial contributions from the Dominions unlikely, the Admiralty shelved them.

\textsuperscript{14}Memo., 24/1/1919. ADM1/8549/18.

\textsuperscript{15}McDonald, Naval Policy, p. 142.


\textsuperscript{17}Board, 18/8/1919. ADM167/56.

\textsuperscript{18}Resolution of the Imperial War Conference, 30/3/1917. ADM116/1831.


\textsuperscript{20}Jellicoe Report Chapter VIII, p. 147. ADM116/1834.

Independently of Jellicoe, the Admiralty formulated its own plan for the defence of the Far East. The D-of-P also thought the Japanese posed the greatest potential threat and contemplated Sydney and/or Singapore as the primary fleet base and ‘a train of supply and fuel ships on a large scale.’ Hong Kong would be useful as a submarine base but would ‘be an embarrassment as a naval base.’ In May 1920, Singapore was selected as the main fleet base for Far East operations.

Control over commercial coalbunkers was a major factor in British sea power. The First Sea Lord Admiral Beatty wrote ‘If we lost it, half our sea power is gone and our position may become a precarious one.’ He calculated that if 75% of large commercial vessels burnt oil by 1930, a twelve months’ supply for them would amount to 1,500,000 tons. The Admiralty anticipated the oil companies would be unwilling to maintain stocks or accommodation in ‘excess of a few months’ turn over,’ and recommended that, in addition to the naval reserve, the Government maintain an oil reserve of twelve months’ commercial usage ‘at home and each important bunkering station abroad,’ as the nation’s tanker fleet was considered incapable of fulfilling its wartime obligations. Failure to agree a common oil specification for warships and merchant vessels reinforced the Admiralty’s view that unless an extra merchant reserve was created in wartime merchantmen would deplete naval stocks, while commercial stocks would be unsuitable for naval use. In retrospect, the calculation was extravagant as over 60% of the world’s merchant marine still relied on coal in 1930.

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26 Ibid.


28 Baddeley (Admiralty Assistant Secretary for Finance) to Treasury, 21/7/1921. T161/455. It was common practice at this time, to the tune of around 100,000 tons per annum, for merchant vessels to draw on naval stocks in certain ports. Initially the Admiralty charged the market price, but after the summer of 1920 charged ten shillings per ton extra to discourage the practice and so as not to be seen as competing with commercial suppliers.

The Cabinet, having previously agreed to a twelve months' naval oil reserve, was merely informed by Long, in the 1920/21 estimates, that this amount to 4,500,000 tons and that the Admiralty wished, in order to save money, to acquire it over a ten-year period, commencing in 1919. The reserve already stood at 1,400,000 tons, therefore 3,100,000 tons needed to be acquired at a rate of 310,000 tons per annum, and due to limited storage, no additions had been made in 1919/20. To appease the Treasury, which had suggested that no addition be made for a further year, Long made provision for only 300,000 tons (£1,681,000), and warned that if no oil were purchased:

'[O]f the 1,400,000 [tons] already in reserve, 260,000 would not be available for Fleet purposes at the end of the year in case of emergency, as large quantities of the Oil we buy have to be mixed with Texas Oil or with Texas and Creosote to make it usable.'

If further restrictions to the Admiralty's 'extremely moderate programme' were demanded his bottom line was 200,000 tons this year to be compensated for next year by 400,000 tons, when oil prices would most probably be higher. The Cabinet approved 200,000 tons, with no commitment for the following year.

Reserves were treated separately from consumption as regards policy, but not as regards purchases. For 1920/21 the total oil budget was £4,660,000, enough, it was hoped, to buy 1,260,000 tons. However, in June 1921 the price of Texas oil reached 207 shillings per ton. Tough market conditions prompted the Admiralty to seek extra money from the Treasury in order to snap up bargains without waiting for Treasury approval. The Treasury agreed and made a further £700,000 available, but, in order to save on scarce dollars, not for American oil, and despite savings in other Admiralty votes, a supplementary of £1,063,000 was eventually required for fuel. The actual

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30 Long to Cabinet, 20/2/1920. ADM167/60
31 Ibid.
33 Ibid.
34 Treasury to Baddeley, 3/7/1920. T161/455.
amount spent on all fuels exceeded the original estimate of £10,462,000 (11.8% of estimated effective services), by £3,905,861 (13.7% of gross effective services). With prices so high the 1921/22 fuel budget was going to necessitate tough negotiations. The campaign opened early in November 1920, with the Admiralty informing the Treasury that 1,550,000 tons were needed. Having recently purchased Texas at a ‘specially favourable’ price of 138 shillings per ton the Admiralty sought leave to extend its freedom to make one off opportune purchases into 1921/22. However, the Cabinet Finance Committee placed a £60,000,000 limit on naval spending (exclusive of capital ship construction). Following negotiations the restriction was raised to £80,000,000, but the Treasury was reluctant to make any commitment until it had seen the Admiralty’s planned economies. At the same time the size of the Navy was set at a ‘one power standard,’ effectively equal to the United States, and slightly greater than Japan and the largest European navy combined. The estimate for fuel was much the same as the previous year, but early indications predicted an overshoot of £4,000,000. In response, the First Lord presented a supplementary in August 1921. When this proved unnecessary, as fuel came in underspent by £1,000,000, the Cabinet appointed the Committee on National Expenditure, chaired by the former First Lord Sir Eric Geddes, to examine naval spending. It recommended drastic cuts.


37Board, 22/1/1920. ADM167/63 The estimated Exchequer grant for 1920/21 had been £90,872,300: The net expenditure, unknown at this meeting, exceeded the grant by £1,632,990. Comptroller’s report for 1920/21.

38The actual net expenditure was £75,986,141. Comptroller’s Report for 1921/22.

39Note agreed to by Barstow, 25/1/1921. T161/455


41Estimates and Comptroller’s report for 1921-22. Net spending on all fuels was £9,317,776.

42The majority of the supplementary of £1,095,000 was for wages, it did not include provision for fuel; Roskill, Naval Policy, p. 230-231.
Notwithstanding the austere financial climate, the Admiralty increased its oil requirements in May 1921 to take into account possible fleet operations in the Far East and the adoption of the one power standard. In a paper for the Board, the Deputy Chief of Naval Staff (DCNS), Vice Admiral O. de B. Brock, argued that with a smaller fleet mobility was more crucial than ever, and 'must therefore be the keystone of British Naval Strategy.' Only 'adequate fuelling arrangements on the main lines of communication and supplies' could ensure mobility. Brock was sanguine about the home reserve, which although nowhere near completion, did have Cabinet approval. The chief cause of his consternation was the route East:

Until the reserves recommended in this paper are well under way we shall be unable to send a fleet to the Far East at short notice or to maintain it there on a war footing after arrival.  

As the approved home reserve was not intended for fleet operations outside European waters he suggested the twelve months' reserve principle be extended so:

(a) That in all probable main theatres of operations a year's supply of fuel for the fleet to be employed in that area should be available within practicable transport distance of the bases at which it will be required.
(b) That after taking into account of the amount available from oilfields of which the safety is assured and from which transport arrangements are practicable, the balance should be made up by reserves stocks.

He applied his principles to three scenarios; war with a European power, war with America or war with Japan. For the first case, the home reserve was thought sufficient. For an Anglo-American conflict 660,000 additional tons of oil would be required in Canada and the West Indies. For an Anglo-Japanese war (or an American-Japanese war), an extra reserve of 3,500,000 tons was needed overseas. For the purposes of calculation, a completion date of 1930 was put forward, based on the Cabinet's 'ten year' ruling. Still awaiting the Cabinet's decision on the proposed mercantile oil reserve, the Board supported the DCNS's paper and requested Cabinet approval to

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43Memo., DCNS, Oil Fuel Reserves, 24/5/1921. ADM167/64, ADM 1/8607/102 and ADM116/3102.
44Ibid.
45Ibid.
commence forthwith a programme of tank construction to complete the provision for
the whole amount [over 9,000,000 tons] by 1930." As it was improbable, that with
some 2,000,000 tons already in stock, the Treasury would allow more than the
minimum suggested by Admiralty, the Board effectively shot itself in the foot by
recommending that not less than 500,000 tons per annum be added to the reserve,
extending completion by four years. With minor alterations, the DCNS’s paper went to
the CID without any cost implications.47

In a memorandum to the Chancellor of the Exchequer, Sir R. S. Horne, Barstow
questioned every aspect of the Admiralty’s submission. Justification of a year’s war
usage at home, he argued, was based on war with the USA and the assumption that
Britain relied on the USA for oil. Moreover, if it is not for a war with America, why a
year as ‘we need be under little apprehension that she will decline as a neutral to supply
us with oil fuel?’ Unless relations with the US deteriorated further, Barstow suggested,
six months’ was adequate; which was, coincidently, what would roughly be in stock at
the end of the financial year. The second six months, if required at all, he suggested
could be accumulated slowly, at 100,000 tons a year over the next twenty-five years.
Turning next to the overseas scheme, 500,000 tons at Bermuda may correspond with the
‘sound maxim that offence is the truest defence,’ however, for Britain to put herself in a
position to attack the USA was, he thought, wrong:

There will be no inconsiderable section of the public who will
regard the whole proceeding as folly and wickedness, and as
part of a general policy of embarking on an era of competitive
armament and naval rivalry with a new and very formidable
power. But apart from ethical consideration, financial
consideration must surely prohibit such enterprise for many
years.48

The Far East plans did not escape Barstow’s censure. He thought: ‘the whole policy is
based on the assumption of unprovoked attack by Japan, our ally, upon Australia, [with

46Board, 26/5/1921. ADM167/63. 9,000,000 is the combined total of the home (4,000,000), mercantile
(1,500,000) and overseas (3,500,000) reserves.

47CID paper145-C, June 1921. ADM116/3102 and CAB 5/4. The mercantile reserve was reduced from
1,500,000 tons in the previous paper already before Cabinet, to 1,000,000 tons. 500,000 tons in the UK,
300,000 tons at Malta and 200,000 tons at Colombo. Lord Lee of Farnham FL 13/2/1921-23/10/1922.

the USA remaining neutral.' The Admiralty's memorandum on the merchant shipping reserve that had been languishing in the Cabinet Finance Committee's in tray for eighteen months, was, he contemplated, 'even more in the realm of hypothesis than the naval reserve proposals.' Warren Fisher added

In no direction do the Admiralty evidence the least intention of considering the facts of today as they are. New construction, oil reserves, naval works — these and everything else the Admiralty must have on a scale of which they are the sole arbiters, relying on "Rule Britannia" sentiment to see them thro [sic], and with sublime indifference to the circumstances of the kinds obtaining in 1921-22 as compared with 1913-14.50

The CID did not greet the DCNS's paper with alacrity either. Recalling his days as First Lord, Churchill, now Secretary of State for the Colonies, was sympathetic to the scheme but had 'always been in favour of making moderate demands for reserves so that the proposals should not be negatived on financial grounds.' He suggested the period of acquisition be extended or the total reduced, and observed that no account had been taken of replenishing the reserves during the first year of war, 'as our existence depended on the command of the sea it was reasonable to anticipate that some renewal of supplies would be forthcoming.' The DCNS reported that oil for the Singapore route would cost £17,500,000.51 Home asked the Admiralty to re-examine its proposal in light of the CID's discussion, provision for the reserve was accepted in principle, and the maximum annual amount devoted to it set at £1,500,000.52 The Admiralty's subsequent re-examination deleted the commercial reserve, provision for an Anglo-American conflict and suspended augmenting the home reserve while a reduced overseas reserve of 2,713,000 tons was completed over the next seven years. When the CID's deliberations resumed, the First Sea Lord explained that the Admiralty had taken regular replenishment into account because without it the total reserve would only last for four months and the great distances necessitated that 33% of the oil be expended in

49Ibid.

50Ibid. Appended by Warren Fisher, 1919-1939, 6/7/1921

51Using DCNS's figures, the whole scheme would cost £63,000,000. The Treasury's rough estimate was £81,000,000, based on £6 per ton. Barstow to Home, 4/7/1921. T161/963/S 17116/1.

52CID, 22/7/1921. CAB2/3.
bunkers for tankers. However, the revised proposal, which was the minimum the Naval Staff would accept as it 'meant incurring a certain amount of risk,' still cost £2,000,000 per annum. In Horne's absence, further Treasury objections were muted, and anyway it thought as the Admiralty had insufficient tankage to accept the oil it would be unable spend all the money within the current financial year.

Once the outcome of the Washington Treaty was clear, the Geddes Committee on National Expenditure sought substantial savings from the fuel budget. A Cabinet committee chaired by Churchill examined Geddes' recommendations, and it too recommended savings - to the tune of £1,500,000. A fortuitous reduction in the price of oil came to the Admiralty's aid, allowing a revised programme to be put to the CID in July 1922 that met the proposed savings. The Admiralty even reintroduced the commercial reserve, but deferred it to allow for a concentrated effort on oil for the route east to enable a fleet to be sent to Singapore in 1925, although on arrival it would not have 'freedom of action.' After 1925 two alternatives were presented, completion of the full amount by 1929 or 1931. With hostilities with Japan considered unlikely in the near future the CID counselled that the 1923/24 estimates be framed with a view to the programme being completed by 1931.

Considering the overall reserve, in the August, Churchill's expenditure committee recommended that £2,396,000 should be included for oil in the 1923/24 estimates, and in future years, it should be set at £3,000,000 and linked with naval works. As a number of works' annuities lapsed in 1924, a greater proportion of the £3,000,000 could then be devoted to oil until completion of the eastern route in 1931.

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53 Naval Staff Paper, Naval Oil Fuel Reserves, CID147-C, 26/7/1921. CABS/4.
54 CID, 28/7/1921. CAB2/3; Barstow to Horne, 28/7/1921. T161/963/S17116/1. Even with the hoped for 700,000 tons provided by the Dominions, the Admiralty's figures could only balance the price of oil went down to £5 per ton.
56 Board, 27/1/1922. ADM167/65.
57 Board memo., undated (1922) ADM167/66. The Admiralty in fact accepted more than the £1,500,000 proposed reduction. The provision for fuel, £4,082,000, in the 1922/23 (vote 8 II k1) estimates was less then half the previous year. For example in March 1923 RDS offered oil at sixty shillings f.o.b. Borneo. D-of-C to Cohen, 16/3/1923. SHELL GHC/UK/A1/11/1. In 1920, the Admiralty was quoted 150 shillings per ton, Cohen to D-of-C, 10/9/1920, SHELL GHC/UK/A1/8/1. Understandably, the Admiralty wanted to terminate its long-term contracts and buy annually at the best price available.
and the home reserve in 1937. This way future estimates would show no overall increase due to the creation of the oil reserve.\(^{59}\) In December, when the CID next discussed the topic, Churchill was out of office and the financial aspect of his scheme was not accepted, although the timescale was.\(^{60}\)

At the same time, reductions in the costs of material and labour allowed over £1,000,000 to be saved on construction of approved storage. To the Treasury's annoyance, the Admiralty attempted to use the savings to accelerate work on both the eastern and home schemes without its approval.\(^{61}\) First Lord Amery decided that the 'unnecessary complexity' of having a home, overseas and commercial reserve should be removed; all three were 'interlocked' and should be treated as one.\(^{62}\) Henceforth, he informed the Treasury, the Admiralty would only refer to the total figure - 8,139,000 tons - in respect to the reserve. Its distribution 'will of course come up for review in the light of strategic requirements year by year.' As the reserve was now 400,000 tons behind schedule, in future 'we must increase our stock at a rate of over 500,000 tons per annum.'\(^{63}\)

Amery's pugnacity earned him plaudits in the Admiralty, but at the Treasury, the Financial Secretary could 'not recall such an instance of bare faced effrontery.'\(^{64}\) Ultimately, Amery's attitude proved counterproductive, it put the Treasury's back up and encouraged it to question the validity of the policy as well as financially constraining it.

The Chancellor, Neville Chamberlain, was bewildered why the Admiralty needed a 8,139,000 tons reserve at all, and why in the event of a war in the Far East 4,500,000 tons were required in Britain.\(^{65}\) He considered six months' home reserve

\(^{59}\)CID paper 183-C, 6/12/1922. CAB5/5. Under this scheme the eastern route reserve would be completed in 1931.

\(^{60}\)CID, 14/12/1922. CAB2/3. Lloyd George's Coalition Government was replaced by Bonar Law's (after 22/5/1923 Stanley Baldwin's) Conservative administration 23/10/1922.

\(^{61}\)Admiralty Civil Engineer in Chief to Treasury, 25/4/1923. T161/963/S7116/1.

\(^{62}\)Amery FL 24/10/1922-21/1/1924.

\(^{63}\)Amery to Chamberlain, 11/10/1923. T161/963/S17116/1 and ADM1/8673/234.

\(^{64}\)Roskill, Naval Policy, vol. 1, p. 33; Joynson-Hicks to the Secretary of the Navy, 24/8/1923. T161/963 /S7116/1. Joynson-Hicks was the only interwar Financial Secretary to the Treasury to sit in the Cabinet. He moved to the Department of Health 27/8/1923.

\(^{65}\)Chamberlain to Amery, 28/11/1923. T161/963/S17116/1 and ADM1/8673/234.
adequate and begged Amery to reconsider.\textsuperscript{66} Amery stuck to his guns, and challenged Chamberlain to refer it to the CID.\textsuperscript{67} Chamberlain accepted the gauntlet, but with limited naval expertise, the Treasury faced a difficult task.\textsuperscript{68} Barstow admitted the Naval Staff had:

\begin{quote}
The advantage of being able to give free rein to their fancy as to the amount of oil which would be consumed by the fleet in a war with Japan. A criticism by a nonprofessional is singularly difficult.\textsuperscript{69}
\end{quote}

To bolster its position the Treasury asked Cadman, now a director of APOC, to comment. He wrote:

\begin{quote}
In the event of hostilities with Japan, it is inconceivable that it would be a long war of attrition, and only such a war justifies the provision of a very large oil reserve. It is fairly reasonable to assume that America would be, at the least, benevolently neutral. Immense oil supplies could therefore be counted upon from Persia and the States, - far more than would be needed to supply the fleet from month to month. The case for a very large reserve seems therefore to have no relevance to the question of hostilities with Japan.\textsuperscript{70}
\end{quote}

In preparation for a ‘further attack on our oil supply’ by the Treasury, the DCNS recommended another internal review. If the reserves were too large, he wrote, ‘the sooner they are reduced the better.’ If correct, then any further reductions would ‘be the responsibility of the Cabinet.’ The review produced a figure of 9,277,000 tons, including 2,000,000 for the mercantile marine.\textsuperscript{71} However, before it reached the CID the Government changed. The new Labour Chancellor was Philip Snowden and Viscount Chelmsford became First Lord. The departmental positions, however,

\textsuperscript{66}Barstow to Chamberlain, 12/10/1923; Chamberlain to Amery, 28/11/1923. T161/963/S17116/1 and ADM1/8673/234.

\textsuperscript{67}Amery to Chamberlain, 12/12/1923. T161/963/S17116/1 and ADM1/8673/234.

\textsuperscript{68}Chamberlain to Amery, 1/1/1924. T161/963/S17116/1.

\textsuperscript{69}Barstow to Chamberlain and Hankey, 19/11/1923. T161/963/S17116/1.

\textsuperscript{70}Memo., Cadman, January 1924. T161/963/S17116/1. Persian oil fuel production was 2,019,027 tons in 1923/24 and 3,039,095 in 1927/28. Ferrier, \textit{BP}, p. 672.

\textsuperscript{71}Paper, DCNS, undated. ADM1/8673/234.
remained unaltered.\textsuperscript{72} To reduce the Navy’s oil reserve was not, as McIntyre suggests, a new policy of the Labour Government.\textsuperscript{73} Chelmsford kept unquestioningly to his Admiralty brief, even to the point of stating that ‘the Admiralty had required [in 1917-19] a total of 28,000,000 tons of fuel for the use of the Navy, Merchant Service, and for supply to our Allies, the latter item being half the total.’ When Snowden challenged the figure, Beatty, interjected to reveal it was in fact mostly coal.\textsuperscript{74} Then produced new grounds for keeping 4,500,000 tons on Britain; it was now the safest place and allowed the Navy to exercise control of ‘merchant shipping in a manner to the coal bunkering control in the last war.’ Rear-Admiral Boyle, the Fourth Sea Lord, added ‘that the amount used by the fleet in the last war did not really effect the Admiralty estimates for their present requirements as a reserve of oil fuel.’ Chelmsford expressed concern that the annual additions to the reserve had not kept pace with the Admiralty’s wish for 500,000 tons each year.\textsuperscript{75} Snowden questioned why the Admiralty thought 4,500,000 was adequate in 1919 when war in the west and east was contemplated, whereas now, with America ruled out, it wanted practically double the original figure? The Treasury did not mind if the Admiralty treated it as one reserve or not, the question was the total and by when is should be completed. Before adjourning, the chairman, Lord Haldane, suggested a compromise of 5,000,000 tons, sited wherever the Admiralty thought fit to be reviewed on completion, and a sub-committee examine the mercantile reserve.\textsuperscript{76}

Afterwards Beatty wrote his wife that it had been an ‘unpleasant’ meeting, that he had

\textsuperscript{72}The Admiralty’s position is in CID paper 476-B, 30/1/1924, and the Treasury’s is in 477-B, 31/1/1924. Hankey prepared a additional paper, 479-B, reviewing the CID’s past decisions on the oil reserve. CAB4/10.


\textsuperscript{74}13,500,000 tons of coal supplied to the allies (mainly by the Admiralty Agent) 10,000,000 tons of coal used by British Ships and 4,500,000 tons of oil used by British ships. CID, 4/2/1924. CAB2/4 and ADM116/3102.

\textsuperscript{75}Chelmsford appears to have fully accepted the Admiralty’s wish for 500,000 tons without realising that this had never been authorised by the CID as it referred to the earlier figure of 9,000,000 tons of 1921. The actual additions to the reserves had been 200,000 tons in 1921, 400,000 tons in 1922 and 200,000 tons in 1923.

\textsuperscript{76}CID, 4/2/1924. CAB2/4 and ADM116/3102. Each interwar administration, adopted a different approach to the CID. Lloyd George was content to let Balfour be Chairman. Baldwin took the chair himself. Haldane, a former minister in the 1905-08 Liberal Government accepted the post of deputy Chairman during the Labour administration because he feared the inexperience of Labour politicians, although the PM remained the nominal chairman. See Arthur Franklin Johnson, Defence by Committee, (Oxford: OUP, 1960).
argued with Snowden, and Chelmsford could not continue in the Cabinet unless Snowden changed course.77

When the CID reconvened, unable to agree to Haldane’s proposal, Snowden renewed his offensive. The problem in the last war, he argued, had been a shortage of transport: ‘a war in the Far East would not prevent the arrival of a single gallon of our oil supplies.’ The Navy, Snowden continued, was within 1,500,000 tons of its 1919 target and if 1937 was the completion date, the accumulation of 100,000 tons per annum sufficed. Moreover, considering Anglo-Japanese relations were likely to improve, no additions were required at present. Coming to Chelmsford’s aid Haldane reminded the CID that it had already endorsed the size of any reserve at twelve months’ wartime usage, and the Admiralty had accepted 1937 as the completion date. Could this not, he asked, be the basis for a settlement? Snowden, not easily assuaged, would not agree that a war would last twelve months or that further supplies could not be obtained for twelve months. Beatty responded that it was the Admiralty, not the Treasury, who was responsible for advising the Government on the amount of fuel required in wartime.78 He continued that support for Far East operations required 185 tankers that would take months to get into position. Consequently, the fleet would have to depend solely on stocks in situ for the first six months. He rejected Snowden’s suggestion that 3,000,000 tons of fuel oil would be available from Persia, claiming, erroneously, that the Chancellor must have meant total output, as according to his information only 1,200,000 tons of fuel oil was obtainable.79 Reliance on American oil, he continued, was precarious as America consumed most of her own production, Britain would therefore be dependent on American goodwill to prosecute a war, moreover it would require 397 tankers, more than Britain possessed.80 With Haldane’s backing, Beatty overcame Snowden who he regarded as a nuisance and ‘an out and out Pacifist.’81 The CID agreed to treat the naval reserve as one, that it should remain at twelve months’ and be completed by 1937. Although the positioning was a


78CID, 11/2/1924. CAB2/4 and ADM116/3102. See appendix 17 for the Admiralty’s calculations.

79Beatty’s figures were correct for 1921, the figure for 1924 was 2,000,000 tons and production of fuel oil reached 3,000,000 tons in 1927. Ferrier, BP, p. 672,


81Beatty to his wife, 15/2/1924. Ranft, Beatty, vol. II, p. 273. Snowden was a pacifist.
discretionary matter for the Admiralty, it agreed to complete the reserves along the route to the East by 1931. The mercantile reserve was postponed for a future meeting.

Any euphoria over Beatty's success was short-lived. Cancellation of work on the Singapore base dealt a body blow to the Admiralty's policy. Planning went on privately 'for the record,' and combining the oil reserves prevented the Eastern portion being totally sliced away. Indeed, the Navy managed to accrue 300,000 tons of oil for the reserves in 1924/25, bringing the total reserve on 1st April 1925 to 3,320,000. The Labour Government was in office for only ten months, and in November 1924 Stanley Baldwin's incoming Tory administration resumed work at Singapore. William Bridgeman became the First Lord, and a re-labelled Churchill entered number eleven Downing Street. Contrary to Beatty's expectations both were less amenable to accepting his advice than their predecessors. However, the reason for the 'bitter' struggle over the 1925/26 estimates lay in the financial slump rather than any pacifist sympathies. On taking up office, Churchill immediately appealed for naval economies. Heavy naval expenditure, he wrote Bridgeman, would be 'the most effective step for the return of the Socialist administration.' In the cause of economy, Churchill persuaded the Cabinet to renew the 'ten year rule' making it effective annually from 1925.

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82 Admiralty memo. for Cabinet, 1/5/1925. T161/963/S17116/2.
84 McIntyre, Singapore, pp. 39-45.
85 CID paper 228-C and CID 187th, 2/10/1924. ADM1/8713/168.
86 Board, 11/12/1924. ADM167/69.
87 Response to question from Colwyn Committee, 19/10/1925. ADM116/2282.
89 Roskill, Naval Policy, vol. 1 p. 448.
90 Barstow to Murray, 18/11/1924. ADM116/2300.
91 Churchill to Bridgeman, 15/12/1924. Bridgeman mss,
92 Board discussion on Cabinet Meeting of 6/5/1925. ADM167/72.
As a former First Lord, Churchill was familiar with the tactics used by the Admiralty to defend its budget, and, consequently, the weak points to exploit. In framing the 1925/26 estimates, the Board included 500,000 tons of oil for the reserves.\textsuperscript{93} Churchill requested a detailed analysis of the consequences of limiting the total oil purchases to 1,000,000 tons per annum - 700,000 tons for steaming and 300,000 tons for the reserves.\textsuperscript{94} With consumption set to rise over the next four years through additions to the fleet, the Secretary of the Navy replied such a ceiling would entail reductions in sea time. Moreover, the reductions would be disproportionate because of inescapable overheads such as bunkers for tankers and ships' auxiliary machinery – the latter consuming nearly 200,000 tons a year. The Atlantic fleet averaged forty days at sea per year; 700,000 tons would limit this to twenty-four days in 1929. Another Treasury proposal was to reduce the surplus of storage over stock. Hitherto, the Admiralty maintained 8\% more tankage than oil to allow for different oils, repairs, cleaning and part filled tanks. To keep a surplus of just 100,000 tons (less than 3\%) as postulated by the Treasury was unacceptable to the Admiralty.\textsuperscript{95} Whatever Churchill's demands, Beatty remained adamant throughout that the Cabinet decided naval policy on the advice of the Admiralty, not Churchill and Barstow.\textsuperscript{96}

To adjudicate the Cabinet Naval Programme Committee, under the Chairmanship of Lord Birkenhead the Secretary of State for India, considered the estimates for 1925/26; once the committee had dealt with the cruiser programme, it turned its attention to the oil reserve.\textsuperscript{97} The departments' views remained essentially unchanged from those put before the CID the previous year. The Treasury reiterated that 5,000,000 was adequate, to be accumulated at 100,000 tons per annum, the Admiralty stuck to 7,139,000 tons although it gave ground on the annual accumulation

\textsuperscript{93}Board, 11/12/1924. ADM167/69.

\textsuperscript{94}This idea clearly came from Churchill himself, as it is similar to his earlier suggestion made when Chairman of the Cabinet Committee in National Expenditure in 1922. See CHAR 22/18.

\textsuperscript{95}Murray to Barstow, 3/2/1925. T161/963/S17166/2.


\textsuperscript{97}Roskill, \textit{Naval Policy}, vol. 1, pp. 448-450. Roskill only deals with the impact of the Cabinet Naval Committee's (hereafter Birkenhead) on the cruiser programme, ignoring the fuel and Singapore base aspect of its work.
- reducing it from 500,000 tons to 330,000 tons. Churchill noted that the reserve now stood at 3,250,000, about six months' worth, and the need to add more was far less pressing than if there was none. It was therefore less risky to curb the rate of accumulation, either to culminate at 5,000,000 tons in 1937, or 7,000,000 tons 'long beyond.' Churchill also questioned the Admiralty's premise that in wartime warships would spend of average 120 days at sea per annum:

To conceive that the whole of the fleet would be steaming for a third of the year — why, it would be worn out. In war the fleet steams very little.

He recalled a similar discussion from his time at the Admiralty in 1913, when the Board accepted a lower figure that proved ample. The Board resented Churchill's meddling in areas where they alone felt fully qualified to express an opinion. Beatty admitted that although the Navy had been able to replenish its reserve during the War, demand was now so great it would be impossible as there were not enough tankers. Exasperated, he reminded the committee that the CID had already ruled on the matter and only it could effect any alteration. However, he was prepared to go through the whole thing again 'ad nauseam' if necessary.

In 1925, naval spending also came under scrutiny by the Fighting Services Economy Committee, initiated by the Treasury and chaired by Lord Colywn. Naval fuel did not escape its scrutiny and like all Treasury officials, those of the Colywn committee could not understand the Admiralty's desire for so large a reserve. Exceeding its authority and to the Admiralty's surprise the committee advocated that provision of oil tankage be halted and no new oil contracts be made for the reserves.

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99 Cabinet Paper (25) 23 and (25) 27, June 1925. CHAR22/67. Also Admiralty to Treasury, 16/2/1925. ADM116/2300. The lower rate would complete the reserve to the Admiralty level by 1937/38.


100 Ibid.


102 Birkenhead, 25/6/1925. CHAR22/65.

103 Roskill, Naval Policy, p. 454.

104 Fraser (Treasury) to Murray, 18/12/1925. T161/963/S17116/2.
Again, the Admiralty replied these were matters for the Cabinet. Despite the Treasury’s efforts, the oil reserve increased in line with the Admiralty’s aspirations to reach 3,656,000 tons in April 1926. Churchill informed the Board that in the next year’s estimates it was probable the oil reserve would be the only item for discussion. When the CID came to discuss Colwyn’s recommendations, the debate followed the same lines as the Birkenhead Committee. The result, however, did not. For the next two years, only 100,000 tons were to be added to the reserve and no new tankage was to be constructed without explicit Treasury sanction. Both Bridgeman and Beatty placed their dissent on record, Beatty thought the fleet’s mobility was so debilitated that the decision was inconsistent with the agreed policy of maintaining a one power standard to any other fleet ‘where ever situated.’

With no CID ruling for beyond 1926/27, the Admiralty planners worked on the optimistic assumption that from 1928 acquisitions for the reserves would return to 330,000 tons per annum. The Treasury made no such assumption, and construction of the necessity tankage to accept oil in 1928/9 became the subject of the next Admiralty-Treasury skirmish. By restricting current spending on storage the Treasury could also limit oil purchases for the next three or four years. Unless work on tankage in Ceylon commenced in 1926-27 the Admiralty feared there would be insufficient storage for additions of 330,000 tons per annum. Although the Treasury harboured doubts over the veracity of the Admiralty’s figures, Barstow recommended Churchill that the work at Ceylon be sanctioned. Churchill rejected Barstow’s advice and asked Bridgeman to postpone the scheme. Bridgeman pleaded that whilst it was too late to expend the

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105 Murray to Fraser, 24/11/1925. T161/963/S17116/2.
106 Stanhope, Civil Lord Admiralty to Churchill, 10/2/1926. T161/963/S17116/2. The Admiralty had budgeted for 330,000 tons, however, lower oil prices allowed the addition of 380,000 tons. Beatty to Churchill, 25/1/1926. ADM167/74.
107 Board 2158, 26/1/1926. ADM167/73.
109 CID 209, 11/2/1926. CAB2/4. At the time 800,000 tons of tankage had been completed at Singapore.
111 Admiralty to Treasury, 31/5/1926. T161/963/S17116/2.
113 Churchill to Bridgeman, 29/6/1926. T161/963/S17116/2 and ADM167/74.
whole amount originally allocated in the current financial year, it was imperative that a start be made immediately. Barstow again sided with the Admiralty. Churchill, though, remained unmoved, and informed Bridgeman that he fully expected the Cabinet to continue the 100,000 tons rate of accumulation for 1928 and 1929, due to the 'general conviction that alarms about Japan are baseless.'

In 1924, the Admiralty petitioned the CID for control of all tankers and commercial bunkers in wartime. Aware that this effectively meant control over all petroleum products, the Board of Trade and Air Ministry counter-petitioned, protesting it was wrong in principle to place control in the hands of the largest consumer. Only an independent body with representation from all consumers could, they argued, exercise impartial control and co-ordination. The CID referred the matter to the Principal Supply Officers Committee (PSOC). After examining domestic requirements, those of the three services, and the available tankers, the PSOC thought oil was so vital a commodity that Government subsidiaries may be necessary to build up stocks and increase tanker tonnage, as Britain was 158 tankers short of the 470 she required in wartime. It recommended the creation of a peacetime Oil Fuel Board (OB) - a standing advisory body to keep the matter under constant attention. Its president should have Cabinet rank to allow for immediate decision in time of crisis. But for the everyday detailed investigations, as the Admiralty were largest consumers, the Civil Lord at the Admiralty should chair it and membership should comprise two each from the Admiralty and the Board of Trade, and one each from the Treasury, War Office, and Air Ministry. In peacetime it should report annually to the CID and in wartime become the Oil Fuel Control Board, responsible for rationing of all petroleum products. The CID accepted all the PSOC's recommendations.

114 Bridgeman to Churchill, 9/7/1926. T161/963/S17116/2 and ADM167/74.
118 CID, 28/7/1924. CAB2/4. On the PSOC at the time was Barstow, 3rd and 4th Sea Lords. For an account of the creation and work of the PSOC see G. A. H. Gordon, British Sea Power and Procurement Between the Wars, (London: Macmillan, 1988).
120 CID, 18/3/1925. CAB2/4.
Lords Peel and Stanhope became respectively the first president and chairman. The OB did not question departmental requirements or strategies, but sought to show how best they could be satisfied in practice by keeping tabs on oil production and tanker availability world-wide. Initially it was charged with only considering war with Japan. If this contingency could be met then in all probability so could any other, the exception being civil consumption. In its first report in July 1926 it concluded:

We feel that, in the case of a war in the Far East, public opinion at home would consider the application of such drastic rationing that took place in the Great War unreasonable.  

Appended to the report were the most detailed figures the Admiralty had yet presented to justify its 7,139,000 tons naval reserve. If endorsed by the CID, the report would undermine Churchill’s campaign to extract savings from the soon to be reviewed oil budget. To maintain pressure on the Admiralty’s calculations, in reference to the number of days steaming in wartime, Churchill wanted it recorded that ‘he was not convinced of its soundness’ and that a small sub-committee, of which he would like to be a member, should be formed to examine the matter. Beatty and Bridgeman confidently agreed, and in October 1927, the reconstituted Naval Programme Committee was charged with examining the assumptions upon which the Admiralty based its figures and the rate of accumulation.

The Admiralty argued it required sufficient oil for the fleet’s one-and-a-half month voyage to Singapore and to operate from there for the remainder of year, based on ten days steaming a month at eighteen knots. To achieve this, by 1937, 330,000 tons needed to be added to the reserve each year for the next ten years. The Treasury countered that at current prices the Admiralty’s programme would cost £1,320,000 tons per annum, and disputed that storage should be 8% ahead of stocks, citing 5% as a previously acceptable margin. The Admiralty missed Beatty’s formidable debating

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skills and depth of knowledge, his successor, Admiral Sir Charles Madden, was not so sure of his brief.\textsuperscript{124}

In contrast Churchill was supremely confident and challenged the Admiralty in detail; steaming at ‘medium high speeds, twenty four hours a day for ten days a month for a whole year, your fleet would be shaken and buffeted to pieces.’ Five days a month was more realistic and required a reserve of only four million, he argued, Furthermore, challenging the whole basis of Naval policy, he asked why 4,500,000 tons were enough in 1919 whereas now over 7,000,000 were needed? He answered his own question:

It has been raised because of the great Japanese war bogey. This idea was started by Admiral Beatty in 1920 and 1921 with a view to supplying the necessary stimulus on which naval estimates, naval expansion and naval supplies could be based; a great story was told about it, and we have heard again and again how Japan was preparing and was going to spring out upon on all our lines of Eastern communications right up to Aden and even up to Suez, and was going to dominate the whole of the Pacific and Indian Oceans and cut the British Empire into shreds. All that is, in my opinion, utter nonsense.\textsuperscript{125}

Birkenhead concluded that 100,000 tons should be added to the reserve in 1928 without prejudice to any further consideration, and the Naval Programme Committee be made a permanent sub-committee of the CID.\textsuperscript{126} Bridgeman deplored the method, and wrote Baldwin that as the committee usually took the middle way and the Treasury asked for double what they wanted, they achieved their end. Many of the issues, he continued, were matters of policy and should be placed before the CID and not arbitrated on by a sub-committee.\textsuperscript{127} The Admiralty would accept the ruling only if the Cabinet did.\textsuperscript{128}

Instead of focusing on sea-time the Treasury’s next assault on the Navy’s fuel bill concentrated on the period of the reserve. As the Cabinet had agreed twelve months in 1919, it was a much harder nut to crack, but if it succeeded, it promised

\textsuperscript{124}Birkenhead, 2/2/1928. CHAR22/174.

\textsuperscript{125}Ibid.


\textsuperscript{128}CID paper 666-B, 20/2/1928. CAB4/17.
greater economies. In essence, the Admiralty's case was that the Navy would have to rely for the first six months of any war on the reserve. Thereafter, once a logistical chain had been established, supply would match consumption. The second six months' worth of fuel was 'a safe working margin.' For this to hold true the Treasury reasoned an acceleration of accumulation must take place and after six months, about three months' worth of fuel would have to have been delivered. At the start of month seven, therefore, the reserves would in fact be nine months not six. Consequently, a reduction of three months' consumption could be made, around 1,800,000 tons, and the reserve would still meet the Admiralty's criteria. Moreover, increased Persian oil production would soon offset the need to buy oil from America, reduce journey times and further negate the need for a large reserve. A total of 4,500,000 tons, or seven-and-a-half months, was, the Treasury thought, adequate and involved the purchase of 600,000 tons over the next ten years. Furthermore, this could be scavenged from the normal annual consumption. Although consumption was rising, the Treasury argued that if the oil fuel purchases were stabilised at a total 850,000 tons per annum, the Admiralty could complete the reserve from this as it saw fit.129

The following year's naval estimates included 320,000 tons of oil for the reserves. However, the extension of the 'ten years rule' undermined the Admiralty's timescale for completion, and for the fourth consecutive year only 100,000 tons were allocated to the reserve.130 The reserve's fortunes took a further turn for the worse with the return of a Labour Government and Snowden to the Treasury, in June 1929. The Singapore policy was again revised and the scheme suspended. For contractual reasons the main contracts went ahead but where possible work was slowed right down.131 On resuming office, Snowden agreed not to interfere with the current year's expenditure if the Admiralty made substantial savings in 1930 including the deletion of additional oil for the reserve. However, falling oil prices and reduced consumption allowed the

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129Treasury memo., 11/12/1928. T161/963/S17116/3. Consumption increase was due to commissioning of Nelson, Rodney and County class cruisers.

130CID, 5/7/1928. CAB2/5.

131Neidpath, Singapore, p. 117-121.
Admiralty to increase the reserve during 1930, increasing the tonnage by 147,000 tons, although the balance sheet showed a reduction of £127,968 in its value.\textsuperscript{132}

The London Naval Treaty in April 1930, reducing the Navy’s cruisers entitlement from seventy to fifty, led an expectant Treasury to look for a commensurate reduction in the Navy’s fuel reserve.\textsuperscript{133} There was none; instead, an internal Admiralty review increased the total to 7,582,600 tons.\textsuperscript{134} By way of a sacrificial lamb to protect its other programmes, the Admiralty included 100,000 tons in the 1931 sketch estimates.\textsuperscript{135} Optimistically, the Admiralty argued that the depressed oil market presented an opportunity to increase the reserve at minimal cost and this may not be the case for long, as oil companies were increasing refining petroleum by cracking in order to supply the growing petrol market, leaving little or no residue suitable for fuel oil.\textsuperscript{136} Unmoved, the Treasury slaughtered the Admiralty’s lamb and no addition was made to the reserve.

Labour’s First Lord, Albert Alexander, was not so eager to administer cuts as the Chancellor, and in October 1930 warned Snowden that he intended to include provision for an unspecified amount of oil for the reserve in the next estimates.\textsuperscript{137} When Snowden saw the 100,000 tons in the sketch estimates he wrote Alexander personally ‘how greatly disappointed’ he was and implored him to reduce expenditure:

[W]e have no right to make provision for [oil] in these critical times...[i]n the coming year we must draw to the largest extent possible on existing stocks, not excluding the Oil Fuel Reserve.\textsuperscript{138}

Consumption had increased by 30% over the previous five years, making it an obvious area for savings; the estimated requirement for 1931 was 878,600 tons.

\textsuperscript{132}T161/963/S17116/3. Reduction in value is the difference between Comptroller’s reports for 1930 and 1931.

\textsuperscript{133}Treasury memo., November 1932. T161/963/S17116/3.


\textsuperscript{135}Board memo, 2/12/1930. ADM167/82

\textsuperscript{136}Memo. by Waterfield, 27/11/1929. T161/963/S17116/3.

\textsuperscript{137}Alexander to Snowden, 31/10/1930. T161/963/S17116/3.

\textsuperscript{138}Snowden to Alexander, 14/1/1931. ADM116/3389.
However tempting it was, a number of practical considerations militated against large reductions in consumption. Contracts were already in place for 772,000 tons and the balance was local purchases for vessels in transit etc. or fuel for tankers, the latter being 63,000 tons. The fuel allowance for 1931/32 was, none the less, reduced by 10%. The Admiralty managed to save £72,800 by reduced steaming to add to the £53,600 saved from lower prices, and the reserves survived untouched. To conserve fuel, cruises and manoeuvres were cut short or cancelled and tactical exercises carried out at half speed. Only aircraft carriers were permitted to steam at full speed to launch their aircraft.

Following the Japanese attack on Manchuria in September 1931, the Cabinet accepted the Chiefs of Staff (COS) recommendation, citing incomplete or non-existent defences and insufficient naval fuel reserves, that the ten-year rule should be abandoned. The 1932 estimates had already been set at their lowest post-War level, with no provision for the oil reserve. As the brunt of any confrontation with Japan would be borne by the Navy, the Admiralty anticipated an increase in the 1933 estimates. In spite of the deteriorating international situation, the Treasury was preoccupied with the Depression and possible savings from the Geneva Disarmament Conference, and it offered hardly more than the previous year. The Chancellor, Neville Chamberlain, informed the Admiralty that:

> The financial and economic risks are by far the most serious and urgent that the country has to face and that other risks must be run until the country has had time and opportunity to recuperate and our financial situation to improve.

No oil was added to the reserve in 1933/4.

The effective collapse of the Geneva conference, Hitler’s rise to power and Germany’s exit from the League of Nations further destabilised the international

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139Board memo, 1/12/1932. ADM167/87; Comptroller’s report for 1931/32.

140Correspondence and Memoranda, September-October 1931. ADM 116/2852.


142Gross estimate 1932/33 was £52,853,312. ADM 116/3389.


144Chamberlain (Chancellor) to Eyres-Monsell (FL), 6/2/1933. ADM116/3390.
situation during 1933. In response the COS urged a steady increase in defence spending over the next few years and the CID created a Defence Requirements Committee (DRC) to 'prepare a programme for meeting our worst deficiencies, for transmission to the Cabinet.' The ubiquitous Hankey was its chairman and the Permanent Secretaries of the Treasury and Foreign Office, Sir Warren Fisher and Sir Robert Vansittart respectively sat on it alongside the three COS. 145

At the DRC's first meeting in November 1933, Hankey defined the committee's work as bringing Britain's defences up to 'the lowest level consistent with national safety and the enforcement by common action of international obligations.' Excluded from the brief was a time factor and Hankey observed that for simple practical reasons certain deficiencies could not be remedied immediately. Some, like oil, could be made good 'by regular stages.' The First Sea Lord, Admiral Sir A. Ernle Chatfield, took up the subject and told the committee that the Navy had already prepared a paper on its deficiencies and before any oil could be added to the reserve it would take two years to construct the necessary storage. 146 In the absence of any new Cabinet guidelines, the paper was based on preparations for a war in ten years. 147 The required oil reserve remained at about 7,000,000 tons, which, if completed in 1942, would cost £2,422,000 for accommodation and £7,085,000 for the fuel. Under Chatfield's direction, the Fourth Sea Lord revised the figures down so the total was reduced to £6,656,000 148 and the timescale reduced to five years for storage and six for the oil. 149 Overall, the cost of the DRC's recommendations was £82,000,000, of which £71,000,000 was to be spent over the next five years. However, war with Germany began to loom ever larger, making home defence - and the Air Force in particular - the first priority, although, for the Navy Japan remained the most important potential foe, and more liable to materialise if Britain was embroiled in a European war. 150

146DRC, 14/11/1933. CAB16/109; Chatfield First Sea Lord 21/1/1933-17/11/1938.
147Board, 13/10/1933. ADM116/3434.
148Memo., 14/11/1932. ADM116/3434 In 1932 one year's wartime requirement was thought to be 7,582,600 tons.
149DRC report (DRC 14) 28/2/1934. CAB16/110; Note on DRC (14) by Estimates Branch, ADM116/3435.
150Gibbs, Strategy, pp. 105-120.
The Cabinet passed the DRC report on to a ministerial sub-committee, which the Treasury bluntly informed that the country could not afford the preparations to fight Japan and Germany simultaneously. After lengthy and sometimes acrimonious discussions, in the spring of 1935 the Cabinet finally agreed a programme two-thirds the size of the DRC's proposal that heavily favoured the Air Force.\textsuperscript{151} The Admiralty's £13,000,000 share fell short of the £21,000,000 it considered necessary. Infuriated, Chatfield accused the Chancellor of being parsimonious and swayed by Daily Mail propaganda over the fear of air attack.\textsuperscript{152} In order to accommodate the adjustment, the fuel programme was stretched over nine years.\textsuperscript{153} Chatfield was not prepared to accept this as the final word, and hoped to regain ground during the negotiations for the 1935/36 Estimates.\textsuperscript{154} Hopes of clawing back the Chancellor's cuts were dashed when the Treasury requested a reduction of £750,000 in the Admiralty sketch estimates, including £350,000 in its £3,500,000 deficiency allocation for 1935/36.\textsuperscript{155}

In 1932, due to poor market conditions, APOC planned to pump surplus oil fuel back into the ground. The Admiralty suggested instead, to increase the reserve at minimal cost and employ naval tankers idle through the Depression, that the company loan some of the oil to the Navy. APOC agreed to loan the Admiralty 250,000 tons, to be delivered at 100,000 tons per annum.\textsuperscript{156} Loan oil proved helpful in persuading the Treasury to forego the return of any surplus exchequer grant. Why not, the Admiralty argued, use this surplus to purchase loan oil already in its tanks, as there would be no additional charge on the Navy vote? This was secretly sanctioned, first in January 1934 for inclusion in the financial year 1933/34, when the entire loan stock of 105,256 tons was purchased, and again the following year with the purchase of 84,151 tons of the

\textsuperscript{151}Shay, Rearmament, p. 48.

\textsuperscript{152}Chatfield to Eyres-Monsell, 21/6/1934. ADM116/3436.

\textsuperscript{153}Memo., D-of-P, June 1934. ADM116/3436.

\textsuperscript{154}Roskill, Hankey, vol. 3, p. 116. Roskill refers to the 1934/35 Estimates, however as these discussions would have taken place before the Chancellor commented on the DRC report he must mean 1935/36 Estimates.

\textsuperscript{155}Memo., Plans Division, November 1934 and paper for Cabinet C. P. 291(34). ADM116/3436

\textsuperscript{156}Murray to Hopkins (Treasury), 18/10/1932. T161/963/3. The only cost incurred by the Navy was canal dues, the tankers' bunkers were part of the loan oil and paid for when the oil was returned or purchased.
106,582 tons loan stock.¹⁵⁷ Neither purchase reduced the overall amount of the loan; instead, the time taken to deliver the full amount was extended. In subsequent years, no surpluses occurred to be soaked up in this manner; consequently, by 1937 the loan stock reached its peak under the agreement, and remained so until 1939.¹⁵⁸

Of the 3,500,000 tons of oil the Navy earmarked for storage in Britain 3,000,000 tons was already in place by November 1936, and the necessary accommodation for the balance well in hand. This, however, did not deter the Admiralty from proposing to place 28.5% of its home reserve underground. Citing paucity for not having done so before and the increased risk of air attack for wishing to do so now, it also wanted to enhance the survivability of the existing surface storage by allowing 90 feet between the existing pre-1934 tanks in compliance with the Passive Defence Committee’s recommendation.¹⁵⁹ The Admiralty ideally would have liked all its reserves in bomb proof shelters, but instead proposed to place 1,175,000 tons in Britain and 757,000 tons overseas underground, equivalent to two months wartime consumption at home and those places abroad likely to be subject to air attack. A rough estimate of the cost for completion in five to six years’ time was £16,000,000.¹⁶⁰

When the OB president, Ormsby-Gore, recommended the Admiralty should be allowed to proceed with the scheme,¹⁶¹ the Chancellor objected in the strongest possible terms to the ‘enormous expenditure on a single item.’ He viewed this as another example of the Services ‘attempting the impossible task of 100 per cent safety in every direction and in every particular.’¹⁶² While the modest schemes of the Army and RAF gained immediate CID approval, authorisation for the Navy’s mammoth design would have to wait for a recalculation of the Navy’s needs and for the COS to decide the priority for its construction from a strategic aspect.¹⁶³ In February 1937, they

¹⁵⁷ Upcott (Treasury) to Murray, 21/4/1936. T161/963/S17116/4. The price of the loan oil was the same as the main contract.

¹⁵⁸ Memo., for Cadman, 18/1/1938. BP72537.

¹⁵⁹ Over 85% of Admiralty tankage was built before 1934, when 50 ft between tanks was considered adequate.


¹⁶² T161/719.

¹⁶³ CID, 10/12/1936. CAB2/6.
recommended a three-stage plan, with authorisation of a stage a year, starting in April 1937 and completion of the whole by 1942/3.\textsuperscript{164} The CID approved, subject to the Treasury's qualification that orders be placed only up to a total of £3,500,000, which was anticipated would provide 400,000 tons of underground storage.\textsuperscript{165}

By November 1937, the approved schemes promised to provide 100,000 tons more than anticipated at £365,000 less than budgeted. Coverage, however, was incomplete, as five of the twelve sites in the first stage had no underground storage at all. The Treasury was adamant that if the Admiralty wanted all twelve, savings would have to come from the schemes approved so far. Strangely, the Admiralty appeared content with the situation and expressed no wish to re-open the matter for two years.\textsuperscript{166} Rather than evidence of the Admiralty's satisfaction, the Treasury regarded the hiatus as a ploy to forestall the Treasury demanding reductions in the over-ground storage before it was completed.\textsuperscript{167} The over-ground storage approved under the DRC programme was 2,400,000 tons (456,000 tons at home and 1,944,000 tons abroad) to bring the total capacity up to 7,147,695 tons (3,314,295 tons at home and 3,833,400 tons abroad) by 1939/40.\textsuperscript{168} If the first stage of the underground storage was completed as well, the total storage would be 8,313,275 tons.\textsuperscript{169}

The hiatus was short-lived, as the Treasury's cap of £3,500,000 for the first stage, that had been estimated in total at £7,500,000 - £8,500,000, had de facto produced a new stage, part one of the first stage, which it was hoped would provide 545,000 tons of underground storage split between the major naval bases. However, it was already by 1938 about to exceed the Treasury's limit. In mitigation, the Admiralty pointed out that the Civil Engineer in Chief's revised estimate for the whole of stage one did not exceed the minimum in the original estimate and that the whole scheme

\textsuperscript{164}Appendix 18.

\textsuperscript{165}CID, 23/3/1937. CAB 2/6.

\textsuperscript{166}Treasury memo., 30/11/1937. T161/1402/S4115/02/1. Schemes approved were Malta 38,000 tons, Rosyth 242,000, Hong Kong 27,000 tons, Invergordon 35,000 tons and Lyness 35,000 tons. No provision at this time at Aden, Portsmouth, Humber, Harwich, Singapore, Portland and Devonport.

\textsuperscript{167}The exception was the concrete reservoir at Rosyth (250,000 tons) which was 'converted' from over ground to underground by adding a concrete roof.

\textsuperscript{168}Exclusive of Rosyth.

\textsuperscript{169}Treasury memo., 17/2/1938. T161/1402/S41151/02/2.
was now expected to cost £12,500,000 - £13,500,000. However, to complete part one
of stage one an extra £1,000,000 would be needed.\textsuperscript{170} The revised calculations cut little
ice with the Treasury, which had always regarded the full scheme as an extravagance. It
thought the Admiralty's failure to remain within the £3,500,000 ration was simply
because it made no 'sincere effort' to do so. Any commitment to additional funding,
the Treasury thought, should be delayed in light of the Cabinet's recent decision to
adopt Sir Thomas Inskip the Minister of Defence Coordination's report that the services
be given a spending limit for the next five years in which they decided the priorities for
themselves.\textsuperscript{171} The Treasury thought it was:

[I]mportant to resist the first attempts of the Departments to
anticipate their ration or to secure commitments beyond the date
of the next review and in excess of the programme at present
authorised.\textsuperscript{172}

The Admiralty was informed on the 10\textsuperscript{th} March that the Chancellor could 'not agree to
increase expenditure until Inskip, has made his allotment.'\textsuperscript{173} Inskip informed the
service departments on the 11\textsuperscript{th} what he had in mind for their allocation over the next
three years.\textsuperscript{174} The same day Germany annexed Austria. The consequent increase in
defence spending again gave priority to the Air Force and Anti-Aircraft measures for
home defence. First Lord, Duff-Cooper, seized the moment and lobbied for the
acceleration of all naval projects that could possibly be construed to come into the
category of air defence measures.\textsuperscript{175} Heading his £31 million shopping list was
underground oil storage. He set his sights on additional funds to complete part one of
the first stage and to simultaneously start the balance of the first stage. Claiming this
would produce savings, as the Treasury's piecemeal approach was not cost or time

\textsuperscript{170}Admiralty to Treasury, 15/2/1938. T161/1402/S41151/02/2.

\textsuperscript{171}Memo., Rowan, Treasury, for Chancellor, 7/3/1938. T161/1402/S41151/02/2.

\textsuperscript{172}Comment by Hopkins, and agreed with by Fisher, 9/3/1938. T161/1402/S41151/02/2.

\textsuperscript{173}Treasury Inter-Services Committee, 10/3/1938. T161/1402/S41151/02/2.

\textsuperscript{174}Gibbs, \textit{Grand Strategy}, p. 350. The Navy's allotments were, 1939 £135 million, 1940 £120
million and 1941 £100 million.

\textsuperscript{175}Duff-Cooper to Simon (Chancellor 28/5/1937-10/5/1940), 27/5/1938. ADM116/4434; Alfred Duff
efficient. Why, a sceptical Treasury queried, the rush with the second part of stage one? As most of the facilities in hand would not be completed before the spring of 1941 and the contracts contained provision for the second portion at the agreed price, also unless other commitments were compromised there was not enough building capacity to start work until the first portion was completed. Nevertheless, with Inskip’s support and once it had been established that the Admiralty’s plan did not impede other plans, it was sanctioned in January 1939 to spend up to £7,000,000 on the remaining part of stage one.

When hostilities commenced in September 1939, no underground storage had been completed, either at home or abroad. Home schemes that could not be completed before the end of 1940 were terminated and increased above ground storage ‘in well concealed packets’ made up the lost capacity. Overseas, Malta was due for completion in November 1940 anyway, and the large scheme for 200,000 tons at Singapore was similarly allowed to proceed, even though it was not due for completion until May 1943. A decision regarding Hong Kong’s 27,000 tons was held in abeyance. The delay in the underground storage programme was reflected in the delay in the acquisition of the oil reserve, the Admiralty estimated 8,733,150 tons was necessary for a simultaneous war in Europe and the Far East, and 7,741,000 for a war in Europe only. In September 1939, 6,300,000 tons were in stock, split about fifty-fifty between Britain and overseas. Fortunately, the fear of air attack proved exaggerated; the Luftwaffe managed to destroy just 145,000 tons of storage capacity in Britain between 1939 and 1941.

The Navy’s post-War policy to create a twelve months’ oil reserve was a continuation of its pre-War aspiration, almost as though the War was an aberration. In

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176 Memo., Duff-Cooper for Cabinet, 8/5/1938. ADM116/4434.
178 Treasury Inter-Service Committee, 6/12/1938, T161/1402/S41151/02/2. Sanctioned by the Treasury 3/1/1939, the plan was for 767,000 tons at home and 315,000 tons abroad.
179 Admiralty minute, 16/6/1941. ADM1/17814. It was anticipated, with accelerated construction, that 694,500 tons of storage would be ready in Britain by the end of 1940. In reality this was only completed in the autumn of 1943. ADM 1/12625.
naval terms in some ways, it was; with the exception of a few commerce raiders, the action took place in the North Sea, British coastal waters and the Mediterranean.\textsuperscript{142} The Navy though was an instrument of global power, and after Fisher’s realignment of the fleet pre-War mobility was a substitute for permanent forces stationed around the world. However, to base the size of the reserve on a rejected pre-War study, before the size of the post-War fleet was established without regard to the country’s parlous economic circumstances was unrealistic. None the less, Long skilfully obtained the Cabinet’s approval for a twelve months’ reserve; an approval that was to hinder all the subsequent Treasury challenges to the size of the reserve. The Treasury was not mindlessly intransigent, it believed a reserve was necessary and when appropriate helped the Admiralty, for example by releasing funds for purchases on the spot market in the 1920s and the purchase of APOC loan oil in the 1930s. Overall, though, it regarded the Navy’s demands as unjustifiably large, and unable to restrict the reserve’s life span, instead, prolonged its gestation. For the Navy to sustain the case for a large reserve in Britain for the whole of the interwar period, when the focus of attention was on Japan, knowing the tanker fleet was inadequate was a remarkable achievement. Especially when one considers the reasons it gave were remarkably fluid; first, it was to fight a European Navy, then the USN or anyone else without US assistance and even, according to Beatty, to control merchant shipping. No satisfactory answer why a twelve months’ reserve was necessary was ever received by the Treasury. Only a reminder that the Cabinet had agreed to it and that the Admiralty knew best. The Navy, Beatty in particular, was ruthless in pursuing a large reserve and managed to convince both the truculent Tory Amery and compliant Socialist Chelmsford of its merits. Churchill, wise to Beatty and the Admiralty’s ways, questioned the policy in detail and the larger threat it was supposed to address. Even he though failed to see the wood for the trees - in 1919, a large reserve was to break Britain’s dependence on American oil, which by the late 1920s was no longer necessary. Indeed, a large reserve in Britain became increasingly useless in the event of an Anglo-Japanese war, as sources closer to Singapore increased production. The Admiralty unrepentantly maintained its case, and cited low overall oil reserves as an immediate concern when defence deficiencies were reviewed, first by Hankey and then Inskip. The Admiralty never convinced the Treasury that a twelve months’ reserve was necessary, a failure that reinforced the

\textsuperscript{142} Compared to the Napoleonic and Second World Wars.
Treasury's suspicion that the Admiralty's claims generally were unrealistic. When the Admiralty significantly increased the cost of the reserves by proposing underground storage far in excess of that requested by the other two Services, the Treasury was, not surprisingly, sceptical of the need. Events vindicated the Treasury; the effects of enemy air attack had been greatly overrated. However, it was not Treasury constraints that prevented completion of underground storage before September 1939, but the inability of the contractors to complete even the limited programme sanctioned. Snowden's attack came nearest to the heart of the matter - a shortage of tankers. The purpose of a reserve is to grant a period of grace before wartime supply arrangements can be implemented and absorb any surge in demand. During the War, the reserves did reach twelve months' consumption, but it was the inability to sustain it because replenishment failed to keep pace with consumption that led to the 1917 crisis.\footnote{Appendix 14} A mobile fleet needed a mobile fuel reserve. The Admiralty's attempt to gain control of tankers led to the creation of the OB, it did not, however, lead to any attempt to remedy the acknowledge shortage of tankers, even though they were crucial to the fleet reaching and operating from Singapore. It is, therefore, to tankers and Far East war plans that the thesis turns to next.
Chapter Ten

Tankers and Strategic Plans

This chapter examines how the Admiralty planned to make oil fuel available to the Fleet in wartime. In this context, the management and operation of the Admiralty’s tanker fleet are reviewed and the Admiralty’s strategic plans for hostilities are considered, first in the Mediterranean, then for an Anglo-Japanese conflict. Finally, it looks at the work of the OB in planning the overall strategic oil requirements of the nation, particularly its predictions of wartime tanker requirements.

Just eight days after the Armistice the D-of-S confidentially assumed the Admiralty would not require the tankers then under construction. The Admiralty considered it already had a surfeit of tankers for everyday peacetime use and more than the Treasury would allow it to keep in reserve. The question was how many of the existing vessels should be sold. Twenty-seven were thought necessary for the Navy’s requirements, leaving around seventy to be returned to their former owners or put up for sale. Pressure to sell came from both the Treasury, eager for money, and the oil companies clamouring to replace losses and capitalise on high freight rates. The market for tankers in 1919 was so buoyant that the Shipping Controller wanted to sell vessels even if it caused a temporary shortfall in the Navy’s needs, reasoning any deficit could be covered by charters.

Operating and manning tankers - both requisitioned and owned by the Navy - during the war had been contracted out to commercial shipping companies; Bowring, British Tankers, Hunting and Sons, Anglo-Saxon and Lane and Macandrew all operated tankers on behalf of the Government. This practice extended into peacetime and in 1925, private companies operated twenty-one Admiralty tankers - mainly those employed on freighting. The remainder were either laid up in reserve or operated by the RFA. When not required for naval work tankers were hired out, with the D-of-S

1Minute, D-of-S, 19/11/1918. ADM1/8597/3.
3Oil Tankers 1916-18. MT23/805; Sigwart, RFA, p. 4.
4Minute D-of-S, 18/5/925. ADM1/29281.
responsible for arranging charters. In 1935, for example, forty-eight individual charters were entered into, involving the shipment of 204,000 tons of oil, plus two tankers on time charter. The income was entered as appropriations in aid and deducted from the overall cost of fuel services. In this way, the Admiralty received £1,225,000 gross between 1921-30. Thereafter, although the decision to reduce the annual addition to the oil reserve made more tankers available for charter, the Depression started and expected receipts of £326,500 for 1931/32 in reality totalled just £99,422.

As nearly all the Navy’s tankers were of wartime construction, by the late thirties they needed replacing. Renewal began in 1936, the year of the first naval rearmament programme. Six vessels under construction for the British Tanker Co. were taken over by the Admiralty on the slipways to become the first group of the Dale class. Two further vessels building for RDS were acquired in 1938 for evaluation and formed the second group of Dales. Keeping a set of standard tanker plans to allow for rapid construction when necessary had been rejected as the frequent changes required to keep them up to date would be too expensive. Instead, the Admiralty favoured ordering examples of an existing design, as happened with the second group of Dales that acted as precursors for the larger third group built during the Second World War. Normally, new vessels would replace those most exhausted, however, tankers earmarked for replacement in the late 1930s remained in service. The Admiralty justified their retention by citing the rise in commercial charter prices and the need for tankers to increase the oil reserves. The OB also regarded retaining tankers beyond their normal

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5Minute, D-of-C, 8/3/1923. ADM1/29278.
6Hansard 5:307:1767, 18/12/1935.
8Comptroller’s Report 1931/32. In 1931 160 of the world’s 1,437 tankers were laid up. Petroleum Times, 28/3/1931, p. 454.
10Petroleum Times, 19/12/1936
11Sigwart, RFA, p. 106.
working lives as one means of speedily increasing the available tonnage. During the Ethiopian Crisis, when the Mediterranean was at risk of being closed to shipping and it appeared an unfriendly America might withhold her oil, a crippling tanker famine was a distinct possibility, leading the OB to recommend that a war reserve of tankers be created, by retaining old vessels and building more than normally required for peacetime. The £4,000,000 required for the sixteen new tankers it recommended was unacceptable, and a scheme to induce shipowners to construct vessels in excess of peacetime requirements failed. To the Treasury’s trepidation over the costs of maintenance and reconditioning, in May 1938 the CID granted the Admiralty permission to purchase up to twenty-five obsolete tankers on the OB’s behalf. However, before the Admiralty found any, the OB reduced the requirement to six vessels. This still proved unobtainable, and only three vessels were purchased before September 1939.

Refuelling at sea in the interwar was ‘in a state of arrested development.’ The USN took the lead in experimentation. Their advances did not go unnoticed by the DNI, however, with the Empire’s numerous ports and anchorages refuelling at sea was well down the list of the Navy’s priorities. Destroyers did refuel from capital ships on manoeuvres. Indeed the Manuals of Seamanship of 1923 and 1932 only refer to destroyers in the context of refuelling at sea, and only from H. M. Ships, not tankers. Trials with the Battleship Ramillies and tanker Brambleleaf were conducted in 1928

18 OB 13th CAB4/29.
19 Correspondence between Treasury and Admiralty, 1939. T161/1036.
21 Log of Wessex, 9/10/1931. ADM53/92144. The Destroyer Wessex (fuel capacity 367 tons) only received 19 tons of oil from the battleship Rodney in 25 minutes while steaming ‘alongside’ at 10 knots.
22 Manuals of Seamanship, vol. 2, 1923, pp. 82-84 and vol. 2, 1932 B.R. 68, pp. 64-65. The latter volume, oddly, does not include the ‘trough’ method (which may be the source of Sigwart’s error below op cit. 25).
using a wire hawser passed through a hose. Other experiments used the 'trough method,' in which vessels steamed side by side with two or more hoses being passed across, this was, though, only suitable for speeds up to twelve knots. In the 'stirrup method,' where the destroyer was towed about one hundred yards astern of the donor vessel twelve knots was the minimum speed and over fifteen knots could be achieved. The longer hose, however, made for a slower rate of transfer.

It was decided in 1928 that as larger ships would not normally require fuelling under way and after trials with destroyers that the 'stirrup' system was the preferred method. More trials, however, reversed this decision and the 'trough' method was reinstated as the prime method in 1935. In 1936 when the question which method was best was raised again the C-in-C's could not agree. To prevent delay the 'trough' method was confirmed as standard in 1938. Nevertheless both 'trough' and 'stirrup' gear were issued to all RFA tankers. Warships larger than the Arethusa class light cruisers received 'trough' gear and eighteen sets of both types were kept on shore to equip commercial tankers. Nevertheless, it was considered that the need to refuel at sea would unlikely, and throughout the trials no particular effort was made to increase the rates of delivery beyond the normal harbour refuelling rates.

Oil stocks in the Mediterranean were concentrated on Gibraltar and Malta; capacity was increased in the 1920s to accommodate the large peacetime fleet, and provide bunkers for ships en route to the Far East, thereafter stocks levels remained static throughout the 1930s. The nature of Gibraltar dictated that the 51,400 tons of storage was underground. At Malta, 46,000 tons of the total 102,000 tons was underground and a small stock of 15,200 tons was maintained at Port Said. The first serious test of the Mediterranean fuelling arrangements was the 1935 Ethiopian crisis. As the crisis unfolded warships moved from Britain to Gibraltar, and the Mediterranean Fleet moved from Malta to Alexandria. Once at Alexandria the Fleet soon depleted

23 History of Fuelling at Sea 1939-45. ADM116/5813. Sigwart, RFA, p. 18. He gives the date as 1924.

24 Sigwart, RFA, p. 19. He claims the 'trough' method was first introduced in 1937, this is incorrect as a photograph in The Army, Navy and Air Force Gazette of 3/9/1931, shows the Repulse refuelling the Wessex using the 'trough' method.


the available stocks and by September fuel shortages in the Eastern Mediterranean had become a cause of anxiety. In response an unprecedented thirteen tankers left Britain for Mediterranean ports, and tankers freighting oil to Britain from Iran were detained in the Mediterranean. Extra storage was taken up at Port Said, Suez and Alexandria where two large tankers were utilised as a floating reserve providing 20,000 tons. Five more tankers, with 42,000 tons, were kept in readiness at Port Said to accompany the Fleet if required.

When the Fleet vacated Malta, the island's fuel stocks were reduced. However, this decision was soon reversed and Malta was given a role as a refuelling base with two tankers positioned in the harbour and the shore stocks were increased to 62,000 tons of oil fuel and 16,000 tons of diesel. It is noteworthy that the underground tanks remained largely empty, which when considered along with the two vulnerable tankers, suggests that the threat of Italian air attacks was not taken as seriously as Marder argues. Rather, it confirms Quartararo's view that the Fleet's need to be near Suez was 'much more important than the vulnerability of Malta.' Haifa was also used as a refuelling base, first by stationing a tanker there and subsequently by the taking over of three tanks from the Iraq Petroleum Company. The demands of the crisis exceeded the ability of the Navy's tankers and it proved necessary to charter commercial vessels. By the end of the crisis, 145,000 tons of oil had been amassed in the Levant and Egypt; confirming Marder's opinion that Britain's naval measures were a serious precaution against any Italian action, rather than just a military display accompanying a political bluff.

Understandably, during the War oil fuel installations outside the European theatre of operations had been neglected. A 1918 review of naval and commercial oil bunkers revealed the problem of sending the Fleet to the Far East. The China station was particularly deficient in oil storage. Attempts to hire commercial storage proved

28Ibid.
29Marder, Dardanelles, p. 69.
31Memo., C-in-C Mediterranean, 19/3/1936. ADM116/3468; Marder, Dardanelles, p. 73.
problematic, as RDS was reluctant to tie up valuable tankage at a time of high prices. In the Indian Ocean, the situation was not so dire because of the proximity of oil in Persia and Burma.

With a large permanent naval presence in the Pacific ruled out for economic reasons, the strategy for an Anglo-Japanese war instead centred on the timely despatch of the Fleet from European waters to a naval base at Singapore. To be feasible, adequate fuel supplies, both along the route to Singapore and at Singapore itself to enable the Fleet to conduct operations, were crucial. Construction of the Singapore base proceeded at a slow and uneven pace. The original rough estimate for the initial fuelling facilities with 400,000 tons of oil storage and jetties was £1,530,000, out of a total of £4,190,000 for the base. Costs escalated, until February 1923 when, to save money, the Cabinet approved a truncated plan. This reduced the number of graving docks and length of quayside but not the oil storage. Cost of the minimum requirement, for 400,000 tons of oil storage, was to be spread over four years; the final total of 1,200,000 tons was to be ready by 1937. By April 1929, oil stocks at Singapore reached 807,000 tons, well behind schedule, nevertheless, more than the minimum recommended by the Admiralty. Given the political and financial climate at the time it was, as Neidpath wrote, 'a solid achievement.' Four years later, stocks had diminished to 764,000 tons, although tankage existed for 860,000 tons. Emergency measures initiated in the late thirties increased Singapore's oil reserve to 1,100,000 tons.

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33 Correspondence between Admiralty and Cohen, May-June 1919. SHELLGHC/UK/A1/6/1.
34 Memo., D-of-S, 6/10/1919. ADM1/8570/292.
35 Memo., Naval Staff on Japanese-US war, June 1921. ADM1/8948.
37 Neidpath, Singapore, pp. 103-104.
38 Vote 10, 1926/27 Estimates.
40 OB 4th. CAB4/18.
41 Neidpath, Singapore, p. 121.
42 War memo. (Eastern), figures as of 30/3/934. ADM116/3475.
in February 1939, with tankage for a further 228,000 tons, plus 40,000 tons of diesel fuel.43

Detailed plans to move the Fleet east were drawn up in 1923 by the Admiralty Plans Division.44 Fuelling en route depended on a number of practical considerations – the number of ships despatched and their range, available tankers, places suitable for fuelling, pre-positioning of oil stocks, the route selected and Japanese countermeasures. The Fleet initially expected to make the voyage to Singapore comprised twenty battleships, eight battle cruisers, twenty-six cruisers, eighty destroyers, thirty submarines and seventy auxiliaries.45 By 1939, this force had dwindled to eight battleships, two aircraft carriers, four heavy cruisers, six light cruisers and fifty-three destroyers.46 With the exception of capital ships and the Elizabethan class cruisers, all the wartime construction had been built with North Sea operations in mind, and consequently had short operational ranges. This was rectified post-War when ships were designed with greater ranges; the standard interwar destroyers (A to I classes) had ranges in excess of 5,500 nautical miles at fifteen knots, compared to their wartime predecessors’ (V & W classes) 2,600 nautical miles.47 Ranges though decreased sharply if speed was increased, the Queen Elizabeth class battleships’ range at twelve knots was 5,000 nautical miles, but at their full speed of twenty-five knots it shrank to a mere 1,600 nautical miles.48

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43War memo. (Eastern), January 1939. ADM116/4393.

44War memo. (draft), February 1923. ADM116/3124.

45Memo. 22/11/1922. ADM116/2100. This is clearly only a working hypothesis as there were not 8 battle cruisers in the fleet, the absence of aircraft carriers may explain this anomaly.

46War memo. (Eastern), January 1939. ADM116/4393.

47March, British Destroyers.

48Raven and Roberts, Battleships WWI, p. 257.
Via Suez was the most direct route to the Far East for both the Mediterranean and Atlantic Fleets. The alternative Cape route doubled the distance and added eight weeks' sailing. Passage through the Mediterranean was considered safe but Suez provided a tempting choke point for the Japanese to attack. It was hoped its distance from Japan would allow the Fleet to pass through the canal before the Japanese could mount an attack. In any case, an attack would be limited in scope, and even if successful it would still be quicker to clear any impediment at Suez than reroute the Fleet via the Cape.

In the Indian Ocean, the likelihood of a Japanese attack increased and fuel calculations could not be based on the most economical speed, as a zigzag course would have to be implemented to avoid submarines. Tankers might also have to detour to evade marauding Japanese cruisers and the need to protect fuel depots from hit-and-run raids was appreciated, with limited shore defences placed at Colombo and Rangoon and

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40 Oil Expenditure trials, 2/3/1916. ADM136/10

50 War Memo. (Eastern), July 1925. ADM116/3118.

51 Ibid.
where possible tanks were situated behind natural features to reduce exposure to direct fire from warships.\textsuperscript{52}

In 1923, calculations showed that after departing Britain on 'Z day' the Fleet could reach Singapore in 'five to six weeks.'\textsuperscript{53} In 1925, this was reduced to twenty-eight days to Singapore, where it would stop for forty-eight hours to refuel before proceeding to relieve Hong Kong nine and a half days later. Poor weather could mean diversion and delay, and increase the time to Hong Kong to fifty-four days.\textsuperscript{54} For the voyage to Singapore, three sheltered anchorages suitable for refuelling warships directly from tankers were earmarked. To keep their identities secret each was given a code letter; 'M' was Kamaran Bay in the Red Sea north of Aden, 'T' was Addu Atoll in the Maldives and 'W' was in the Nancowry Harbour in Nicobar Islands off the northern tip of Sumatra.\textsuperscript{55} Vessels would also refuel at Gibraltar, Malta, Port Said, Port Sudan, Aden, and Colombo from stocks on shore. The principal obstacle to adherence of the timetable was the requisitioning of British commercial tankers already in or near the Indian Ocean in sufficient time for their arrival at the locations 'M' and 'T.' Admiralty Trade Division statistics showed that on any one day fifty-one suitable British tankers were in the area; fifteen in harbour and thirty-six at sea. Most, however, would be loaded with petroleum, and only empty vessels heading for Abadan or Rangoon could be loaded with naval oil fuel, issued with secret orders and despatched to their rendezvous in time. Unless the majority of tankers began moving seven to ten days before 'Z' day, the Fleet could not reach Singapore on time.\textsuperscript{56} Rather than load at Abadan, tankers would be redirected to fill up from naval stocks at Ceylon and Rangoon, where they would be issued with equipment to fuel warships at anchor and secret papers revealing their true destination. Vessels destined for 'T' would load at

\begin{footnotesize}
\textsuperscript{52}Correspondence between C-in-C East Indies and Admiralty, May-June 1924. ADM1/8713/168; Overseas Defence Committee paper 489-M, April 1920. ADM116/2100.

\textsuperscript{53}War Memo. (draft), February 1923. ADM116/3124.

\textsuperscript{54}War Memo. (Eastern), July 1925. ADM116/3118.

\textsuperscript{55}The codes letters were originally 'Z', 'X' and 'V' respectively, minute D-of-P, 29/6/1925. ADM116/3123. The locations are in the 1933 edition of the War Memo., ADM116/3475. After October 1941 they were referred to by name. D-of-P, ADM116/4444.

\textsuperscript{56}Ibid.
\end{footnotesize}
Trincomalee, ostensibly for delivery to Asiatic Petroleum at Kilindini in Kenya, and those earmarked for ‘W’ would load at Rangoon with papers for APOC at Singapore.57

Table 10.158

<table>
<thead>
<tr>
<th>Destination</th>
<th>Number of Tankers</th>
<th>Total Cargo</th>
<th>When required (Z day is the day the main Fleet set sail)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘M’</td>
<td>5</td>
<td>37,000</td>
<td>Z plus 6 days</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>14,800</td>
<td>Z plus 8 days</td>
<td>-</td>
</tr>
<tr>
<td>‘T’</td>
<td>3</td>
<td>22,200</td>
<td>Z plus 14 days</td>
<td>To meet 3rd Cruiser Sqn.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>22,200</td>
<td>Z plus 15 days</td>
<td>at rendezvous A A on Z plus 13 day.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>14,800</td>
<td>Z plus 16 days</td>
<td>-</td>
</tr>
<tr>
<td>‘W’</td>
<td>3</td>
<td>22,200</td>
<td>Z plus 23 days</td>
<td>To meet Cruiser Sqn at rendezvous C C on Z plus 22 day</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>133,200</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

The Fleet would cross the Indian Ocean at sixteen knots until it rendezvoused around ‘W’, from where the speed would be reduced to ensure an adequate oil reserve for any action when approaching Singapore.58 The force commander was faced with a choice of approaches to Singapore. Either the shorter but riskier option down the long narrow passage of the Malacca Straits, or along the west coast of Sumatra to emerge through the Straits of Sunda into the Java Sea, which would add two days to the voyage. It the latter were chosen the decision had to be made ten days out from Singapore to arrange for the extra fuel required. It might also entail refuelling at sea, which the Director of Plans thought would add further to the delay. This possibility diminished,

57 Contents of sealed envelope ‘T/35’. ADM 116/4444
58 ADM 116/3123.
59 War Memo. (Eastern), 19/9/1933. ADM 116/3475.
however, as the Fleet received new vessels with longer ranges. In 1925, including bunkers for tankers, 202,125 tons of oil would be needed for the passage to Singapore, on arrival the Fleet would require another 50,870 tons to fully replenish.

Italy's invasion of Ethiopia made her a potential hostile European power and introduced several new factors into Britain's strategic calculations. One was the feasibility of the Fleet's passage through the Mediterranean to Singapore, leading to an increased focus the Cape route. It was not, though, until the 1939 estimates that the Admiralty requested increased oil storage at Sierra Leone and the Cape. However, this did not mean the Cape route had been totally ignored until then. A small stock of 24,000 tons had long been maintained at Simons Town, but if the Fleet was to use the route 72,000 tons would be required and a larger anchorage. However, an upsurge of South African nationalism made it politically inexpedient for Britain to be seen erecting oil tanks in South Africa. Although normally averse to subterfuge, the Admiralty turned to the oil companies. Both RDS and the AIOC maintained stocks at the Cape, but as high dues encouraged vessels to bunker elsewhere these were very small. With no tankage available for rent, the Admiralty's only alternative was to construct its own. The South African Government, while not willing to undertake the work or contribute financially, leased the Admiralty suitable land at a peppercorn rent. A Board of Trade report on Cape Town's harbour was arranged; Australia was sounded out about her cargo ships using the harbour if it was improved, and RDS agreed to follow the Board of Trade's recommendation and extend its oil facilities. As a courtesy, the South African Government was informed that the 'Admiralty usually arrange their supplies through the commercial oil companies and might ask if the South African Government had any objection to them doing so.' When, in 1937, the tanks' construction was

60 Ibid.
61 War Memo. (Eastern), July 1925. ADM116/3118.
62 Gibbs, Grand Strategy vol. 1, pt II, chapter VI.
63 Vote 10, 1939 Estimates.
64 Minutes of meeting re. oil storage at the Cape, 1/3/1935. ADM116/3584.
announced in the local press no mention was made of the Navy, only the general increase of oil-fuelled vessels.⁶⁶

On reaching Singapore, the nature of the Fleet’s operations would depend on the situation at the time. As the Singapore base was defensive, if Japan was to be defeated, Beatty argued, a forward base, Hong Kong, would be required to blockade Japan.⁶⁷ Consequently, the ‘keynote’ of the naval strategy was, first, to get the Fleet to Singapore and then to Hong Kong.⁶⁸ It was anticipated that the Japanese would have already invested Hong Kong by the time the Fleet reached Singapore. Therefore, it was important that the Fleet move swiftly to Hong Kong and have the ability to operate from there on arrival.⁶⁹ With this in mind, the C-in-C East Indies strongly criticised the Admiralty’s lack of planning for the voyage from Singapore to Hong Kong. He wrote the Admiralty in 1925:

> [I]t is essential that the “Passage of the Fleet to the East” should be worked out on the basis of the passage to Hong Kong. The voyage ends, not at Singapore, but at Hong Kong...[]...Its recapture would be an operation of the first magnitude.⁷⁰

The Admiralty did not, as he suggested, extend the plan in detail. Its prime aim was to secure Singapore ‘with its supply of fuel’ essential to the mobility of the Fleet. Hong Kong should resist ‘to the last’ but its capacity to do so had been constrained by article nineteen of the Washington Treaty prohibiting increases in its existing naval and military facilities.⁷¹ Construction of limited oil storage had started before the treaty was signed; afterwards a policy of substituting coal with oil of equal calorific value was initiated to a total of 24,000 tons of oil, although the substitution policy allowed up to 45,000 tons to be stored at Hong Kong.⁷² Storage, however, remained at 24,000 tons

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⁶⁶*Cape Argus*, 10/7/1937.

⁶⁷Beatty to Imperial Conference, 4/7/1921. CAB32/1.

⁶⁸War Memo. (Eastern), July 1925. ADM116/3118.

⁶⁹Memo. C-in-C China Station, 13/12/1926. ADM116/2401.

⁷⁰Telegram, C-in-C East Indies Station, 31/7/1925. ADM116/3123.

⁷¹Memo., D-of-P, 9/7/1924. ADM116/3124.

⁷²Memo., C-in-C China Station, 13/12/1926. ADM116/2401.
Cowman infers that Britain broke the spirit if not the letter of the Washington Treaty by having an unwritten agreement with RDS, to maintain 26,000 tons of oil at Hong Kong for use in an emergency and with Standard Oil for access to the 36,000 tons they maintained there. He is mistaken, as, to the consternation of some senior naval officers, the Admiralty took great pains to keep to the spirit as well as the letter of the treaty. It is inconceivable that Cohen would have tied up the whole of RDS’s storage with Admiralty grade oil fuel, and none of the 35,000 tons of petroleum products maintained by Standard Oil was suitable as naval fuel. It is also clear from the OB’s fourth report that Hong Kong’s commercial stocks were not taken into account when assessing available stocks. A 1927 re-examination of Hong Kong’s role concluded that until the Singapore base was completed the colony was indefensible, and any fuel could well fall into the hands of an attacker. Hong Kong’s fuel level was to be based on peacetime requirements only, and remained so even after the Treaty had expired. The only alteration to the colony’s fuel arrangements was to place it (24,000 tons of oil fuel and 3,000 tons of diesel) in underground tanks in 1939.

Although untenable until Singapore was completed Hong Kong was, nevertheless, regarded as a stepping-stone to victory. Consequently, as work on Singapore progressed in the 1930s the fuelling arrangements for the passage to Hong Kong received more attention. With scant reserves in Hong Kong the Fleet would have to bring its own fuel to replenish with either in Hong Kong harbour or, if necessary, in a convenient anchorage. Survey vessels investigated potential anchorages on the route among the islands and shoals to the west of Palawan (west Philippines).

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73War memo. (Eastern), January 1938. ADM116/4393.
75Memo. C-in-C China Station, 13/12/1926. ADM116/2401.
76OB 4th CAB4/20.
78To do otherwise would have broken the Washington Treaty. The maximum expected to operate from Hong Kong was 5 heavy cruisers, 1 aircraft carrier, 1 destroyer flotilla, 12 submarines and 16 gunboats. ADM116/2401.
79Memo. Plans Division, 24/1/1939. ADM116/4356.
80Various survey vessels reports, 1928-32. ADM116/2812.
China Station suggested the north Borneo coast might provide a suitable haven.\textsuperscript{81} Another possibility was an anchorage on the Asian mainland in the Tongking Gulf, the major drawbacks being the difficulty in preserving secrecy because of the heavy commercial traffic in the area, and the anchorages being only suitable for flotilla craft. All the island groups in the South China Sea came under scrutiny. The Paracel Islands had potential, but their sovereignty was disputed by China and France. The Navy supported China’s claim because China had the least capacity to interfere with the Islands’ surveying and use, but until the claim was settled, it visited the islands without informing either party.\textsuperscript{82} It boiled down to a choice between the Paracel Islands, with a good anchorage although difficult to defend, and Yu Lin Kan on the mainland that was only suitable as a ‘temporary refuelling anchorage.’\textsuperscript{83} Exploration continued throughout the thirties; with the C-in-C China Station requested to carry out, at his convenience, an aerial survey of the west coast of the Lei Chow peninsula and further unobtrusive investigations of the Paracel Islands. The Japanese occupation of Hainan in February 1939, and the Spratley Islands shortly after sounded the death-knell for any rapid relief for Hong Kong.\textsuperscript{84} Its role relegated to a submarine base, a thorn in the side of the Japanese that might weaken their efforts elsewhere.\textsuperscript{85}

Although the OB examined the current world oil situation in its reports, its chief hypothesis was that Britain could be involved in a war against Japan in 1937 ‘without European complications.’\textsuperscript{86} It had to balance the competing needs of the Empire’s different military and civil sectors during a war.\textsuperscript{87} Predicting fuel consumption in 1925, for a war in 1937 was difficult, but based on the use and rate of growth in the previous five years the OB considered something in the neighbourhood of 7,500,000 tons would be needed to meet Britain’s civil requirements in 1937, necessitating the use of 136

\textsuperscript{81}C-in-C China Station to Admiralty, 14/11/1934. ADM116/3338.
\textsuperscript{82}Report by Adventure, 28/5/1938; Foreign Office to Admiralty 16/1/1937. ADM116/3605.
\textsuperscript{83}Minute, D-of-P, 19/7/1937. ADM116/3605.
\textsuperscript{84}Correspondence between D-of-P and C-in-C China Station, September-October 1937. ADM116/3605; Cowman, Dominion, p. 33.
\textsuperscript{85}Marder, Old Friends, p.67.
\textsuperscript{86}OB 1\textsuperscript{a}, CAB4/16.
\textsuperscript{87}Initially called the Oil Fuel Board, its name was shortened to Oil Board to reflect its responsibilities were for all petroleum products not just oil fuel.
tankers. Another 110 would be employed supplying the Empire and Dominions, but greatest of all would be the 212 tankers required by the Navy, which along with nine for the other Services, made a total of 467. The OB further postulated that in 1937 there would be 482 tankers available, thirty-one Admiralty, 360 British and ninety-one neutral, giving a surplus of fifteen vessels. However, if war broke out in 1925, there was a shortfall of sixty-two tankers. Growth in tanker tonnage inevitably reflected the growth in civil consumption. As each annual report revealed the inaccuracy of its predecessor's predictions, attempts to forecast the world in 1937 were soon discontinued. Subsequent reports concentrated on giving an annual digest of the world's oil and tanker resources and how best the Empire's needs could be met in war at the time.

Strained Anglo-American relations following the breakdown of the Geneva Naval Conference in 1927 again brought into question the availability of American oil supplies in wartime. In response the OB's reports included two scenarios, a 'friendly' and an 'unfriendly' America. In the latter case, 'the situation would be precarious.' Fortuitously, though, new large oil fields had just come on stream in Venezuela that could just about cover the shortfall with closer Imperial co-operation and wartime rationing. Moreover, the OB thought that if America withheld its tankers it was inconceivable that they would not be available for hire by neutrals, and the total pool of tankers from which Britain could draw would remain about the same, albeit still inadequate.

The OB's 1926 prediction that 360 tankers would be available in 1937 was a compromise between the Board of Trade's estimate of 400 and the Admiralty's of 341.

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88 A conservative estimate as the consumption of petroleum products in 1938 exceeded 10,500,000 tons. Payton-Smith, Oil, p. 482.
89 OB 2nd Report, CID paper 859-B, 26/3/1928. CAB4/17. Consequently although fifteen tankers were added to the total of British registered tankers, the estimated wartime deficit only went down by two. In fact it hovered constantly between 60-70 vessels in all the OB Reports.
90 OB 4th CAB4/18.
92 OB 3rd CAB4/18. Over half of Venezuela's oil production of 9,000,000 tons of crude was controlled by RDS, the remainder by Standard Oil. By 1939 Venezuela was the single largest source of oil for the UK market (although it did not supply fuel to the Navy until after September 1939). B. S. McBeth, British Oil Policy 1919-1939, (London: Frank Cass, 1985).
Such a large disparity led to a further bid by the Admiralty for control over all tankers in wartime. As in the earlier tussle that brought the OB into being; the Board of Trade objected.\(^9\) The solution was a compromise, a wartime OB Tanker Tonnage Sub-Committee on which both parties were represented.

In November 1934, the CID instructed the OB that in addition to planning for a Far East war it should proceed on the basis of a war with Germany in five years' time.\(^4\) In 1935, the OB reported a shortfall of 98 tankers (46 with rationing).\(^5\) In its final calculation before the outbreak of war, it predicted a surplus of 114 tankers if it assumed an open Mediterranean and a friendly US, however the surplus dwindled to six with an unfriendly US and a closed Mediterranean.\(^6\) The dramatic turn around in the tanker situation was a result in the growth in the commercial oil industry. A two-war scenario added less than two million tons to the total needs. Commercial pressures increased the world’s tanker Fleet, and pushed up the average size of individual vessels.\(^7\) Commercial pressures also led to the development of new sources closer to Britain, both in the Empire in Trinidad, and outside in Venezuela, that reduced tanker requirements. The Ethiopian Crisis showed that even in a medium-sized conflict the Navy depended on the commercial sector for the extra tankers required. In an Anglo-Japanese war, commercial tankers were involved even before the Fleet weighed anchor. The Admiralty's peacetime needs and tanker fleet remained virtually unchanged throughout the interwar period. The only reason it had tonnage available for charter was because the hoped for additions to the reserve only partially materialised. Although the income from charters was a welcome alleviation of hard-pressed naval estimates, it was, in defence terms, counter-productive as it prevented increases in overall tanker numbers.

When the Government finally attempted to increase the national tanker fleet, its efforts amounted to tinkering at the edges. In 1928, the OB calculated the introduction

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\(^9\) OB 111 April 1933, CAB50/10.

\(^4\) CID 266\(^{th}\), 22/11/1934. CAB2/6; CID paper 1165-B 22/2/1935. CAB4/23.


\(^6\) OB 13\(^{th}\). CAB4/29.

\(^7\) In 1926 the world's tanker fleet was 1,006 vessels and in 1938-39 it was 1,655. OB 1\(^{st}\) CAB4/16 and 13\(^{th}\) CAB4/29.
of rationing in Britain would reduce imports by 2,450,683 tons, or over 40%. As the domestic market grew, and the notion of a European war made rationing politically more acceptable, the potential savings through rationing increased to over 3,100,000 tons in 1940. How much domestic demand could be reduced by rationing dictated the number of tankers available for naval use in wartime in addition to the Navy’s own vessels.

With no supplies of her own Britain’s wartime oil supplies would always be dependent upon other Governments. The American Neutrality Act, for example, was one threat, following which OB calculations had to disregard US sources. However, by the 1930s, more sources had become available and if Britain could continue to draw oil in wartime from where she did in peacetime, the tanker tonnage released through rationing represented a strategic reserve. However, if forced to import supplies from further afield then Britain and the Navy would be in trouble. The greater the domestic private consumption available to be squeezed the greater the reserve of tankers, a truth that never really sank home in the Admiralty and the OB, nor did the fact, until it was too late, that the only other way to have a reserve of tankers is to keep them idle in peacetime. The Admiralty realised it would have to depend on the commercial oil infrastructure in wartime, but does not appear to have grasped the basic mechanisms of the market. Its chances of preventing the sale of tankers post-War, due to the economic situation, were nil. However, by hiring out its own tankers the Admiralty was in effect reducing the number of commercial tankers and consequently the pool it could draw from in wartime. The receipts from charters were welcome and idle tankers may well have brought the down the wrath of the Treasury, nevertheless, the advantages of idle tankers does not appeared to have occurred to the Admiralty. Tankers would be the key to supplies in the next war, wherever it occurred, as they had proved to be in the last. Fortunately, at least as far as oil supplies were concerned, the next war occurred in Europe and peacetime sources continued to provide oil and

98 OB 2nd, CAB4/17
99 OB 13th, CAB4/29
100 In 1940 the Petroleum Board imported 8,717 tons of oil of American origin. None of the 1,991,002 tons of oil fuel the Admiralty imported into Britain in 1940 was purchased from the US. POWe 33/212. The same argument the OB used regarding US tankers and neutral tankers, i.e. The Neutrality Act merely displaced trade, also applies to oil.
demand was less than anticipated, and as no large Fleet was sent to Singapore the majority of the pre-War oil supply plans were never tested.
Chapter Eleven

Back to Coal

This chapter explains why the potential fuel savings of the diesel engine were not realised by the Navy interwar and the unwitting technical effect of the Washington Treaty. Then it refocuses on coal, which was still considered by some as the only fuel capable of releasing the Navy from its dependency on foreign interests. It examines developments in the different ways to use coal, either on its own, in conjunction with petroleum and as a raw material to extract oil from, and the Navy’s interest in these technologies. Finally, it looks at the social, political and economic agendas that motivated the champions of coal, particularly Bernard Acworth and the ‘Back to Coal’ movement of the 1930s.

Fisher never realised his dream of a diesel-engined battleship. The naval tankers fitted with experimental diesels during the War were unsuccessful and diesel’s promised fuel economy was more than offset by limited performance and poor reliability.\(^1\) Fitting a diesel in the battle cruiser Hood (1918) for cruising had been considered but rejected.\(^2\) Post-War, the minelayer Adventure (1924) was equipped with auxiliary diesel-electric engines for cruising, but this was not repeated in other vessels.\(^3\) The 1922 Washington Treaty made displacement the limiting factor in the design of battleships, cruisers and aircraft carriers for the first time. The agreed yardstick, ‘standard displacement,’ did not include a vessel’s fuel.\(^4\) Although steam turbines used three times the fuel as diesels, they were far lighter, allowing more tonnage to be devoted to vessels’ armour and armament. As a result, except for submarines, the Treaty retarded development of

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diesel engines for naval use.\textsuperscript{4} Diesels came to the fore in the late twenties with the construction of the German diesel equipped \textit{Deutschland} class `pocket battleships.' The Admiralty judged:

In the case of the \textit{Deutschland}, although the engines themselves are relatively light, the weight of the complete installation is approximately 20\% greater than that of a contemporary steam plant and the space occupied is considerably greater. The reliability and durability are undoubtedly inferior to steam plant.\textsuperscript{6}

Although the Admiralty never equipped a major surface warship with diesels, for the merchant marine fuel economy was a more important consideration than weight and diesels were adopted in increasing numbers between the wars. In 1922, 2.5\% of merchant ships were diesel powered; by 1935, it was 17.8\%. British shipowners on the whole were slow to introduce diesels, and the majority of British shipping remained steam-powered until well after the Second World War, as indeed did the Admiralty's own large fleet of auxiliary vessels.\textsuperscript{7}

In 1917, some believed that the solution to the oil crisis lay in a return to burning coal, and converting oil-burners to coal was considered by the DNC, D'Eyncourt, in June. He rejected it as impractical as the work required `would probably absorb the whole of the warship building capacity of the country.' Instead, he pointed out, effective savings could be made if destroyers went at reduced power except when necessary. By this time, construction of large warships had all but ceased and shipyards were concentrating on smaller vessels needed to counter the U-boats. Although against the idea, in order to save time, D'Eyncourt thought it was wise to prepare plans for a small coal-burning destroyer suitable for anti-submarine work.\textsuperscript{4}

The Shipping Controller added his voice to those advocating a return to coal, and in August 1917 forwarded a memorandum to the First Lord and Cabinet Secretary.

\begin{footnotes}
\item[^{6}]{Memo. for 1933 estimates, probably by the E-in-C. ADM116/2986.}
\item[^{7}]{Max E. Fletcher, `From Coal to Oil in British Shipping,' \textit{The Journal of Transport History}, New series vol. 3. no. 1 (February 1975). p. 11.; Sigwart, \textit{RFA}, p. 98.}
\item[^{8}]{DNC to 3rd SL, 27/6/1917. ADM1/8604/70}
\end{footnotes}
His disquiet was not just due to the shortage of oil, but also to the loss of cargoes through using double bottoms and that over a fifth of the merchant ship construction programme was dedicated to tankers. He saw little hope of raising the Navy’s reserve beyond three, or at the most four months’ consumption continuing:

It is obvious that we are entirely dependant on the United States for the mobility of our Navy and failure of the United States' supply, or any action by the United States Government to restrict that supply, would be a determining factor in our War policy.9

He urged the Navy to reconsider building coal or dual-fuel warships. In response, the First Lord reported to Cabinet that the Navy had considered building coal-burners, but no change could take effect before the end of 1918. Thereafter it might be desirable to take delivery of some coal-burning destroyers.10 By January 1918, however, the Board, clearly confident over oil supplies, and only included oil-burning destroyers in the 1919 programme.11 The only warships built exclusively as coal-burners during the War were some small coastal minesweepers.12

Construction of coal-burning warships resurfaced again in 1921, when the Third Sea Lord, anxious over oil supplies, induced Beatty to ask the DNC and E-in-C to re-examine the question. Their investigations centred on destroyers, the greatest consumers of oil during the War; if only a proportion used coal substantial savings might be made. All the, by now, familiar arguments were marshalled, and they concluded it was impracticable ‘to approach at all closely the results obtainable using oil fuel alone.’13 As far as the Navy was concerned, oil was here to stay.

External pressure for a return to coal post-War emanated from two sources; those who thought it crucial to be independent from foreign fuel supplies and from the South Wales coal industry. When oil was introduced before the War the coal industry had remained quiescent, as South Wales’ coal exports were booming and the larger

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10Cabinet 19/10/1917. CAB23/4.
113rd SL to DNC, 8/1/1918. ADM1/8604/70.
mercantile market appeared secure. Post-War, though exports contracted, as foreign sources expanded faster than consumption and the transition to oil by the world’s merchant fleets began to make significant inroads into steam coal’s market. Until the Depression the industry remained optimistic, hoping the trend could be reversed by constraints in oil supplies and improved methods of utilising coal. The latter included burning coal dust, either on its own or suspended in oil (colloidal fuel), and extracting oil from coal. None, however, proved able to prevent the decline of the steam coal industry, and by 1935, 51% of the world’s merchant ships used oil. Nevertheless, the coal industry remained a formidable force in the British economy. The 1925 *Royal Commission on the Coal Industry* wrote:

> The paramount importance of the coal mining industry in the economic and social life of this country is a commonplace... With the exception of agriculture, to which it is a close second, the industry employs more men than any other; not less than one-twelfth of our population is directly dependent on it. It is the foundation of our iron and steel, shipbuilding and engineering trades, and indeed, of our whole industrial life.

The coal industry’s political clout, be it via the unions, the mine owners or the ballot box could not be easily dismissed by the Government.

Before the War burning coal dust was a widespread industrial practice; indeed the Admiralty had tried it in 1904. Its advantage was ease of stoking, as it was normally sprayed into furnaces. A significant impediment to maritime use was the heavy milling equipment required to pulverise the coal immediately before spraying. Trials in 1918 by the Royal Australian Navy gave ‘favourable results’ and showed

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14 *Jevons, Coal Trade*, p. 705.

15 *Asteris, Rise and Decline*, p. 41. The South Wales coal industry experienced seventy-five years of almost uninterrupted growth in exports before 1913.

16 *Fletcher, 'British Shipping,'* p. 8. British vessels switched to oil slower than the rest of the world, and many owners hedged their bets by building dual fired vessels.


18 *The Engineer, 15/4/1904; Petroleum Times, 26/5/1928.*
powdered semi-coke was superior to powdered coal. Discontinued after the Armistice, the trials were criticised by D'Eyncourt for being unrealistic as the coal was delivered on board ready powdered, which was, he considered, impractical on a large scale. The Admiralty conducted shore trials in 1922 at Devonport and again these appear not to have been taken beyond the preliminary stage. Interest was rekindled in 1929, and it converted the depot ship Maidstone (1912) to test the 'Brand' system. At the same time, the Board of Trade made funds available for the Fuel Research Station to also experiment with powdered coal. Although a handful of merchant ships used powdered coal quite satisfactorily. The Navy rejected it emphatically in 1933 because of its low calorific value in relation to oil, weight of milling machinery, increased fire risk and difficulties arising from the ash.

A compromise between oil and coal was colloidal fuel - a mixture of oil fuel and coal dust - that gave the same advantages of oil over coal as it could be pumped through pipes and sprayed into furnaces. During the War, the USS Gem burnt colloidal fuel for over five months. Mixtures generally consisted of 30-40% coal, and compared to oil loss of calorific value was small. The principal drawback was the mixture's stability, and unless stability could be sustained the dust eventually settled out to form a hard sludge. As for helping the coal industry, in 1932 it was calculated that if the entire Navy and the mercantile marine burnt colloidal fuel demand for coal would increase by just 0.4%. Both Cunard and Navy conducted trials with colloidal fuel in 1933.

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19Ibid.


21Engineers Dept. to Admiral Superintendent, Devonport Dockyard, 8/8/1922. Records of Coal and Oil vol. 2. NHB.


23Hansard 5:249:223-224. 3/3/1931

24OB 5th, CID paper 1007-B, 1/7/1930. CAB4/20. Ten British commercial vessels used or partially used pulverised coal at this time.


26A small patrol vessel, 201 tons gross, built 1913.

27Petroleum Times, 29/10/1932.

Navy's limited efforts at Haslar involved just a couple of tons of fuel. In contrast, Cunard, in conjunction with the Powell Duffryn Company, tested 150 tons in the *Scythia* with, they claimed, satisfactory results, apparently though not satisfactory enough to lead to its widespread introduction. The Navy concluded that difficulties of supply, transporting and storing precluded the use of colloidal fuel.

Post-War the Scottish shale industry was in a parlous state. Encouraged by the Government, APOC acquired it in 1919. Although the six remaining mines continued to operate independently, they were brought under the umbrella of Scottish Oil Ltd. along with the Grangemouth refinery. In November 1924, Scottish Oil hoped to sell the Admiralty 140,000 tons of oil per annum with a slightly lower flash point than the Admiralty specification at seven pounds a ton. Normally, the Admiralty purchased around 20,000-30,000 tons of shale oil a year for diesels - any more than that would have to be burnt in furnaces. Acknowledging the wartime benefits of maintaining a domestic supply and as light shale oil was used in torpedoes the D-of-C was sympathetic to the proposal. Believing that if the Admiralty purchased shale oil, it 'might save an industry that employs many thousands of men' and, as the price of oil was set to increase, it was financially acceptable. The D-of-S was less accommodating; it was not, he thought, the role of the Navy to provide subsidies to industry, and compared to Texas oil the offer would cost the Admiralty £602,000. In the event no Admiralty order was placed for shale oil for 1925/26, and for 1926/27 the Admiralty offered to buy 30,000 tons at only three pound ten shillings per ton, nowhere near enough to save the industry. A company proposal to reduce wages and close a third of the mines provoked a strike in November 1924, and work resumed only after an inquiry was set-up to examine the industry. It recommended the Government should consider granting a more favourable Admiralty contract, as the survival of the industry was in the national interest.

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29 *Petroleum Times*, 15/4/1933.

30 Memo., E-in-C, 25/1/1935. ADM116/3402. Colloidal fuel came under renewed scrutiny during WW2 and again, although considered promising, no progress was made. Payton-Smith, *Oil*, p. 94.

31 Bamberg, *BP*, p.177.


contract or otherwise, and in June 1926 the wage reductions and closures were implemented. The slimmed down industry survived until the next crisis in 1928, when again the Admiralty was asked to provide a concealed subsidiary in the form of a favourable contract. Again, it declined. Things reached another crisis point in 1931, when once more the Admiralty was turned to for salvation, this time by the Minister for Mines. Although, as Payton-Smith observes, the production of oil fuel from shale was 'dwarfed by the rising estimates of war needs,' the Admiralty wanted to save the industry. However, to do so entailed paying eight pounds a ton for fuel the Admiralty could obtain elsewhere for one pound six shillings. When this was rejected by the Treasury, the whole industry again almost closed, but not before the Government introduction of preferential tax rates for home produced oil and more efficient plant ensured the industry's survival, though not expansion.

Only the extraction of petroleum from coal offered the promise of large quantities of oil suitable for naval fuel from domestic sources, and at the same time halting the decline in the coal industry. There were two principal processes, hydrogenation and Low Temperature Carbonisation (LTC). During hydrogenation, powdered coal was subjected to high pressures and temperatures in the presence of hydrogen, producing high yields of petroleum, particularly the lighter factions such as petrol, but little else. Although limited work had been conducted in Britain, development had been largely confined to Germany. Most attention in Britain focused on the LTC process in which coal was heated to 600/650°C; although this produced less petroleum, it was more suitable for naval fuel. In addition, the resultant semi-coke was better quality than that manufactured in the High Temperature Carbonisation process used in the gas industry. In 1925, the PSOC reported that although LTC could not supply the country's total wartime requirements, it could make a significant contribution. Recommending that research be accelerated and the construction of a Government operated plant that 'might not pay its way' would be justified by experience and

35 Secretary of Mines to Chancellor, 11/6/1931. ADM1/8985.
36 Payton-Smith, Oil, p. 19.
37 Admiralty to Treasury, 6/7/1931. ADM1/8985.
knowledge acquired. In 1926, the Samuel Commission also recommended that the Government 'give sympathetic consideration' to supporting LTC research in Britain, recognising that any large-scale commercial exploitation was dependent more on a market for semi-coke than the market for oil. However, only small-scale private experimentation continued.

As with shale oil, the high costs of mining made the peacetime economics of LTC unacceptable. Furthermore, it would not generate a significant increase in demand for coal; at best, 30-40,000 jobs might be created. In wartime, even if LTC could fulfil Britain's needs it would take a million additional men to operate the plant and mine the coal. Despite these drawbacks, with unemployment in the coalfields growing, the 1929 Labour Government created an OB sub-committee to examine the manufacture of oil from coal. This judged that although LTC 'fuel can never seriously affect the situation so far as the Fleet is concerned,' investigations should continue into refining the tar oil produced by LTC. However, research into the actual process should remain with commercial companies without the Government's financial assistance.

Even though the quantities of oil fuel produced by LTC were in strategic terms insignificant, the Admiralty was interested in any potential source of domestic fuel and inquired into fuel from fifteen different LTC processes. Four showed promise and were purchased for evaluation. Small-scale sea trials were conducted in the destroyer Tyrant in 1931. After more tests on shore in 1932, only one was proceeded with, and only then after the manufacturer, Low Temperature Carbonisation Ltd., reduced its price. In February 1933, more comprehensive trials were conducted in the destroyer

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39 CID paper 582-B, 10/2/1925. CAB4/12.

40 Samuel, pp. 19-24. The semi-coke was marketed as Coalite. Different systems had different ratios of product, but on average a ton of coal produced 60-75% semi-coke and 15-20 gallons of tar oil.

41 OB 5th CAB4/20.

42 Supple, Coal, p. 322. The OB's figure was 20,000.

43 Payton-Smith, Oil, p. 21.

44 OB 5th, CAB4/20. The Sub-committee's chairman was G. Hall, Civil Lord of the Admiralty.

45 Memo. OB 64, 19/3/1931. CAB50/4.

46 Petroleum Times, 18/2/1933.

Westminster, when 330 tons were burnt. LTC oil had a lower calorific value than regular fuel oils but its lower viscosity averted the need for preheating before burning or pumping in the winter. However, the Navy only purchased small quantities; twenty tons in 1929, 540¾ tons in 1930, 224 tons in 1931, 220 tons in 1932 and 3,025 tons in 1933.  

The growth of the LTC industry was sluggish and its economic prospects very dubious; in 1936 all fifteen LTC plants combined treated only 364,305 tons of coal to produce around 25,000 tons of tar oil. In April 1937, following a deputation of coal interests to the Prime Minister, Lord Falmouth was appointed chairman of a CID sub-committee to:

Consider and examine the various processes for the production of oil from coal and certain other materials indigenous to this country, and to report on their possibilities. And on the advantages to be obtained by way of security of oil supplies in emergency.

Falmouth computed if ten million tons of coal were treated by LTC - thirty times that treated at the time - the main product would be 7,500,000 tons of coke of questionable value, and just 750,000 tons of oil; of which only a third was suitable as naval fuel, concluding that LTC should 'be ignored as a possible major source of indigenous oil supply.'

Falmouth also looked to hydrogenation as a possible source of oil. The Admiralty had found diesel fuel manufactured by hydrogenation satisfactory for submarines, but unless the price was reduced, declined to place a substantial order.

From 1928, to encourage the development of hydrogenation imported petrol was taxed...
at four pence a gallon. However, development remained leisurely, with only Imperial Chemical Industries Ltd. (ICI) investing seriously in the process. After the Government announced in 1933, that it would guarantee the four pence levy as a minimum for the next nine years the pace of development quickened and ICI erected a plant at Billingham. Falmouth thought, if hydrogenation was to stand a chance of becoming economically viable, the petrol levy would have to be increased to cover all petroleum products and guaranteed for twelve years. Purely from a defence perspective, Falmouth came out against Hydrogenation, arguing that the present infrastructure for importing oil with its reliance on numerous tankers and port facilities was diverse and capable of rapid expansion. Reliance on one large oil from coal plant was tantamount to putting all the country’s eggs in one basket - one vulnerable to air attacks with potentially disastrous consequences. Moreover, to be viable it would have to operate in peacetime, as a result the infrastructure for importing oil would inevitably contract. Falmouth concluded, that no direct subsidy should be given. Billingham continued to extract oil from coal – thirty-five million gallons of it in 1938 - but two more years of large-scale operation were considered necessary to iron out all the technical difficulties, before an accurate economic appraisal was possible.

In his autobiography First Sea Lord Admiral Chatfield, bemoaned his powerlessness to directly counter false technical advice in the press:

There are always old Service men ready to write their views. Unfortunately these views are sometimes misleading. A powerful “expert” writer can sway not only the man in the street, but also the responsible statesman and the interested politician. ...[who can]... be led astray by writers who however honest their opinion, are irresponsible and apt to have “bees in their bonnets”.

54 Retail price of petrol in 1928 was 1s 2d a gallon.

55 The levy was for ‘36 pence years,’ so if it exceeded 4d the period was correspondingly reduced. The tax soon went up to 8d and the preferential period down to 4½ years. W. J. Reader, in Barry Supple, (Ed.), Essays in British Business History, (Oxford: OUP, 1977). pp. 227-243.

56 Falmouth.

57 OB 13th. CAB4/29.

58 Admiral Sir A. Ernle M Chatfield, First Sea Lord 21/1/1933 - 17/11/1938

Chatfield kept his own counsel as to whom he was specifically referring. High on his list of well meaning nuisances with 'spurious' and dangerous opinions, along with Admiral Richmond, was undoubtedly Captain Bernard Acworth. 60

Acworth retired from the Navy in February 1931, having been a submariner, a battle cruiser turret commander and, post-War, a destroyer captain. 61 His prolific penmanship contained two main themes; Britain's naval forces were the product of a flawed system and Britain was too dependent on imported oil, which placed her into bondage to 'America and cosmopolitan Jews,' and was destroying the livelihood of 'patriotic and loyal miners.' 62 At the core of both themes lay the late Admiral Fisher, whom he held responsible for all Britain's setbacks during the War and dependence on oil. 63 Acworth argued that the Navy could and should revert to burning coal. He thought high speed was not essential for British warships because as the blockader an enemy would be forced to confront them to break a blockade or attack a convoy. Speed of the battle-fleet's scouting forces should, he thought, be relative to the speed of the battle-fleet, not the enemy's scouts. Slower vessels could compensate for the tactical disadvantage of lower speed by devoting the weight saved from fewer boilers to guns and armour. 64

Using various nom de plumes Acworth started campaigning before retiring from active service. As Neon, he wrote The Great Delusion in 1927, although he later credited the work to his wife. 65 In 1928, he wrote the article In Bondage to Oil, that the Naval Review reprinted from The National Review, as Poseidon. 66 After retiring officially, he became the naval correspondent of the Morning Post, writing articles such


61 The Times, 6/2/1931.

62 Bernard Acworth, Navies of Today and Tomorrow, (London: Eyre and Spottiswoode, 1930), p 123. The 'cosmopolitan Jew' was Marcus Samuel.

63 Acworth's attack on Fisher permeates most of his work, but is best exemplified in Navies Today and Tomorrow. He thought that air power, torpedoes, radios, submarines and centralised fire control were all over rated, and instead placed his faith in aggressive blockade and convoys.

64 Ironically, this fitted in even better with oil-burners as they could devote even more space to protection and armament than coal-burners of equal speed.


as *Our Peril on the Seas*, linking the Admiralty's concern over its oil reserves to his case for coal." In addition to his books and newspaper column, he pursued his case unabashed with professional institutions through articles and papers, publishing in, among others, *The Naval Review*, *Transactions of the Institution of Naval Architects* and *The British Science Guild*.

Acworth's message struck a chord with a declining coal industry and he became a self-appointed spokesman for the 'Back to Coal' movement, created to lobby for Government help for the coal industry." Divergent views in the movement made it quite disparate, some members favoured the use of powdered coal, others colloidal fuel or oil from coal. Acworth though was clear; he considered the possibility of oil from coal supplying Britain's naval needs a 'great and cruel hoax.' Sympathy for the miners' plight during the Depression permeated all levels of society and Acworth's message that the advantages of oil were illusory fell on fertile ground. He succeeded in convincing significant numbers of parliamentarians, publishers and public of the merits of his case.

Decline in the Navy's coal consumption post-War had been dramatic, from 2,486,000 tons in 1919 to just 180,000 tons in 1934 - the majority of which was for use ashore for smithies, foundries, generating stations and heating." The First Lord pointed out in 1933, 'if the Navy burnt coal exclusively, its consumption would not exceed one half of one per cent of the total output of coal.' None the less, the 'Back to Coal'

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66 Supple, *British Coal*, p. 321; Bernard Acworth, *Britain in Danger, Our New Navy Examined*, (London: Eyre and Spottiswoode, 1937), pp. 143-150. In 1932, Baldwin, when President of the Board of Trade received a deputation from the 'Back to Coal' lobby, but in 1934, when PM declined to receive another. The frustrated 1934 delegation included Admiral Sir Reginald Hall, former DNI who detected Marcus Samuel, A. H. Pollen, Sir R Redmayne, former chief inspector of mines, the Mayors of Cardiff and Merthyr Tydfil, and representatives of the Miners' Federation and South Wales Coal Owners Association.

67 Acworth, 'Bondage,' p. 771. Initially Acworth rejected oil from coal for all purposes, but later accepted that it might be able to supply aviation fuel.


movement intensified its crusade as the situation in the coalfields deteriorated, reasoning if the Navy could be induced to burn coal, then the decline in coal’s use by the merchant marine might also be arrested.\textsuperscript{19} The Government could not afford to ignore Acworth and his acolytes. Regular parliamentary interventions calling for the Navy to return to coal were greeted with an unequivocal response from the Government. Typical, is Sir V. Warrender’s (Parliamentary and Financial Secretary to Admiralty) exasperated reply to William Jenkins in 1935.

As has been repeatedly explained in the House and elsewhere, the substitution of coal for oil in fuel in His Majesty’s ships would entail so serious a loss of efficiency that the change suggested is quite out of the question.\textsuperscript{20}

Outside of Parliament, as the Admiralty loathed debating what it considered its business in public, it was difficult for serving officers to openly challenge Acworth. Nevertheless, Acworth’s articles and papers were challenged either by a counter paper, as in the case of \textit{Naval Review},\textsuperscript{21} or, as in the case of Acworth’s paper to the Institute of Naval Architects, in the subsequent discussion.\textsuperscript{22} Retired officers were also enlisted to challenge the ‘Back to Coal’ movement. Former E-in-C Engineer Vice-Admiral Sir Reginald W. Skelton entered the fray using a RUSI lecture to rebut Acworth’s claims.\textsuperscript{23} Bracey’s Naval Annual also waded in, comparing the last coal burning class of cruisers built for the Navy with the new \textit{Leander} class, to the detriment of the former.\textsuperscript{24}

Under this onslaught, Acworth shifted his ground. He remained firm that ‘a fuel supply must be absolutely assured under all circumstances,’ but by the end of the 1930s acknowledged some of the technical advantages of oil and accepted dual-firing in

\textsuperscript{19}The ‘Back to Coal’ movement had some success in obtaining subsidies for commercial bunker in the late 1930’s.

\textsuperscript{20}Hinxworth, 5.304 263, 31/7/1935.


\textsuperscript{22}Acworth, ‘Alternative Firing.’


\textsuperscript{24}Bracey’s 1934, ‘The Building of a Cruiser.’ pp. 82-91.
cruisers. Battleships, he persisted, should though only burn coal.\textsuperscript{79} The suggested designs in his earlier works by 1937 had become drawings and models, convincing enough to persuade some Parliamentarians that the matter merited further debate. Lord Ailwyn (Unionist) with the support of the Lord Beatty (son of the Admiral), called for the reintroduction of dual-fired warships in June 1937. During the long debate, the Admiralty claimed Acworth's design for a 10,000 tons cruiser would have to displace 21,000 tons to meet his criteria and require 550 more stokers to work it. Ailwyn declined to put the matter to a vote.\textsuperscript{80} This did not stop him raising it again though in 1938, when another debate re-trod the same ground.\textsuperscript{81} It is clear that the 'back to coal' lobby had discomforted the Admiralty, and to such an extent that the First Lord felt compelled to include in his statement accompanying the 1939 estimates that:

During the past year, considerable time has been devoted to detailed investigations of the claims put forward recently in favour of a return to coal burning in warships. These investigations have proved conclusively that, on the major counts weight and space required and operation, a return to coal burning would impose such a handicap on our ships as to be definitely unacceptable.\textsuperscript{82}

Diesels could not compete with the reliability, high speed and lightweight of steam turbines for warships. Without the fuel savings offered by diesels large quantities of fuel would still be required to be burnt under boilers. As we have seen in previous chapters the desire to free the Navy from potential or real dependence on foreign fuel and interests, particularly American ones, motivated the Admiralty and its critics. The failure of Cowdray to discover large quantities of oil in Britain did not necessarily mean the end of the ideal solution – the Navy totally supplied by a domestic fuel source. It was hoped that coal in one form or another might still provide the solution. However, as far as the Navy was concerned, a return to coal alone or even dual-fired boilers was not going to happen. All the alternatives to oil were tried by the Admiralty and found unsuitable; powdered coal and colloidal fuel were not practical, and oil from coal was at

\textsuperscript{79}Acworth, \textit{Britain in Danger}, p. 220.

\textsuperscript{80}Hansard (Lords), 5:105:632-666, 16/6/1937.

\textsuperscript{81}Hansard (Lords), 5:108:596, 6/4/1938.

\textsuperscript{82}1939 Estimates, Cmd.5952.
a too early a stage of development and uneconomic in peacetime. Purists of the 'Back to Coal' movement, such as Acworth, were never going to be satisfied, but the furore they raised could not be ignored as it challenged the Admiralty's competency. Acworth's more laudable motive - to alleviate suffering in the coal industry - also found limited favour in the Admiralty when the shale oil producers turned to it for help. However, the Scottish oil industry was also disappointed and for the same basic reasons as the manufactures of oil from coal were, first because the price was too high and, more importantly, despite Churchill's pre-War boast, because they did not produce enough oil to make a strategic difference. None the less, like the oil companies the coal and chemical industries looked to the Navy for support for their enterprises, ideally with direct financial aid and if that was not possible, then indirectly with an Admiralty contract. However, fuel was not unique to the Navy and unless it could see an early and direct advantage, industrial support was regarded as the province of the Board of Trade. Consequently, the Navy was loath to allocate any of its scarce resources supporting industries that would inevitably survive in some form or were the wider responsibility of the Government. Indeed, as Falmouth observed, interfering with commercial activity could ultimately be the riskier course.

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8) One post-War exception was the armour plate manufacturers, whose only customer was the Navy and consequently received financial assistance. Gordon, Procurement, p. 83-84.
Chapter Twelve

Conclusion

Britain was extraordinarily fortunate that the source of the world’s best steam coal was located in Britain, ideally situated in the event of a war with any major European power – near to where it was required, but invulnerable to attack. If the Navy had been a regional force this would have been sufficient, it was though an instrument of a global empire. Because the War was fought predominantly in or around Europe, it is easy to overlook all the advantages the Navy had in respect of coal. First was control, it was physical control over the mines in British territory that gave the naval planners peace of mind; this would have been the case though in whichever corner of the Empire the mines were situated. Second, (for the period covered by this work) the coal industry was a mature industry with a large market and highly developed infrastructure far in excess of the Navy’s needs. Scholars have placed great emphasis on the network of British coaling stations across the globe. Indeed denying bunkers to foreign vessels was a potent enhancement of British imperial power and used to good effect during the War. Because, as a matter of routine, warships refuelled at the extensive network of bases, it is misleading to assume that the bases alone were the only key to global naval power. As the Russians in 1905 and Americans in 1907-09 found out, another essential element was a large collier fleet. Deterioration prevented the Navy maintaining large coal stocks at naval bases. Stocks had to be regularly rotated and topped up by a fleet of colliers shuttling between South Wales and the coaling stations; it was the colliers that made the coaling stations viable. Moreover, by 1900, the collier fleet also gave the Navy a degree of independence from fixed bases, as by then it had become common during manoeuvres for colliers to follow the Fleet and coal warships directly. Attempts

\[1\text{Archibald S. Hurd, 'Coal, Trade, And The Empire', The Nineteenth Century, Vol. 44, (Nov. 1898), pp. 718-723, and Schurman and Colomb as cited by Beeler in Far Flung Lines. P.33}

\[2\text{Salter, Shipping Control, p. 105.}

\[3\text{The Russian Fleet relied on German and British colliers, Lamer J. R. Cecil, 'Coal for the Fleet that had to Die' The American Historical Review, vol. LXIX, no. 4 (July 1964), pp. 990-1005. The American Fleet was supplied with 28,499 tons (US) by USN colliers and 265,094 tons (US) by British colliers. RG 38 E 106 Box 837.}
to coal at sea under weigh were unsuccessful, but the practice of coaling in sheltered anchorages was widespread and the method of choice for the Grand Fleet throughout the War. Absence of shore-based coaling facilities at Scapa Flow was by design, not neglect. Nicholas Lambert's notion that large stocks overseas were Britain's 'hidden strengths' is an exaggeration. Overseas stocks were to sustain naval operations, be it a small gunboat or a couple of battle cruisers, until the true hidden strength came into play - a large Battle Fleet accompanied by a large fleet of colliers. Indeed, because of deterioration, unless a very large stock of patent fuel was created, there was no other option. When, under Fisher, the Fleet concentrated in home waters the size of the overseas stock remained stable, although the proportion of patent fuel was increased to compensate for the reduced turnover rate. A secure supply of the best available fuel and a global network of bases connected by a large collier fleet underpinned Britain's global naval strength. The necessary pre-War decision to concentrate the Fleet in British waters was made easier by improved communications and because the collier fleet gave Britain the capacity to despatch to any corner of the globe a fleet far larger than the size of static coal stocks suggest. The composition of the collier fleet, with its many small independent operators, prevented the formation of a monopoly that could dictate high prices, making interference by the Navy minimal. In home waters, the available colliers could easily support the Navy both in peacetime, and, in conjunction with a highly developed railway network, in wartime too, averting the need to build expensive yard facilities on the east coast. To ignore the collier fleet is to fundamentally misunderstand the inherent strength of the base system and the true nature of the Navy's global capacity. However, because colliers were not part of the Navy their importance has been over largely overlooked. Discounting the crucial role played by commercial infrastructure - the large disparate fleet of colliers - in the supply and mobility of the Navy is not a fault unique to naval historians, the Admiralty failed to heed this lesson too.

The Navy's move from coal to oil has been characterised as leisurely. In comparison with the move from sail to coal, it was extraordinary rapid. Indeed the tender for the first all oil-fired destroyers was issued seven months before the Admiralty

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4Nicholas Lambert in *Far Flung Lines*, p. 57

5Jones, 'Oil Companies', p. 10.
finally dispensed with sails in sixty-one of its cruisers. Once it was obvious that other navies were about to exploit oil technology, the Navy swiftly assimilated all the available knowledge of both civil and military experimentation and quickly developed a superior system. Trials of various oil-burning apparatus were not limited to minor craft but included the Navy's most modern battleships in the Navy's principal fleet. Following a visit to Britain a USN constructor wrote in 1906:

I cannot but think that the English have scored a distinct advance in an engineering way with their successful application of oil fuel and left us far behind in this field. They certainly think so themselves, and were especially proud of the fact that while we had rejected oil fuel, they, relying upon American oil, had made a great success of it.

Fear over supply inhibited oil's universal introduction into the Navy, even so, its limited usage was far ahead of every other navy. Reliance on home produced oil would have been the ideal, and, perhaps surprisingly, the Admiralty never vigorously pursued that avenue pre-War, even when home sources were regarded as the wartime reserve for the early oil-burning destroyers. Britain had little control over the sources of petroleum 1900-14. It was a new fuel, with a small underdeveloped infrastructure that had very little spare capacity to be taken up in wartime. It was, however, lack of control over sources rather than the infrastructure's limitations that mesmerised the Admiralty planners. Pretyman's 1903-06 inquiry was 'devoted principally to the sources of supply - both actual and potential - that exist in British territory or within British spheres of influence.' Because of the lack of petroleum in the Empire, his solution that oil be used only as an auxiliary to coal could only be temporary if other navies used oil. His other recommendation, 'a substantial reserve of oil fuel be formed owing to the impossibility of relying on casual purchases and to the scarcity of the commodity in the open market,' was for peacetime consumption. Selborne and Fisher, although both keen to see technological progress, accepted Pretyman's analysis that limited control over sources

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6 March, Destroyers, p. 85; Order withdrawing sails in sixty-one cruisers and sixteen gunboats, 7/6/1905, ADM1/7825.


8 Pretyman (my Italics).

9 Ibid.
inevitably meant limited use in service. No other solution was contemplated, if the Navy could not replicate in oil its massive reserve of coal, it would have to continue to rely on coal.

Dual-firing with a four months’ oil reserve to allow for market fluctuations was Pretyman’s legacy. If oil presented a supply problem for Britain, this was not the case elsewhere, particularly in America. Oil-firing was coming, the Navy had the technology and the benefits and drawbacks were well known, all it required was someone to make a political decision. To what degree Fisher, Greenway and Samuel influenced Churchill we shall never know. It is clear though, when Churchill took up office as First Lord he recognised the Navy was already a long way down the road towards dependence on oil, and that he accelerated the trend before the supply problem was resolved. It was during his tenure that the Navy became dependent on a fuel source beyond British control and the policy of a large war reserve and a British oil company emerged.

Churchill’s first task was to overturn Pretyman’s conclusions at minimal economic cost. His first attempt - Pakenham’s committee – was, politically, a disaster. Following his investigations Pakenham acknowledged the trend to oil but recommended a politically unacceptable massive reserve of twelve months’ wartime consumption. Churchill’s faith that Fisher was astute enough to find a politically acceptable solution proved misplaced when Fisher suggested a reserve equal to four years’ peacetime consumption - about the same size as Pakenham’s. The Navy’s hankering for a large reserve has to seen in the context of the massive coal reserve it was giving up. Naturally, Pretyman, Pakenham and Fisher all wanted the strategic benefits of coal as well as the tactical advantages of oil. They all, though, misunderstood the inherent strength of the coal industry by concentrating on stock levels rather than capacity to deliver. Supply balanced demand and in a large coal market a large increase in naval coal occasioned by war, although inconvenient to trade, could be coped with, as the facilities existed. Indeed during the War Britain’s coal industry and colliers took on more than the Navy’s increased consumption and were vital in supplying her European allies.

The pre-War commercial oil sector was very limited and had limited latent strengths that could be called on in an emergency. Without an adequate infrastructure, a

10Samuel’s biography and Fisher’s autobiography have be taken with a large pinch of salt.
large reserve only addressed the supply problem for at most the first twelve months (if
the postulated consumption was correct). Post-War, the Navy remained fixated on a
twelve months' reserve at the start of any war and maintaining at least six months' reserve throughout, however long a conflict lasted. Because oil could be stored for long periods without deterioration, this was technically possible. Pakenham was aware of the limited prospect of surplus tankers, and he concluded that:

[U]nless war brings a very serious curtailment of the World's oil trade, this Department [transport] will have to use all possible pressure on owners to obtain the steamers required for feeding the Fleet, and it will be extremely difficult to obtain, in addition, the steamers required for replenishing tanks. 11

Construction of naval tankers beyond a few yard craft and experimental vessels was recommended only for economic reasons when the commercial freighting rates rocketed in 1913.12 The flexibility of the collier fleet was not present in the tanker fleet. With a large oil reserve the Navy might scrape by, providing of course any reserve was in the right place and the war was not too long. Perhaps it is unfair, with the benefit of hindsight, to say the Navy should have taken into account that the nation's overall petroleum consumption was inevitably going to increase in wartime and the Navy should have factored this into their calculations, any more than it should have been able to predict the length of the War. However, the available tankers would have had difficulty in coping with supplying the predicted needs of the Navy and Pakenham's comments above show some realisation of the connection between trade and naval supplies. All predictions and calculations centred on Naval consumption, no one took pains to examine the possible consumption of other sectors of the economy in peace or war, or indeed the oil industry's ability to react to a short-term growth in demand. Constructing a fleet of tankers as well as a twelve months' reserve would have been unacceptable to the Treasury in 1913, but in early 1916, when the tanker shortage was first manifest, it was a different matter, and by late 1916 it was almost too late.13

11Pakenham.

12Rates increased partly because of the normal market fluctuations and partly because imports of petroleum products exceed exports of creosote reducing the opportunity of return loads.

13A tanker took around ten-twelve months to build.
The resurrection of the twelve months’ reserve after the War displayed the same politically naivety as its pre-War advocacy.\(^{14}\) It also flew in the face of wartime experience. The War had lasted longer than expected and overall demand for petroleum products had grown dramatically. However, there had been no serious shortage of oil, just a chronic shortage of tankers. Indeed the prime reason given for a large reserve - reliance on American oil - had been exacerbated by the shortage of tankers. Moreover, despite starting the War with six months’ reserve the Navy had managed to increase it to twelve months’, only to find it unsustainable through lack of tankers.\(^{15}\) With the example of the War and the flexibility of the collier fleet to draw on, instead of building (or retaining) more tankers post-War the Navy, impervious to the major disadvantage of Welsh coal – it was all in Wales – that the collier fleet had overcome, opted for a large static oil reserve. Although the collier fleet had served the Navy well the D-of-S thought, ‘it would be an indefensible position to rely upon a commercial tonnage for Navy [oil] requirements.’\(^{16}\) Just so long as Admiralty tankers could service the peacetime fleet, the D-of-S was sated. It was the D-of-P who was sufficiently wise to pose the question whether for wartime:

Economy and efficiency might be better served by putting more money into tankers and less into permanent storage, or visa versa.\(^{17}\)

None the less, at the end of the War fearing American control over supplies, the Board, with a surplus of tankers, high oil prices and an impoverished economy, with no enemy in sight requested an oil reserve of twelve months’. Oil tankers were sold and by 1921 the opportunity to match a smaller Navy, which by its own admission had to be more mobile, with a smaller but mobile reserve had effectively gone. Long, like his successors at the Admiralty, was weak enough to accept the Admiralty’s policy, but politically shrewd enough to realise it was necessarily a long-term aspiration. Beatty’s protests that the Admiralty not the Treasury decided naval policy only held good so long

\(^{14}\) It was the Assistant D-of-S G. H. Ashdown who prepared the D-of-S’s submission to Pakenham that resulted in the recommendation of a twelve months’ reserve. It was Ashdown who as the D-of-S in 1919 guided the Board into again seeking a twelve months’ reserve.

\(^{15}\) Appendix 14.

\(^{16}\) Minute, D-of-S, 16/8/1919. ADM1/8597/3.

\(^{17}\) D-of-P to FSL, 20/10/1919. ADM1/8570/292.
as the Admiralty’s requests were cognisant of the economic reality. The scene was set for a fifteen-year battle between the Admiralty and the Treasury.

Treasury opposition to a large oil reserve was often informed and cogent, and not always the product of its natural parsimony. By the late twenties the world oil market was nothing like that of the early twenties. Oil was cheaper and America’s fear of depletion of her own oil had receded, with it disappeared the first raison d’être for a large oil reserve in Britain. Churchill was correct about predictions of wartime consumption. Jackson’s pre-War prediction of eighteen days at sea per month for major units was far too high, and Beatty did mislead post-War committees by citing examples of the highest wartime consumption to predict average consumption in a future war. When under real pressure the Admiralty fell back onto the Cabinet’s 1919 decision, or managed somehow to increase the reserve despite Treasury restrictions. Finally, during rearmament, when completion of twelve months’ reserve was in sight the Admiralty moved the goal posts and asked for prohibitively expensive underground oil storage. Although it proved unnecessary, given the perception at the time of the threat posed by German bombers underground storage may have appeared to have been a sensible precaution. Nevertheless, given the Admiralty’s previous requests for fuel the Treasury was more than sceptical, especially when the other services requested comparatively modest schemes for their stocks of highly inflammable fuel.

Oil stocks on the route east in preparation for an Anglo-Japanese conflict were to be created in three stages. First to get the Fleet to Singapore, then to allow it to operate from Singapore and finally for to move on Hong Kong. However, even when the final stage was completed the Admiralty could not guarantee adherence to the timetable, as the whole plan hinged on how many British commercial tankers happened to be heading for Abadan or Rangoon at the time. Without a suitable reserve of tankers the Admiralty and the OB could only calculate what tonnage might be available for charter or requisition in an emergency. The OB did realise that the tanker tonnage available in wartime depended on the reductions in civil consumption be it by rationing or otherwise. However, the Admiralty and OB never fully grasped the direct

18From the financial perspective in 1935 naval fuel stocks tied up £9,594,800 (£6,716,360 allowing for inflation or 18% of annual estimate) compared to £2,885,000 in 1914 (6% of annual estimate).
ADM116/3402.

19The OB deduced in a Far East war rationing might be unacceptable to the public, in which case ‘any estimate must be purely conjectural.’ OB 14. Suggesting that all the plans for war with Japan were built on sand.
correlation between peacetime markets and wartime availability. For example, the Iraqi pipeline (although it is extremely doubtful if the Admiralty could have prevented its egress at the Levant) was welcomed by the Admiralty because it saved tanker journey times, whereas in fact it reduced the overall number of tankers.\(^{20}\) Likewise, hiring out surplus Admiralty tankers may have generated income for the Navy; but the net effect was to reduce the commercial tanker fleet. There were only two main sources of additional tankers for emergencies; tonnage kept idle in peacetime or released by a reduction in civil consumption through rationing or pricing some trade out of the market. These steadily increased as civil consumption increased. Taking all the OB reports together the number of vessels available to the Navy after the introduction of civil rationing remained steady, as vessels’ sizes increased broadly inline with the tonnage made available through rationing. The idea of idle tankers was taken up far too late to be of any value.

The policy of creating an oil reserve equal to at least twelve months’ wartime consumption was a constant feature of the Admiralty’s oil supply policy 1912-1939. It was not the product of experience gained in the War. However, the more it was challenged by the Treasury the more it became entrenched and regarded by the Admiralty as something to be defended rather than reviewed in principle. It was so large and so expensive it prevented a more balanced supply policy that gave tankers equal footing with static oil tanks. There was no practical alternative in a major war to taking up tankers from trade, however maintaining a larger fleet of its own in peacetime would have made the Navy a far more balanced and flexible tool, and more able to perform the role Ferris suggests for it:

> It had to maintain a large and general purpose fleet to handle each of these foes [regional navies] at its selected time and place. While simultaneously deterring hostile actions by other powers.\(^{21}\)

Dealing directly with industry was by no means a novel experience for the Admiralty. It had dealt regularly with the shipbuilding companies that, along with the

\(^{20}\)The effect of the trans-Scotland pipeline would have had the opposite effect because it was built during the War when the normal market forces were suspended.

naval dockyards, had provided its warships for decades, if not centuries. Indeed the cross flow of personnel between private and naval dockyards was an important strength of the relationship. The oil companies, however, posed a new challenge. Lack of technical experience in handling oil could be overcome with the assistance of the oil companies and practice. The uniqueness of the relationship lay in structure of the oil industry, which was very different to the coal and shipbuilding industries. A few large foreign oil companies controlled production, transportation, and marketing worldwide. With so few companies, the services of an intermediary could be dispensed with, and the D-of-C purchased oil and the D-of-T arranged the shipping directly with the oil companies. More important though, was that the oil companies were the first foreign companies that the Admiralty dealt with on a large scale, coming to terms with end of naval autarky also proved difficult for other departments of Government as well as the Admiralty.

Pretyman, Pakenham and Fisher, all looked at oil sources in national terms, examining each one country by country, for their oil potential and level of British influence. Pretyman excluded American oil - 60% of world production - from his calculations, as they did not have enough to export. Even though most of the Navy's pre-War oil supplies originated in America the D-of-C advised both Pakenham and Fisher this could not relied on in wartime. The D-of-C, Pakenham and Lambert all appreciated the benefits of oil, and considered although the Navy could buy it on the open market in peacetime in wartime only sources under direct British control could be relied on. Which after Greenway's assurance that: 'The British Government has absolute control there,' included Persia. Churchill took a fundamentally different view. He regarded British control over Persian oil as a basis for peacetime supplies that freed the Navy not so much from the political interference of the oil producing countries but from peacetime price fixing by the duopoly of RDS and Standard. For wartime supplies Churchill placed his faith in the strength of sterling and the Navy's ability to

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22Lyons in *Technical Change*, p. 60.
23Pretyman.
24Pakenham.
25Ibid
keep the sea-lanes open, agreeing with Deterding that oil would always be available at a price.

Churchill's dissenters were willing to rely on the market in peacetime but would only accept oil-burning for all vessels if a totally secure supply could be guaranteed in wartime. Both Churchill and his dissenters wanted oil, the best fuel, for the Navy but Churchill was convinced oil-burning was inevitable and wanted Britain to reap the advantages before anyone else, especially the Germans. To do so, he needed to convince the Cabinet that it could be introduced at an acceptable price. Eventually, post-War, APOC did fulfil Churchill's expectations and underpin the Navy's peacetime fuel supplies. His wartime prediction also held good. Britain was able buy enough oil, more than her tankers could move. None the less, it did entail dependence on America and American oil companies, and whereas in 1898 the USN had purchased Welsh coal and saved it to use when it came face to face with the enemy, by 1918 the tables had been completely turned, and the BCF was hoarding its stock of Texas oil for use in action.

While Persia was the only significant source of oil under British control Greenway had a strong hand. He played it well, strengthening his position and securing APOC's independent future with an injection of Government capital and a secure long-term income from the Admiralty contract. Greenway and Slade's remarks about RDS's foreign ownership served to reinforce the conviction that secure oil supplies and an all-British company were synonymous. Partly as a foil to the advances of American economic interests and partly from a naivety of the way multi-national companies operated, control of the supplying company became a substitute for political control. Acquiring a majority shareholding in RDS was the only realistic way to fulfil the policy, and APOC was the only significant asset the Government had to entice RDS into accepting British ownership. Deterding, like Greenway, sought to use the Government to strengthen his company's earning power, so long as the company's board remained under his control whether it was nominally British or Dutch did not initially seem to matter. Harcourt's recommendations gave renewed impetuous to the notion of an all-

26 It was also probable that Churchill had less faith in the security of Welsh coal than the Admiralty. Having in 1910, as Home Secretary, had to deal with strikes by dockworkers at Newport and miners in the Rhondda Valley. A view that he was unlikely to commit to paper.

British company and American post-War panic over its own supplies further upped the stakes.

From the Admiralty’s perspective, an all-British company existed, and its major asset was the Persian oil concession. Any arrangement that compromised the Admiralty-APOC contract was akin to cutting off one’s nose to spite one’s face. The contract may have had limited utility in wartime but it was, as intended, still the best deal for peacetime. Most of RDS’s sources were either American or too distant to entice the Navy. Thanks in no small part to Slade, the Admiralty stuck by APOC through thick and thin and ensured it survival. The attraction for RDS of becoming British by absorbing APOC with its Middle East concession began to wane post-War as American threats of retaliation over restrictive practises increased. The Americans already accused APOC of being primarily a political instrument of imperial power. RDS did not want to be tarred with the same brush anymore than it already was. It began to dawn on the Government too, that acquiring 51% of RDS would make little difference to the security of the Navy’s and country’s oil supplies in war or peace.

The Admiralty, with its own oil policy and was at times at odds with other Government departments. The Government’s aspiration for an all-British oil company whose principal role would be to supply the Navy gave the Admiralty a more influential role in the formulation of industrial, foreign and treasury policy than ever before. The concept that only an all-British oil company could be relied on tempted leading figures in the oil industry to recruit the Government to their cause; be it Greenway over the Admiralty contract, or Deterding and Slade over Middle East concessions. Indeed Jones argues that it was the oil companies that initiated the process by seeking to develop closer relations with the Government. It is unlikely they would had any success in the liberal economic climate that prevailed before the War unless, like D’Arcy, they were tipped the wink that they would receive a sympathetic ear because of the need for naval fuel.

Britain had produced petroleum products from the 1860s. For Pretyman these constituted a wartime reserve that allowed the limited use of oil by the Navy. There

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28 Bamberg, BP, p. 62.
29 Jones, ‘Oil Companies’, p. i.
30 Pretyman regarded Blast furnace oil (50,000) and creosote (80,000) rather than shale oil as backstop in wartime.
was never going to be enough to support an all-oil Navy, and production could not be easily switched to the manufacture of oil fuel without disrupting their normal markets, not that Pretyman took that into account. Nevertheless, for the first half of the War, so long as imports kept pace with demand they were left alone. Only when the tanker crisis began to bite was a fresh eye cast toward the domestic fuel industries and the progress of Cowdray's exploration. Creosote, whose properties were well known (and disliked) since the early oil fuel trials, was introduced into service relatively easily. The sad sagas of oil from cannel coal, shale oil and the mineral rights legislation suggest the 1917 oil crisis was not sufficiently serious that heads needed be banged together, egos and departmental squabbles put aside or emergency legislation steamrollered through Parliament. Nevertheless, utilisation of domestic sources involved the Admiralty in new and unfamiliar areas of industrial policy, such as mineral exploration and domestic gas production. That these sources were considered before the German unrestricted submarine campaign commenced lends further credence to the argument that the chief cause of the oil shortage was consumption running ahead of tanker capacity rather than tanker losses due to enemy action.

Post-War the coal industry's attempts to stem the decline in sales of maritime bunkers through innovation were, as with all fuel innovations, of interest to the Navy. Burning coal in any shape or form though could never reproduce the technical advantages of oil. Only the extraction of oil from coal offered any promise. This was not, however, developed primarily to provide fuel for the Navy, the experimentation and tax incentive were to aid the coal industry in its attempts to create new markets for its product. The Navy was regarded as a large potential customer, which for its part was keen to see the development of any domestic fuel source, providing it had no adverse effect on the Navy estimates. In the end, oil from coal benefited the Air Force far more than the Navy. Aid for the miners was also the prime motivation for the 'Back to Coal' movement. Acworth's particular spin was to portray it as a return to a secure domestic supply of naval fuel. To this end, he developed tactics that, he thought, negated the tactical advantages of oil.31 His persistence, allied to the widespread sympathy for the miners gave his case more force than it merited. Acworth was a constant irritant to the

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31The merits or otherwise of Acworth's tactical thought are beyond the scope of this thesis, however any advantage of his ideas would have been even greater if the vessels designed to implement his notions burnt oil.
Admiralty and through the ‘Back to Coal’ movement subjected it to social pressures and distractions that it could ill afford to ignore.

The Navy was wholly dependent on commercial suppliers for its fuel, either directly as for oil or through an intermediary as in the case of coal. Churchill’s vision of APOC being to oil supplies what the naval dockyards were to shipbuilding had limited currency. The Government directors were appointed to APOC’s board were there to protect the contract, not manage the company whose chief interests lay outside the Admiralty contract. Nevertheless, pre-War coal and oil purchases were a matter between the Admiralty and the supplier. Only the Treasury, as in all things, had the power to interfere. The War changed all that; at first, the Admiralty took on more responsibilities, supplying the French Navy through the ACA, for example. However, if the Admiralty thought the mine owners were naïve in thinking they would retain control over the mines in wartime a similar criticism can be levelled at the Admiralty over oil. As the War stretched on, Admiralty control was removed slice-by-slice salami style as the Navy’s fuel requirements conflicted or coincided with the claims of other sectors of the War effort. New ministries were created, and existing ones expanded to extend their control over fuel suppliers, removing the Admiralty’s exclusive control over its own fuel supplies. The Government intervened directly in the mines when naval coal stocks were threatened by industrial action. The immediate problem was resolved, but control of naval coal supplies shifted to the Board of Trade. The Navy grudgingly handed authority over requisitioning and organisation of fuel vessels to the new Ministry of Shipping. Only vessels that directly fuelled warships remained under Admiralty control. Use of petroleum products by the army, industry, agriculture and for the manufacture of explosives expanded rapidly, reducing the Admiralty’s direct control and forcing it to liaise with more and more departments, but widening its influence. Conflict and confusion over supply lead directly to Long’s appointment. With the help of Cadman, he managed to gain control over all petroleum products, except those of the Admiralty. Sumida contends that the Admiralty managed to extract more of the nation’s strength than its position warranted. It is certainly true that Geddes had the ear of the Prime Minister, placing the Admiralty in a strong position to resist its supply coming fully under the auspices of the PE. Cadman’s sagacity and pragmatism allowed a more balanced approach to the oil companies, which Slade’s pro-APOC anti-RDS had

32Sumida in Feeding Mars, p. 231.
campaign prevented. Cadman’s chairmanship of the Inter-Allied Petroleum Conference can be regarded as recognition of the PE’s ultimate control over petroleum products, and, as he was British, the central role of the Navy in the Allied War effort.

As the wartime economy stood down the Admiralty recouped control over its fuel supplies. Oil was now though a vital commodity for a number of sectors of the economy. The Board of Trade, as well as the other services, was concerned about the Admiralty alone having control of wartime oil supplies via its control over tankers. The CID concurred, and control over oil in any future conflict was placed in the hands of the OB. Forced liaison over petroleum supplies had an upside too. The OB did not question departmental policies; it only examined their practical application in relation to the needs of other departments and the state of the world oil market. If it deemed a policy practical as a sub-committee of the CID, it had the effect of entrenching the policy and inhibiting any Treasury criticism.

It required a leap of faith to move to all oil, one only a politician, not an Admiral, could make. Churchill made it. His approach to the job as First Lord of the Admiralty was different to most other First Lords. He regarded Admirals in a similar fashion to civil servants; they were there to help him implement policy. Unlike his successors (and predecessors) who saw their role as representing the Board’s policy in Cabinet, which, although it led to a degree on continuity, meant they never seriously questioned the policy creating a large oil reserve. Chelmsford, for example, was weak and followed Beatty’s lead, while Amery regarded the degree to which he could implement the Board’s policy as a measure of his own political virility. Consequently, Churchill’s policy of APOC for peace and sterling for war departed with him when he left the Admiralty. Thereafter, the Admiralty was able to reintroduce the policy of a large twelve months’ reserve.

In 1918 control over oil meant independence from America sources, which was reinforced by Harcourt’s recommendation to control as much of the world’s oil as possible. Inevitably, this brought Britain into confrontation with America, ironically adding further impetuous to the policy. War with America was rightly deemed a catastrophe to be avoided at all costs, making it axiomatic that Britain maintained at least cordial relations with the United States. However, British independence of action required independence of oil supplies. Just as new finds in America removed their oil
fears, new discoveries in Trinidad and Venezuela gave Britain more assured supplies in wartime.\textsuperscript{33}

The policy to create an all-British oil company was ill thought out and born out of Government naivety and manipulation by the oil companies. The Navy was in favour in principle, but it was even more attached to its APOC contract and frustrated any all-British oil company that threatened the contract, until it was obvious to both the Government and RDS that an all-British company would be too costly economically and diplomatically. The other solution to the oil question - a large oil reserve - was a flexible enough asset to have many reasons for existing. The principal post-War one was to cater for an Anglo-Japanese war, the scenario that required most oil under the illusion that if prepared for the worst all other possible eventualities would be catered for. The reserve was however a static asset and lacked the strategic flexibility to cope with all situations without a suitable tanker fleet. As Ferris points out Britain had the warships and bases to make her a world power at least for the first half of the 1920s,\textsuperscript{34} it was not though as unfettered as he supposes. It could not, as he argues, easily overawe any two European powers and deter Japan. Not without American fuel supplies, a fact it was thought prudent not to remind the Americans of at the Washington Conference.

Ultimately, however large the reserve, the Navy's fuel supplies depended on the size of the commercial fuel sector. The large fleet of colliers was just as important as the location of Welsh coal. Similarly, a strong, vigorous and diverse oil industry was important for the supply of oil. Yet there was no representative from industry on the OB.\textsuperscript{35} Falmouth realised a strong commercial sector was the key, and a far safer bet than one or two oil from coal plants. Churchill's policy of support for APOC was as much about invigorating the competitive element in the oil trade by threatening Standard and RDS's duopoly as it was about British ownership. That the Admiralty continued to defend APOC for narrow nationalistic reasons preventing the duopoly totally reasserting itself post-War was more by accident than design.

Two features distinguish the secondary literature on naval history for the period of this thesis, first, fuel is rarely mentioned, and secondly, when it is, the references are

\textsuperscript{33}OB 8\textsuperscript{a}, CAB 4/22

\textsuperscript{34}Ferris in Far Flung Lines, p. 125.

\textsuperscript{35}Appendix 3.
invariably inaccurate. At its most basic fuel has only one purpose, to store energy and release in a controlled way to power the mechanical and electrical equipment. 

The naval historian Nicolas Rodger wrote:

[N]aval history is above all technical history. In every era of history, warships and sea fighting have involved the most advanced and complex technologies of the period. It is impossible to understand or explain what went on at sea without coming to grips with the technologies concerned.

There are many differences between coals and oils as well as between coal and oil, this thesis, therefore, contends that to fully comprehend the decisions made at all levels regarding naval fuel a degree of technical knowledge is a prerequisite to avoid misunderstandings. For example, Cowman’s mistake over Hong Kong’s storage and his subsequent accusation that Britain flouted the Washington Treaty could have been avoided. A basic knowledge of refuelling procedures could have prevented Sumida’s mistake that led to erroneous deductions about the Grand Fleet’s operations during the War. The converse is also true; works that concentrate on the technical aspect are apt to repeat errors regarding political decisions. Rippon’s error can be traced to Jellicoe’s *The Submarine Peril*, which provides another example of misinformation. In defending himself against criticism over his wartime role, Jellicoe alleges Churchill resisted his pre-War efforts to increase the oil reserve to six months, and implies that the 1917 oil crisis can be traced to the low level of oil reserves at the start of the War. The documents show that neither assertion is true. However, nor do they fully vindicate Churchill who wrote that after ten months of war the Navy had twelve months’ reserve in stock.

Company histories’, by definition concentrate on one company, by looking at different companies in relation to a common customer – the Navy – otherwise seemingly mysterious occurrences can be explained, for example, why RDS was requested to

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36 N. A. M. Rodgers, in *Doing Naval History*, p. 121.
37 See above, p. 238
38 See above, p. 120.
supply a less viscous oil in 1914. This work shows a new synthesis centred on naval fuel can cast new light onto naval, company and political history, at all levels.

When war came in September 1939, inconveniently, its course did not conform to the Admiralty’s plans. No large Fleet was immediately required in the Far East, and in the summer of 1940 the fall of France and entry of Italy on the side of the Axis confined the majority of the Navy to the Atlantic and Mediterranean, nearer to its principal sources of oil in Trinidad and Persia. Consequently, any shortcomings that might have been exposed in the tanker fleet by a war in the Far East were avoided. Fuel consumption estimates, as for the First World War, had erred on the side of caution, and in reality were well below that predicted - Payton-Smith described the disparity as ‘startling.’\(^\text{42}\) In the first forty-eight months of the War, the Navy’s average weekly oil fuel consumption was 47,661 tons. Not until the fourth year of the War did it exceed 6,000,000 tons per annum, and this was partly due to the Navy supplying fuel to the USN in the Mediterranean.\(^\text{43}\) It is precisely because the course of Second World War diverged from Admiralty expectations and finally put paid to any notion of returning to coal that makes 1939 an appropriate point at which to end this work.

\(^{42}\)Payton-Smith, *Oil*, p. 82.

\(^{43}\)ADM1/12652
## Appendix 1

### Coal and Patent Fuel Situation 28th July 1914

<table>
<thead>
<tr>
<th>Place</th>
<th>Total Storage normally in use</th>
<th>Authorised Reserve</th>
<th>Quantity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>tons</td>
<td>tons</td>
<td>In Stock</td>
<td>Discharging or on its way</td>
</tr>
<tr>
<td>Chatham</td>
<td>50,000</td>
<td>250,000</td>
<td>44,653</td>
<td>2,380</td>
</tr>
<tr>
<td>Sheerness</td>
<td>22,000</td>
<td></td>
<td>21,072</td>
<td>1,750</td>
</tr>
<tr>
<td>Portsmouth</td>
<td>20,000</td>
<td></td>
<td>18,901</td>
<td>4,900</td>
</tr>
<tr>
<td>Portland</td>
<td>35,900</td>
<td></td>
<td>29,612</td>
<td>6,330</td>
</tr>
<tr>
<td>Devonport</td>
<td>89,000</td>
<td></td>
<td>93,709</td>
<td>1,850</td>
</tr>
<tr>
<td>Pembroke</td>
<td>3,700</td>
<td></td>
<td>1,865</td>
<td>-</td>
</tr>
<tr>
<td>Haulbowline</td>
<td>12,300</td>
<td></td>
<td>8,405</td>
<td>-</td>
</tr>
<tr>
<td>Harwich</td>
<td>5,500</td>
<td></td>
<td>2,938</td>
<td>1,000</td>
</tr>
<tr>
<td>Grimsby</td>
<td>1,500</td>
<td></td>
<td>759</td>
<td>1,000</td>
</tr>
<tr>
<td>Invergordon</td>
<td>3,000</td>
<td></td>
<td>2,935</td>
<td>-</td>
</tr>
<tr>
<td>Dover</td>
<td>1,200</td>
<td></td>
<td>756</td>
<td>-</td>
</tr>
<tr>
<td>Lerwick</td>
<td>300</td>
<td></td>
<td>387</td>
<td>-</td>
</tr>
</tbody>
</table>
### Appendix 1

<table>
<thead>
<tr>
<th>Total Storage normally in use</th>
<th>Authorised Reserve</th>
<th>Place</th>
<th>Quantity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>tons</td>
<td>tons</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5,800</td>
<td></td>
<td>Firth of Forth</td>
<td>4,583</td>
<td>-</td>
</tr>
<tr>
<td>Home Total</td>
<td></td>
<td></td>
<td>230,575</td>
<td>19,210</td>
</tr>
<tr>
<td>Colliers transports loading this week and available for the Fleet</td>
<td></td>
<td></td>
<td>25,100</td>
<td>25,100</td>
</tr>
<tr>
<td>Other colliers loading or to load this week for H M ships</td>
<td></td>
<td></td>
<td>30,000</td>
<td>30,000*</td>
</tr>
<tr>
<td>Other Colliers loading or to load this week for Flotillas</td>
<td></td>
<td></td>
<td>15,000</td>
<td>15,000</td>
</tr>
<tr>
<td>250,000</td>
<td>250,000</td>
<td>Total Home</td>
<td>230,575</td>
<td>89,310</td>
</tr>
<tr>
<td>Malta</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>228,300</td>
<td>150,000</td>
<td>Coal</td>
<td>108,336</td>
<td>12,906</td>
</tr>
<tr>
<td>Gibraltar</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>91,700</td>
<td>80,000</td>
<td>Coal</td>
<td>59,660</td>
<td>6,500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Patent Fuel</td>
<td>18,565</td>
<td>-</td>
</tr>
</tbody>
</table>

* 7,500 already chartered. ** 7,200 already chartered.

Source: D-of-S Memorandum, 28/7/1914. CAB 1/33.
### Appendix 2

**Particulars of Destroyers**

*(For comparison between those fitted to burn oil fuel alone and those fitted to burn coal alone)*

<table>
<thead>
<tr>
<th></th>
<th>Acorn and Defender Classes (Oil Burners)</th>
<th>Beagle Class (Coal Burners)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Duration at Full Power Trails</strong></td>
<td>8 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td><strong>4 inch Guns</strong></td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td><strong>12 Pounders</strong></td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td><strong>Complement</strong></td>
<td>72</td>
<td>96</td>
</tr>
<tr>
<td><strong>Engine Room Staff</strong></td>
<td>26 (24 in Defender)</td>
<td>58</td>
</tr>
<tr>
<td><strong>Fuel Stowage, tons</strong></td>
<td>170</td>
<td>225</td>
</tr>
<tr>
<td><strong>Length, feet</strong></td>
<td>240</td>
<td>270</td>
</tr>
<tr>
<td><strong>Machinery Weight, tons</strong></td>
<td>300</td>
<td>345</td>
</tr>
<tr>
<td><strong>Displacement Deep Load, tons</strong></td>
<td>840</td>
<td>1,060</td>
</tr>
<tr>
<td><strong>Price Ex-Armament</strong></td>
<td>Average £89,000 for Acorns, £83,000 for Defenders</td>
<td>Average £106,000</td>
</tr>
<tr>
<td><strong>Full Speed</strong></td>
<td>27 Knots, Actual 28.5 Knots (average)</td>
<td>27 Knots, Actual 27.2 knots (average)</td>
</tr>
<tr>
<td><strong>Load carried on trials</strong></td>
<td>3/4 amount of oil fuel for steaming 1,650 miles at 13 knots plus 59 tons for equipment = a load of 130 tons (average)</td>
<td>3/4 amount of coal for steaming 1500 miles at 15 knots plus 50 tons. = a load of 150 tons (average)</td>
</tr>
<tr>
<td><strong>Radius of action at low speed</strong></td>
<td>2,000 miles at 13 knots (equivalent to about 15,000 miles at 15 knots)</td>
<td>1,500 miles at 15 knots</td>
</tr>
<tr>
<td><strong>Actual</strong></td>
<td>2,600 miles at 13 knots</td>
<td>2,200 miles at 15 knots.</td>
</tr>
</tbody>
</table>

Source: ADM265/28.
Appendix 3

Composition of Royal Commission and Committees

Admiralty Oil Fuel Committee, 'Pretyman'
(August 1903 - June 1906).

President  Mr. E.G. Pretyman, Financial Secretary of the Admiralty,
Members  Mr. Gordon W. Waller  Director of Navy Contracts.
          Captain H. L. Heath  Assistant Director of Naval Intelligence.
          Professor Vivian B. Lewes  Royal Naval College Greenwich.
          Mr W. St. D. Jenkins  Secretary.

Co-opted at an early stage,  Sir Boverton Redwood
Captain Heath was succeeded by Commander E. C. Villiers, R. N.  Who in turn was
succeeded by Commander the Hon. C. J. T. Dormer, R. N.

(Source: Admiral May mss. MAY.)

Admiralty Departmental Committee on Oil Fuel, 'Pakenham'
(December 1911 - February 1912)

Chairman  Captain W. C. Pakenham  4th Sea Lord.
Members  Rt. Hon. Sir Francis Hopwood  Additional Civil Lord of the Admiralty,
          Sir Trevor Dawson  Vickers armaments manufacturers.
          Mr. F. W. Black  Director of Contracts Admiralty.
          Eng. Rear Admiral W. Riley  Dept. Engineer in Chief.
          Captain O. De B. Brock  Assistant Director Mobilisation Division.
          Mr. H. Eastwood  Secretary.

(Source: ADM265/29)

Royal Commission on Fuel and Engines 'Fisher'
(September 1912 - February 1914)

Chairman  Lord Fisher  Civil Lord of the Admiralty,
Members  Rt Hon. George Lambert M.P.  Advisor on petroleum to HMG,
          Sir Boverton Redwood Bart.  Former DNC and advisor to Board of
          Sir Philip Watts  Naval Construction.
          Sir John Rushworth Jellicoe  Vice Admiral, Late Controller of the
          Navy, commander of the 2nd Battle
          Squadron.
          Sir Henry John Oram  Engineer Vice Admiral and Engineer
          in Chief, Admiralty.
          Sir William Matthews  Past President of the Institution of
          Civil Engineers.
          Sir Thomas Henry  Professor of Geology to the University
          of Manchester.
### Appendix 3

<table>
<thead>
<tr>
<th>Name</th>
<th>Title and Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sir Thomas Thorpe</td>
<td>Late Principle of the Government Laboratory.</td>
</tr>
<tr>
<td>Mr. Alexander Gracie</td>
<td>Managing Director of the Fairfield Shipbuilding Company.</td>
</tr>
<tr>
<td>Dr. George Beilby</td>
<td>Chairman of the Glasgow and West Scotland Technical College.</td>
</tr>
<tr>
<td>Mr. Alfred Yarrow</td>
<td>Principle of the Yarrow Shipbuilders</td>
</tr>
<tr>
<td>Admiral Sir Reginald Friend</td>
<td>Late Admiral commanding</td>
</tr>
<tr>
<td>Mr. Hannman Henderson</td>
<td>Coast guards and reserves</td>
</tr>
<tr>
<td>Capt. Philip Wylie Dumas</td>
<td>Secretary</td>
</tr>
<tr>
<td>Eng. Lieut. Charles Hawkes</td>
<td>Assistant Secretary</td>
</tr>
</tbody>
</table>

(Sources: ADM116/1208 and ADM116/1209)

#### Committee on Production of Oil from Home Sources ‘Crewe’
March 1918 – July 1918

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chairman</td>
<td>The Marquess of Crewe. K. G.</td>
</tr>
<tr>
<td>Members</td>
<td>Lt-Col. A. Stirling M. P.</td>
</tr>
<tr>
<td></td>
<td>Lt-Col Godfrey Collins M. P.</td>
</tr>
<tr>
<td></td>
<td>Sir Lionel Phillips, Bart.</td>
</tr>
<tr>
<td></td>
<td>Eng Vice-Admiral Sir G. Goodwin</td>
</tr>
<tr>
<td></td>
<td>Sir Richard Redmayne</td>
</tr>
<tr>
<td></td>
<td>Mr. G. C. Smallwood</td>
</tr>
</tbody>
</table>

(Source: CAB24/60)

#### Petroleum Imperial Policy Committee, ‘Harcourt’
(May 1918 – March 1919)

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chairman</td>
<td>Rt. Hon. Viscount Harcourt</td>
</tr>
<tr>
<td>Members</td>
<td>Rt. Hon. E. G. Pretyman</td>
</tr>
<tr>
<td></td>
<td>Lord Inchcape</td>
</tr>
<tr>
<td></td>
<td>Col. Sir Robert Horne</td>
</tr>
<tr>
<td></td>
<td>Col. R. S. Williamson</td>
</tr>
<tr>
<td></td>
<td>Mr. J. Ferguson</td>
</tr>
<tr>
<td></td>
<td>Mr. H MacGowan</td>
</tr>
<tr>
<td></td>
<td>Mr. A. Parker</td>
</tr>
<tr>
<td></td>
<td>Mr. L. Smith</td>
</tr>
<tr>
<td></td>
<td>Professor J. Cadman</td>
</tr>
</tbody>
</table>

(Source: POWE33/12)
### Appendix 3

**Sub-Committee on Oil from Coal, 'Falmouth'**  
(April 1937 - January 1938).

**Chairman** Viscount Falmouth  
**Members**  
- Sir Amos L. Ayre  
- Mr. Arthur E. Cutforth  
- Professor A. C. G. Egerton  

**Joint Secretaries;**  
- Commander A. D. Nicholl (CID)  
- MR F. C. Starling (Mines Department)

(Source: Cmd 5665)

**Oil Fuel Board, CID Sub-Committee**  
(At time of First Annual Report 31st December 1926)

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>President</td>
<td>Rt. Hon. Viscount Peel</td>
<td>Commissioner of Work</td>
</tr>
<tr>
<td>Chairman</td>
<td>Rt. Hon. Earl Stanhope</td>
<td>Civil Lord, Admiralty</td>
</tr>
<tr>
<td>Members</td>
<td>Mr. H. E. Fass</td>
<td>Assistant Secretary Treasury</td>
</tr>
<tr>
<td></td>
<td>Capt. W. A Egerton RN</td>
<td>D-of-P, Admiralty</td>
</tr>
<tr>
<td></td>
<td>Mr. J. W. L. Oliver</td>
<td>D-of-S, Admiralty</td>
</tr>
<tr>
<td></td>
<td>Maj-Gen. P.O. Hazleton</td>
<td>Director of Supplies and Transport, War Office</td>
</tr>
<tr>
<td></td>
<td>Mr. C. R. Brigstocke</td>
<td>D-of-C, Air Ministry</td>
</tr>
<tr>
<td></td>
<td>Mr. A. E. Faulkner</td>
<td>Director of Sea Transports, Board of Trade</td>
</tr>
<tr>
<td></td>
<td>Mr. J. J. Wills</td>
<td>Director of Petroleum Department, Board of Trade</td>
</tr>
<tr>
<td></td>
<td>Sir Gilbert Grindle</td>
<td>Assistant Under-Secretary of State, Colonial Office</td>
</tr>
</tbody>
</table>

**Joint Secretaries;**  
- Commander the Hon. C. P. Hermon-Hodge RN (CID)  
- Mr. R. A. Pitcher (Admiralty)  
- Mr. C. E. W. Justice (Board of Trade)

(Source: CAB4/16)

**Oil Board, CID Sub-Committee**  
(At time of Final Report, 24th January 1939)

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>President</td>
<td>Rt. Hon. Viscount Runciman</td>
<td>Lord President of the Council</td>
</tr>
<tr>
<td>Chairman</td>
<td>Col. J. J. Llewellin MP</td>
<td>Civil Lord of the Admiralty</td>
</tr>
<tr>
<td></td>
<td>Capt. Rt. Hon. H. F. C. Crookshank MP</td>
<td>Secretary for Mines</td>
</tr>
<tr>
<td></td>
<td>Sir Alfred Faulkner</td>
<td>Permanent Under-Secretary, Mines</td>
</tr>
<tr>
<td></td>
<td>Mr. B. W. Gilbert</td>
<td>Principal Assistant Secretary, Treasury</td>
</tr>
<tr>
<td></td>
<td>Lt-Col. R. A. Thomas</td>
<td>Chief Inspector of Explosives</td>
</tr>
<tr>
<td></td>
<td>Mr. C. W. Dixon</td>
<td>Assistant Secretary, Dominions Office</td>
</tr>
</tbody>
</table>

---
Sir Henry Moore  Assistant Under-Secretary of State, Colonial Office
Mr. G Graham Dixon  Assistant Secretary, Burma Office
Capt. V. H. Danckwerts RN  D-of-P, Admiralty
Mr. W. J. Gick  D-of-S, Admiralty
Maj-Gen. M. S. Brander  Director of Supplies and Transports, War Office
Mr. L. V. Meadowcroft  D-of-C, Air Ministry
Group Capt. R. P. M. Whitham  Deputy Director of Organisation, Air Ministry
Mr. W. G. Hynard  Director of Sea Transports, Board of Trade
Sir Frank Smith  Secretary, Department of Scientific and Industrial Research.

Joint Secretaries; Commander A. D. Nicholl RN (CID)
Mr. S. Harlow (Admiralty)
Mr. F. J. Coleman (Petroleum Department)

(Source: CAB 4/29)
## Appendix 4

### Admiralty Oil Fuel Purchases 1902-1913

<table>
<thead>
<tr>
<th>Financial year</th>
<th>Tons</th>
<th>Source</th>
<th>Price per ton.</th>
<th>Method of Purchase</th>
<th>Freight per ton</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1902</td>
<td>1,200</td>
<td>Texas</td>
<td>40s</td>
<td>c.i.f. Thames Haven</td>
<td>-</td>
</tr>
<tr>
<td>1903</td>
<td>6,000</td>
<td>Texas</td>
<td>40s</td>
<td>c.i.f. Thames Haven</td>
<td>-</td>
</tr>
<tr>
<td>1904</td>
<td>2,000</td>
<td>Texas</td>
<td>40s</td>
<td>c.i.f. Thames Haven</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>420</td>
<td>Texas</td>
<td>45s 6d</td>
<td>c.i.f. Sheerness</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>20,000</td>
<td>Texas</td>
<td>21s</td>
<td>f.o.b. Port Arthur</td>
<td>16s</td>
</tr>
<tr>
<td>total</td>
<td>22,420</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1905</td>
<td>7,000</td>
<td>Texas</td>
<td>40s</td>
<td>c.i.f. Thames Haven</td>
<td>-</td>
</tr>
<tr>
<td>1906</td>
<td>10,000</td>
<td>Texas</td>
<td>39s</td>
<td>c.i.f. Thames Haven</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>15,000</td>
<td>Texas</td>
<td>40s</td>
<td>c.i.f. Portland</td>
<td>-</td>
</tr>
<tr>
<td>total</td>
<td>25,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1907</td>
<td>2,000</td>
<td>Texas</td>
<td>50s</td>
<td>c.i.f. Thames Haven</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>12,000</td>
<td>Texas</td>
<td>33s 6d</td>
<td>f.o.b. Port Arthur</td>
<td>35s*</td>
</tr>
<tr>
<td></td>
<td>7,000</td>
<td>Burmah</td>
<td>20s</td>
<td>f.o.b. Rangoon</td>
<td>45s</td>
</tr>
<tr>
<td>total</td>
<td>21,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1908</td>
<td>6,000</td>
<td>Texas</td>
<td>23s 9d</td>
<td>f.o.b. Port Arthur</td>
<td>15s</td>
</tr>
<tr>
<td></td>
<td>15,000</td>
<td>Texas</td>
<td>25s 3d</td>
<td>f.o.b. Port Arthur</td>
<td>11s - 14s</td>
</tr>
<tr>
<td></td>
<td>15,000</td>
<td>Texas</td>
<td>25s 6d</td>
<td>f.o.b. Port Arthur</td>
<td>11s - 14s</td>
</tr>
<tr>
<td></td>
<td>7,000</td>
<td>Burmah</td>
<td>20s</td>
<td>f.o.b. Rangoon</td>
<td>45s</td>
</tr>
<tr>
<td>total</td>
<td>43,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1909</td>
<td>5,000</td>
<td>Northern USA</td>
<td>22s 6d</td>
<td>f.o.b. New York</td>
<td>10s</td>
</tr>
<tr>
<td></td>
<td>40,000</td>
<td>Texas</td>
<td>23s 6d</td>
<td>f.o.b. Port Arthur</td>
<td>11s - 12s 6d</td>
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<tr>
<td></td>
<td>40,000</td>
<td>Texas</td>
<td>24s</td>
<td>f.o.b. Port Arthur</td>
<td>17s</td>
</tr>
<tr>
<td></td>
<td>7,400</td>
<td>Burmah</td>
<td>25s</td>
<td>f.o.b. Rangoon</td>
<td>23s</td>
</tr>
<tr>
<td>total</td>
<td>92,400</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1910</td>
<td>20,000</td>
<td>Northern USA</td>
<td>22s 6d</td>
<td>f.o.b. New York</td>
<td>10s 6d</td>
</tr>
<tr>
<td></td>
<td>50,000</td>
<td>Texas</td>
<td>23s 6d</td>
<td>f.o.b. Port Arthur</td>
<td>8s to 9s 6d</td>
</tr>
<tr>
<td></td>
<td>30,000</td>
<td>Roumanian</td>
<td>22s 7d</td>
<td>f.o.b. Constantza</td>
<td>8s 6d</td>
</tr>
<tr>
<td></td>
<td>7,600</td>
<td>Burmah</td>
<td>25s</td>
<td>f.o.b. Rangoon</td>
<td>25s</td>
</tr>
<tr>
<td></td>
<td>20,000</td>
<td>Scotish Shale Oil</td>
<td>42s</td>
<td>f.o.b. Grangemouth</td>
<td>-</td>
</tr>
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<td>total</td>
<td>127,600</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Average price landed at UK Port 37s 5d
Average price landed at UK Port 39s 7¾d
Average price landed at UK Port 61s 3¼d
Average price landed at UK Port 42s 7¾d
Average price landed at UK Port 38s 9¾d
Average price landed at UK Port 34s 8¾d
### Appendix 4

<table>
<thead>
<tr>
<th>Year</th>
<th>Quantity</th>
<th>Origin</th>
<th>O.B. Location</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1911</td>
<td>45,000</td>
<td>Texas</td>
<td>f.o.b Port Arthur</td>
<td>17s 6d</td>
</tr>
<tr>
<td></td>
<td>30,000</td>
<td>Roumanian</td>
<td>f.o.b Constantza</td>
<td>18s</td>
</tr>
<tr>
<td></td>
<td>60,000</td>
<td>Roumanian</td>
<td>f.o.b Constantza</td>
<td>RFA Petroleum</td>
</tr>
<tr>
<td></td>
<td>7,350</td>
<td>Burmah</td>
<td>f.o.b Rangoon</td>
<td>24s 6d</td>
</tr>
<tr>
<td></td>
<td>40,000</td>
<td>Scotish Shale Oil</td>
<td>f.o.b Grangemouth</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1,500</td>
<td>Borneo</td>
<td>f.o.b Hong Kong</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>f.o.b Singapore</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>total</td>
<td>183,850</td>
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<table>
<thead>
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<th>Year</th>
<th>Quantity</th>
<th>Origin</th>
<th>O.B. Location</th>
<th>Price</th>
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<tbody>
<tr>
<td>1912</td>
<td>50,000</td>
<td>Texas</td>
<td>f.o.b Port Arthur</td>
<td>25s</td>
</tr>
<tr>
<td></td>
<td>50,000</td>
<td>Texas</td>
<td>f.o.b Port Arthur</td>
<td>25s†</td>
</tr>
<tr>
<td></td>
<td>75,000</td>
<td>Texas</td>
<td>f.o.b Port Arthur</td>
<td>25s†</td>
</tr>
<tr>
<td></td>
<td>40,000</td>
<td>Roumanian</td>
<td>f.o.b Constantza</td>
<td>19s†</td>
</tr>
<tr>
<td></td>
<td>25,000</td>
<td>Roumanian</td>
<td>f.o.b Constantza</td>
<td>19s†</td>
</tr>
<tr>
<td></td>
<td>10,000</td>
<td>Northern USA</td>
<td>f.o.b Baton Rouge</td>
<td>25s†</td>
</tr>
<tr>
<td></td>
<td>7,350</td>
<td>Burmah</td>
<td>f.o.b Rangoon</td>
<td>40s†</td>
</tr>
<tr>
<td></td>
<td>20,500</td>
<td>Scotish Shale Oil</td>
<td>f.o.b Grangemouth</td>
<td>-</td>
</tr>
<tr>
<td></td>
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<td>total</td>
<td>277,850</td>
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</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Quantity</th>
<th>Origin</th>
<th>O.B. Location</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1913</td>
<td>80,000</td>
<td>Texas</td>
<td>f.o.b Port Arthur</td>
<td>u/a</td>
</tr>
<tr>
<td></td>
<td>80,000</td>
<td>Roumanian</td>
<td>f.o.b Constantza</td>
<td>u/a</td>
</tr>
<tr>
<td></td>
<td>10,000</td>
<td>Roumanian</td>
<td>f.o.b Constantza</td>
<td>u/a</td>
</tr>
<tr>
<td></td>
<td>30,000</td>
<td>Persian</td>
<td>f.o.b Abadan</td>
<td>u/a</td>
</tr>
<tr>
<td></td>
<td>17,500</td>
<td>Scotish Shale Oil</td>
<td>f.o.b Grangemouth</td>
<td>u/a</td>
</tr>
<tr>
<td></td>
<td>7,500</td>
<td>Burmah</td>
<td>f.o.b Rangoon</td>
<td>u/a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>total</td>
<td>225,000</td>
<td></td>
</tr>
</tbody>
</table>

* Charter cancelled
† Estimated

Sources ADM 265/29 and ADM 116/1219.
### Appendix 5

**Admiralty Oil Tankers January 1915**

<table>
<thead>
<tr>
<th>Name</th>
<th>Displacement (tons)</th>
<th>Engines</th>
<th>Speed (knots)</th>
<th>Cargo capacity (tons)</th>
<th>Bunkers (tons)</th>
<th>Present condition [Jan. 1915]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olaf</td>
<td>Tenders declined</td>
<td>diesel</td>
<td>11 (est.)</td>
<td>10,000</td>
<td>750 oil (also 750 reserve)</td>
<td>Suspended</td>
</tr>
<tr>
<td>Olona</td>
<td>Tenders declined</td>
<td>diesel</td>
<td>11 (est.)</td>
<td>10,000</td>
<td>750 oil (also 750 reserve)</td>
<td>Suspended</td>
</tr>
<tr>
<td>Olivia</td>
<td>Tenders declined</td>
<td>diesel</td>
<td>11 (est.)</td>
<td>10,000</td>
<td>750 oil (also 750 reserve)</td>
<td>Suspended</td>
</tr>
<tr>
<td>Petroleum</td>
<td>9,900</td>
<td>steam</td>
<td>9</td>
<td>6,170</td>
<td>426 oil</td>
<td>In service</td>
</tr>
<tr>
<td>Burma</td>
<td>4,116</td>
<td>steam</td>
<td>11</td>
<td>2,600</td>
<td>210 coal</td>
<td>In service</td>
</tr>
<tr>
<td>Isla</td>
<td>1,010</td>
<td>steam</td>
<td>9</td>
<td>300 (petrol)</td>
<td>75 coal</td>
<td>In service</td>
</tr>
<tr>
<td>Kharki</td>
<td>1,430</td>
<td>steam</td>
<td>9</td>
<td>677</td>
<td>90 coal</td>
<td>In service</td>
</tr>
<tr>
<td>Olympia*</td>
<td>13,450</td>
<td>diesel</td>
<td>11 (est.)</td>
<td>8,000</td>
<td>450 oil (also 450 reserve)</td>
<td>Completion date unknown</td>
</tr>
<tr>
<td>Kurumba</td>
<td>7,670</td>
<td>steam</td>
<td>10</td>
<td>4,000</td>
<td>600 coal 210 oil</td>
<td>Just laid down</td>
</tr>
<tr>
<td>Trefoil</td>
<td>4,060</td>
<td>diesel</td>
<td>11 (est.)</td>
<td>2,000</td>
<td>200 oil</td>
<td>Launched completion unknown</td>
</tr>
<tr>
<td>Turmoil</td>
<td>4,060</td>
<td>diesel</td>
<td>11 (est.)</td>
<td>2,000</td>
<td>200 oil</td>
<td>Not yet launched</td>
</tr>
<tr>
<td>Servitor</td>
<td>1,810</td>
<td>diesel</td>
<td>8 (est.)</td>
<td>1,000</td>
<td>25 oil</td>
<td>Launched completion unknown</td>
</tr>
<tr>
<td>Ferol</td>
<td>1,810</td>
<td>diesel</td>
<td>8 (est.)</td>
<td>1,000</td>
<td>25 oil</td>
<td>Complete</td>
</tr>
<tr>
<td>Attendant</td>
<td>1,810</td>
<td>steam</td>
<td>8 (est.)</td>
<td>1,000</td>
<td>60 coal</td>
<td>In service</td>
</tr>
<tr>
<td>Carol</td>
<td>1,810</td>
<td>steam</td>
<td>8 (est.)</td>
<td>1,000</td>
<td>60 coal</td>
<td>In service</td>
</tr>
</tbody>
</table>

Source ADM265/37
Appendix 6
Royal Navy Oil Fuel Specifications

1903 Admiralty Oil Fuel Specification
The oil fuel supplied shall consist of liquid hydrocarbon, and may either be:-
  (a) Shale oil; or
  (b) Petroleum as may be required: or
  (c) A distillate or a residue product of petroleum
and shall comply with the Admiralty requirements as regards flashpoint, fluidity at low
temperatures, percentage of sulphur, presence of water, acidity, and freedom from
impurities.
  The flashpoint shall not be lower than 200 °F., close test (Abel and Pensky
Martens).
  The percentage of sulphur contained in the oil shall not exceed 0.75 per cent
  The oil supplied shall be free from acidity
  The quantity of water delivered with the oil shall not exceed 0.5 per cent.
  The oil supplied shall be sufficiently free from paraffin or bitumen to flow freely
by gravitation with two feet head at a temperature of 32 °F. Through a horizontal length
of three feet of half inch bore copper pipe.
  The oil supplies shall be free from earthy, carbonaceous, or fibrous matter. Or
other impurities which are likely to choke the burners.
  The oil shall, if required by the inspecting officer, be strained by being pumped
or discharged from the tanks, or tank-steamers, through filters of wire gauze having 16
meshes to the inch.

(Source ADM 265/29)

1911 Admiralty Oil Fuel Specification
The oil fuel shall consist of liquid hydrocarbon, and may either be:-
  (a) Shale oil; or
  (b) Petroleum as may be required: or
  (c) A distillate or a residue product of petroleum
and shall comply with the Admiralty requirements as regards flashpoint, fluidity at low
temperatures, percentage of sulphur, presence of water, acidity, and freedom from
impurities.
  The flashpoint shall not be lower than 200 °F., close test (Abel and Pensky
Martens).
  The proportion of sulphur contained in the oil shall not exceed 0.75 per cent
  The oil supplied shall be free as far as possible from acid, and in any case the
quantity of acid must not exceed 0.05 per cent, calculated as oleic acid when tested by
shaking up the oil with distilled water, and determining by titration with decinormal
alkali the amount of acid extracted by the water, methyl orange being used as an
indicator.
  The quantity of water delivered with the oil shall not exceed 0.5 per cent.
  The viscosity of the oil supplied shall not exceed 1,000 seconds for an outflow
of 50 cubic centimetres at a temperature of 32 °F., as determined by Sir Boverton
Redwood's Standard Visometer (Admiralty type for testing oil fuel).
  The oil supplies shall be free from earthy, carbonaceous, or fibrous matter. Or
Appendix 6

other impurities which are likely to choke the burners.

The oil shall, if required by the inspecting officer, be strained by being pumped or discharged from the tanks, or tank-steamers, through filters of wire gauze having 16 meshes to the inch.

(Source ADM 265/29)

1912 Admiralty Oil Fuel Specification.

The oil fuel shall consist of Liquid Hydro Carbons, and may either be:-

- (a) Shale oil; or
- (b) Petroleum as may be required: or
- (c) A distillate or a residue product of petroleum

and shall comply with the Admiralty requirements as regards flashpoint, fluidity at low temperatures, percentage of sulphur, presence of water, acidity, and freedom from impurities.

The flashpoint shall not be lower than 175 °F., close test (Abel and Pensky Martens).*

The proportion of sulphur contained in the oil shall not exceed 3.00 per cent

The oil supplied shall be free as far as possible from acid, and in any case the quantity of acid must not exceed 0.05 per cent, calculated as oleic acid when tested by shaking up the oil with distilled water, and determining by titration with decinormal alkali the amount of acid extracted by the water, methyl orange being used as an indicator.

The quantity of water delivered with the oil shall not exceed 0.5 per cent.

The viscosity of the oil supplied shall not exceed 2,000 seconds for an outflow of 50 cubic centimetres at a temperature of 32 °F., as determined by Sir Boverton Redwood's Standard Visometer (Admiralty type for testing Oil Fuel).**

The oil supplies shall be free from earthy, carbonaceous, or fibrous matter. Or other impurities which are likely to choke the burners.

The oil shall, if required by the inspecting officer, be strained by being pumped or discharged from the tanks, or tank-steamers, through filters of wire gauze having 16 meshes to the inch.

The quality and kind of Oil supplied shall be fully described. The original source from which the Oil has been obtained shall be stated in detail, as well as the treatment to which it has been subjected, and the place at which it has been treated.

The ratio which the Oil supplied bears to the original crude oil should also be stated as a percentage.

*In the case of oil of exceptionally low viscosity such as distillates from shale, the flashpoint must be not less than 200 °F.

** Pending settlement of this specification a viscosity of 1,000 seconds was provisionally adopted in 1912 [sic].

(Source Cd 7010)
Appendix 6

Admiralty Contract Specifications

<table>
<thead>
<tr>
<th>Oil</th>
<th>Contract Specification to which purchased</th>
<th>Character of oil usually supplied</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Texas</strong></td>
<td>Suitable for direct issue to ships and for mixing with Persian, Mexican and other viscous oils.</td>
<td></td>
</tr>
<tr>
<td>Flash point</td>
<td>Not lower than 175 °F</td>
<td>200 °F</td>
</tr>
<tr>
<td>Sulphur</td>
<td>Not to exceed 0.75%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Acidity</td>
<td>Not to exceed 0.05%</td>
<td>Nil</td>
</tr>
<tr>
<td>Water</td>
<td>Not to exceed 0.5%</td>
<td>Under 0.5%</td>
</tr>
<tr>
<td>Viscosity</td>
<td>Not to exceed 1,000 seconds</td>
<td>Under 500 seconds</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>Not detailed</td>
<td>.920 at 60 °F</td>
</tr>
</tbody>
</table>

| **Persian** | Generally suitable for issue directly to ships, but occasionally a cargo was found too viscous for issue in a cold climate without admixture of Texas or other low viscous oil. |  |
| Flash point | Not lower than 175 °F | 175 °F |
| Sulphur | Not to exceed 3% | 1.5% |
| Acidity | Not to exceed 0.05% | Nil |
| Water | Not to exceed 0.5% | Under 1% |
| Viscosity | Not to exceed 2,000 seconds | Will not flow at 32 °F but is under 500 seconds at 40 °F |
| Specific Gravity | Not detailed | .895 at 60 °F |

| **Mexican** | Generally mixed with less viscous oil of low sulphur content to reduce the viscosity to below 1,000 at 32 °F and the sulphur content to not more than 1.5% before issue. |  |
| Flash point | Not lower than 175 °F | Above 175 °F |
| Sulphur | Not to exceed 3.5% | 3.5% |
| Acidity | Nil | Nil |
| Water | Not to exceed 1.5% | Nil |
| Viscosity | Not to exceed 600 seconds at 60 °F | 1000/2000 at 32 °F |
| Specific Gravity | Not detailed | .940 at 60% |
### Appendix 6

**Borneo**
Suitable for direct issue to ships and for mixing with Persian, Mexican and other viscous oils.

<table>
<thead>
<tr>
<th>Property</th>
<th>Borneo</th>
<th>Trinidad</th>
<th>American Oil (Northern USA fields)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash point</td>
<td>Not lower than 175 °F</td>
<td>Not lower than 175 °F</td>
<td>Not lower than 175 °F</td>
</tr>
<tr>
<td>Sulphur</td>
<td>Not to exceed 0.75%</td>
<td>Not to exceed 0.75%</td>
<td>Not to exceed 0.75%</td>
</tr>
<tr>
<td>Acidity</td>
<td>Not to exceed 0.05%</td>
<td>Not to exceed 0.05%</td>
<td>Not to exceed 0.05%</td>
</tr>
<tr>
<td>Water</td>
<td>Not to exceed 0.5%</td>
<td>Not to exceed 0.5%</td>
<td>Not to exceed 0.5%</td>
</tr>
<tr>
<td>Viscosity</td>
<td>Not to exceed 1000 seconds</td>
<td>Not to exceed 1000 seconds</td>
<td>Not to exceed 1000 seconds</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>Not detailed</td>
<td>Not detailed</td>
<td>Not detailed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Trinidad**
Suitable for direct issue to ships.

<table>
<thead>
<tr>
<th>Property</th>
<th>Borneo</th>
<th>Trinidad</th>
<th>American Oil (Northern USA fields)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash point</td>
<td>Not lower than 175 °F</td>
<td>Not lower than 175 °F</td>
<td>Not lower than 175 °F</td>
</tr>
<tr>
<td>Sulphur</td>
<td>Not to exceed 0.75%</td>
<td>Not to exceed 0.75%</td>
<td>Not to exceed 0.75%</td>
</tr>
<tr>
<td>Acidity</td>
<td>Not to exceed 0.05%</td>
<td>Not to exceed 0.05%</td>
<td>Not to exceed 0.05%</td>
</tr>
<tr>
<td>Water</td>
<td>Not to exceed 0.5%</td>
<td>Not to exceed 0.5%</td>
<td>Not to exceed 0.5%</td>
</tr>
<tr>
<td>Viscosity</td>
<td>Not to exceed 1000 seconds</td>
<td>Not to exceed 1000 seconds</td>
<td>Not to exceed 1000 seconds</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>Not detailed</td>
<td>Not detailed</td>
<td>Not detailed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**American Oil (Northern USA fields)**
Suitable for direct issue to ships.

<table>
<thead>
<tr>
<th>Property</th>
<th>Borneo</th>
<th>Trinidad</th>
<th>American Oil (Northern USA fields)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash point</td>
<td>Not lower than 175 °F</td>
<td>Not lower than 175 °F</td>
<td>Not lower than 175 °F</td>
</tr>
<tr>
<td>Sulphur</td>
<td>Not to exceed 0.75%</td>
<td>Not to exceed 0.75%</td>
<td>Not to exceed 0.75%</td>
</tr>
<tr>
<td>Acidity</td>
<td>Not to exceed 0.05%</td>
<td>Not to exceed 0.05%</td>
<td>Not to exceed 0.05%</td>
</tr>
<tr>
<td>Water</td>
<td>Not to exceed 0.5%</td>
<td>Not to exceed 0.5%</td>
<td>Not to exceed 0.5%</td>
</tr>
<tr>
<td>Viscosity</td>
<td>Not to exceed 1000 seconds</td>
<td>Not to exceed 1000 seconds</td>
<td>Not to exceed 1000 seconds</td>
</tr>
<tr>
<td>Specific Gravity</td>
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<td>Not detailed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Burmah**
Suitable for direct issue to ships, but generally reserved for issue to submarines.

<table>
<thead>
<tr>
<th>Property</th>
<th>Borneo</th>
<th>Trinidad</th>
<th>American Oil (Northern USA fields)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash point</td>
<td>Not lower than 175 °F</td>
<td>Not lower than 175 °F</td>
<td>Not lower than 175 °F</td>
</tr>
<tr>
<td>Sulphur</td>
<td>Not to exceed 0.75%</td>
<td>Not to exceed 0.75%</td>
<td>Not to exceed 0.75%</td>
</tr>
<tr>
<td>Acidity</td>
<td>Not to exceed 0.05%</td>
<td>Not to exceed 0.05%</td>
<td>Not to exceed 0.05%</td>
</tr>
<tr>
<td>Water</td>
<td>Not to exceed 0.5%</td>
<td>Not to exceed 0.5%</td>
<td>Not to exceed 0.5%</td>
</tr>
<tr>
<td>Viscosity</td>
<td>Not to exceed 1000 seconds</td>
<td>Not to exceed 1000 seconds</td>
<td>Not to exceed 1000 seconds</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>Not detailed</td>
<td>Not detailed</td>
<td>Not detailed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- Flash point: Not to exceed 175 °F
- Sulphur: 0.75%
- Acidity: 0.05%
- Water: 0.5%
- Viscosity: 1000 seconds
- Specific Gravity: 0.945 at 60 °F
- Flash point: Not lower than 175 °F
- Sulphur: 0.75%
- Acidity: Nil
- Water: 0.5%
- Viscosity: 1000 seconds
- Specific Gravity: 0.95 at 60 °F
- Flash point: Not lower than 175 °F
- Sulphur: 0.75%
- Acidity: Nil
- Water: 0.5%
- Viscosity: 1000 seconds
- Specific Gravity: 0.89/.90
- Flash point: Not lower than 175 °F
- Sulphur: 0.75%
- Acidity: Nil
- Water: 0.2%
- Viscosity: 1000 seconds
- Specific Gravity: .89 at 60 °F
Appendix 6

### Scottish Shale Oil

Suitable for direct issue to ships and for mixing with Persian, Mexican and other viscous oils. Use was almost confined entirely to diesel engines.

<table>
<thead>
<tr>
<th>Property</th>
<th>Scottish Shale Oil</th>
<th>American Distillate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash point</td>
<td>Not lower than 200 °F</td>
<td>Over 200 °F</td>
</tr>
<tr>
<td>Sulphur</td>
<td>Not to exceed 0.75%</td>
<td>0.4 %</td>
</tr>
<tr>
<td>Acidity</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>Water</td>
<td>Not to exceed 0.5%</td>
<td>Nil</td>
</tr>
<tr>
<td>Viscosity</td>
<td>Not to exceed 1000 seconds</td>
<td>10</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>Not detailed</td>
<td>.86 at 60 °F</td>
</tr>
</tbody>
</table>

**American Distillate**

Suitable for direct issue but reserved for use by submarines.

<table>
<thead>
<tr>
<th>Property</th>
<th>American Distillate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash point</td>
<td>Not lower than 175 °F</td>
</tr>
<tr>
<td>Sulphur</td>
<td>Not to exceed 0.75%</td>
</tr>
<tr>
<td>Acidity</td>
<td>Not to exceed 0.05%</td>
</tr>
<tr>
<td>Water</td>
<td>Not to exceed 0.5%</td>
</tr>
<tr>
<td>Viscosity</td>
<td>Not to exceed 1000 seconds</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>Not detailed</td>
</tr>
</tbody>
</table>

Standard aimed at when making mixtures of different oils;

- Flash point: Not lower than 175 °F
- Sulphur: Not more than 1.5%
- Water: Not more than 1%
- Viscosity: Not more than 500 seconds at 32 °F
- Specific Gravity: Mixed as thoroughly as possible, so that samples taken from various depths differ less than .02.

### Mixtures Supplied to the Fleet

- **“A”** = 30% Persian and 70% Texas.
- **“B”** = 25% Mexican and 75% Texas or Borneo.
- **“C”** = 33⅓% Creosote, 33⅓% Mexican and 33⅓% Texas or Borneo.
- **“D”** = 20% Cannel oil (Scottish), 30% Creosote and 50% Texas.
- **“E”** = 50% Mexican and 50% Texas.
- **“F”** = 25% Mexican, 25% Creosote and 50% Persian
- **“K”** = 10% Borneo and 90% Persian.

“A,” “B,” “D,” “E” and “K” were made without heating and available for issue immediately after mixing, if necessary without waiting for chemical analysis. “C” mixture was heated to 100 °F for three days in a shore tank before issue. The Mexican and Creosote in “F” were also heated at 100 °F for three days, with the Persian added later without further heating.

(Sources ADM265/45 Memo. 6/5/1921; N. S. Fuel 3124/25 in Admiralty Fleet Orders 1637/25, 26/6/1925.)
### Appendix 7

**Naval War Staff's Estimate of War Expenditure**

<table>
<thead>
<tr>
<th>Financial Year</th>
<th>Estimated Peace Expenditure (tons)</th>
<th>Naval War Staff's Estimates of War Expenditure (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>First Six Months of War</td>
</tr>
<tr>
<td>1914-15</td>
<td>283,000</td>
<td>603,000</td>
</tr>
<tr>
<td>1915-16</td>
<td>387,000</td>
<td>943,000</td>
</tr>
<tr>
<td>1916-17</td>
<td>455,000</td>
<td>1,209,000</td>
</tr>
<tr>
<td>1917-18</td>
<td>519,000</td>
<td>1,369,000</td>
</tr>
<tr>
<td>1918-19</td>
<td>591,000</td>
<td>1,500,000*</td>
</tr>
<tr>
<td>1919-20</td>
<td>654,000</td>
<td>1,625,000*</td>
</tr>
</tbody>
</table>

* These two years were not calculated by the NWS, but based on pro rata increases of peacetime consumption.

### Appendix 8

<table>
<thead>
<tr>
<th>Total storage normally in use tons</th>
<th>Place</th>
<th>Quantity</th>
<th>Total tons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>In Stock tons</td>
<td>Discharging and on its way tons</td>
</tr>
<tr>
<td>500</td>
<td>Queensferry</td>
<td>517</td>
<td>-</td>
</tr>
<tr>
<td>10,000</td>
<td>Pembroke</td>
<td>11,000</td>
<td>-</td>
</tr>
<tr>
<td>56,000</td>
<td>Killingholme</td>
<td>36,528</td>
<td>21,685 Teakwood due 30/7/14, Silvia due 16/8/14 &amp; Strombus due 22/8/14</td>
</tr>
<tr>
<td>685,700</td>
<td>total</td>
<td>612,035</td>
<td></td>
</tr>
</tbody>
</table>

**Overseas**

<table>
<thead>
<tr>
<th>Total storage normally in use tons</th>
<th>Place</th>
<th>Quantity</th>
<th>Total tons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>In Stock tons</td>
<td>Discharging and on its way tons</td>
</tr>
<tr>
<td>11,500</td>
<td>Malta</td>
<td>10,273</td>
<td>6,100 in Petroleum due 6/8/14</td>
</tr>
<tr>
<td>11,500</td>
<td>Gibraltar</td>
<td>9,529</td>
<td></td>
</tr>
<tr>
<td>3,000</td>
<td>Hong Kong</td>
<td>3,000</td>
<td></td>
</tr>
<tr>
<td>26,000</td>
<td>Total</td>
<td>22,802</td>
<td></td>
</tr>
<tr>
<td>711,700</td>
<td>Grand total</td>
<td>634,837</td>
<td>53,018</td>
</tr>
<tr>
<td>721,700</td>
<td>Director of Stores' total</td>
<td>638,837</td>
<td>49,818</td>
</tr>
</tbody>
</table>

Source, D-of-S memorandum, 28/7/1914. CAB1/33
## Appendix 8

**Admiralty Oil Fuel Stocks 28th July 1914**

<table>
<thead>
<tr>
<th>Total storage normally in use tons</th>
<th>Place</th>
<th>Quantity</th>
<th>Total tons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>In Stock tons</td>
<td></td>
</tr>
<tr>
<td>20,000</td>
<td>Scottish Shale Works</td>
<td>17,000</td>
<td></td>
</tr>
<tr>
<td>210,000</td>
<td>Sheerness</td>
<td>197,530</td>
<td></td>
</tr>
<tr>
<td>25,600</td>
<td>Thameshaven</td>
<td>24,311</td>
<td></td>
</tr>
<tr>
<td>170,000</td>
<td>Portsmouth</td>
<td>149,486</td>
<td></td>
</tr>
<tr>
<td>74,000</td>
<td>Portland</td>
<td>73,895</td>
<td></td>
</tr>
<tr>
<td>34,000</td>
<td>Devonport</td>
<td>33,330</td>
<td></td>
</tr>
<tr>
<td>12,000</td>
<td>Haulbowline</td>
<td>961</td>
<td></td>
</tr>
<tr>
<td>5,000</td>
<td>Felixstowe</td>
<td>4,785</td>
<td></td>
</tr>
<tr>
<td>1,000</td>
<td>South Shields</td>
<td>1,022</td>
<td></td>
</tr>
<tr>
<td>62,000</td>
<td>Invergordon</td>
<td>56,093</td>
<td></td>
</tr>
<tr>
<td>5,600</td>
<td>Dover</td>
<td>5,577</td>
<td></td>
</tr>
</tbody>
</table>

|                                                 | Discharging and on its way tons |                      |
|                                                 |                                   |                      |
| Home                                            | -                                 |                      |
| 20,000                                          | -                                 | 17,000               |
| 210,000                                         | -                                 | 197,530              |
| 25,600                                          | 6,000 from Aragaz being refined   | 30,311               |
| 170,000                                         | 1,800 discharging from Burmah     | 151,386              |
| 74,000                                          | -                                 | 73,865               |
| 34,000                                          | -                                 | 33,330               |
| 12,000                                          | 5,099 in Batoum due 7/8/14        | 6.060                |
| 5,000                                           | -                                 | 4.785                |
| 1,000                                           | -                                 | 1,022                |
| 62,000                                          | 13,134; 6,346 of which in Lucellum due 28/7/14 | 69,227             |
| 5,600                                           | -                                 | 5,577                |
Appendix 9

Colliers arrived, *en route*, or allocated on 1st October 1914 and 1st October 1915.

<table>
<thead>
<tr>
<th></th>
<th>1st October 1914</th>
<th>1st October 1915</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Home Waters:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Hone Fleet Colliers</td>
<td>163</td>
<td>126</td>
</tr>
<tr>
<td>(b) Dockyards, Transports and Trawler Bases</td>
<td>9</td>
<td>48</td>
</tr>
<tr>
<td>Allocated to (a) and (b)</td>
<td>9</td>
<td>22</td>
</tr>
<tr>
<td>Mediterranean Fleet and Transports</td>
<td>22</td>
<td>83</td>
</tr>
<tr>
<td><strong>Other Stations:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allocated to Mediterranean and Foreign Stations.</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>Yard Purpose Coal</td>
<td>-</td>
<td>7</td>
</tr>
<tr>
<td>Colliers to be allocated</td>
<td>36</td>
<td>26</td>
</tr>
<tr>
<td><strong>Total Colliers allocated to Fleet Service</strong></td>
<td>326</td>
<td>365</td>
</tr>
<tr>
<td><strong>Total of all vessels Requisitioned by the Naval Branch Transport Service.</strong></td>
<td>?</td>
<td>1,450</td>
</tr>
</tbody>
</table>

(Source: Fayle, *Seaborne Trade*, vol. II, pp. 176-177.)
## Appendix 10

### Admiralty Coal Reserves March 1917

<table>
<thead>
<tr>
<th>Base</th>
<th>Authorised Reserve</th>
<th>Actual Stock 2nd March 1917</th>
<th>Average monthly expenditure during the last six months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In Colliers</td>
<td>In Hulks, lighters, ashore or on rail</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>No.</td>
<td>Quantity tons</td>
<td></td>
</tr>
<tr>
<td>Scapa Flow</td>
<td>31</td>
<td>71,000</td>
<td>-</td>
</tr>
<tr>
<td>Cromarty</td>
<td>2</td>
<td>5,000</td>
<td>-</td>
</tr>
<tr>
<td>Firth of Forth</td>
<td>22</td>
<td>55,000</td>
<td>6,000 (hulk) 113,000 (rail) (b)</td>
</tr>
<tr>
<td>Lerwick</td>
<td>-</td>
<td>-</td>
<td>1,000 (hulk)</td>
</tr>
<tr>
<td>Swarbuacks Minn, (Shetlands)</td>
<td>5</td>
<td>17,500</td>
<td>-</td>
</tr>
<tr>
<td>Loch Ewe</td>
<td>1</td>
<td>3,000</td>
<td>-</td>
</tr>
<tr>
<td>Stornoway</td>
<td>1</td>
<td>2,000</td>
<td>-</td>
</tr>
<tr>
<td>Tyne</td>
<td>2</td>
<td>4,000</td>
<td>12,000 (rail) (b)</td>
</tr>
</tbody>
</table>
### Appendix 10

<table>
<thead>
<tr>
<th>Base</th>
<th>Authorised Reserve</th>
<th>Actual Stock 2nd March 1917</th>
<th>Average monthly expenditure during the last six months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In Colliers</td>
<td>In Hulks, lighters, ashore or on rail</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>No.</td>
<td>Quantity tons</td>
<td>(stacked) (b)</td>
</tr>
<tr>
<td>Humber</td>
<td>5</td>
<td>5,000</td>
<td>75,000</td>
</tr>
<tr>
<td>Sheerness</td>
<td>5</td>
<td>13,000</td>
<td>22,000 (hulk)</td>
</tr>
<tr>
<td>Dover &amp; Dunkirk</td>
<td>5</td>
<td>9,000</td>
<td>1,200</td>
</tr>
<tr>
<td>Portland</td>
<td>5</td>
<td>15,000 (c)</td>
<td>35,000</td>
</tr>
<tr>
<td>Queenstown</td>
<td>5</td>
<td>2,500</td>
<td>12,000</td>
</tr>
<tr>
<td>Berehaven</td>
<td>2</td>
<td>5,000</td>
<td>-</td>
</tr>
<tr>
<td>Lough Swilly</td>
<td>1</td>
<td>2,500</td>
<td>-</td>
</tr>
<tr>
<td>Clyde</td>
<td>-</td>
<td>-</td>
<td>7,000</td>
</tr>
<tr>
<td>Liverpool (d)</td>
<td>-</td>
<td>-</td>
<td>10,000</td>
</tr>
<tr>
<td>Southampton (e)</td>
<td>-</td>
<td>-</td>
<td>18,000</td>
</tr>
<tr>
<td>Thames (f)</td>
<td>-</td>
<td>-</td>
<td>7,000</td>
</tr>
<tr>
<td>Chatham</td>
<td>-</td>
<td>-</td>
<td>50,000</td>
</tr>
</tbody>
</table>
## Appendix 10

<table>
<thead>
<tr>
<th>Base</th>
<th>Authorised Reserve</th>
<th>Actual Stock 2nd March 1917</th>
<th>Average monthly expenditure during the last six months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In Colliers</td>
<td>In Hulks, lighters, ashore or on rail</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>No.</td>
<td>Quantity tons</td>
<td>20,000 (18,000 in hulks)</td>
</tr>
<tr>
<td>Portsmouth (e)</td>
<td>-</td>
<td>-</td>
<td>20,000 (18,000 in hulks)</td>
</tr>
<tr>
<td>Devonport</td>
<td>-</td>
<td>-</td>
<td>66,000 (3,000 in hulks)</td>
</tr>
<tr>
<td>Pembroke (g)</td>
<td>-</td>
<td>-</td>
<td>3,700</td>
</tr>
<tr>
<td>Aberdeen (g)</td>
<td>-</td>
<td>-</td>
<td>1,000</td>
</tr>
<tr>
<td>Great Yarmouth (g)</td>
<td>-</td>
<td>-</td>
<td>1,000</td>
</tr>
<tr>
<td>Harwich (e)</td>
<td>-</td>
<td>-</td>
<td>5,500 (4,800 in hulks)</td>
</tr>
<tr>
<td>Kingstown</td>
<td>-</td>
<td>-</td>
<td>500</td>
</tr>
<tr>
<td>Lowestoft (g)</td>
<td>-</td>
<td>-</td>
<td>1,000</td>
</tr>
<tr>
<td>Newhaven</td>
<td>-</td>
<td>-</td>
<td>500</td>
</tr>
<tr>
<td>Peterhead (g)</td>
<td>-</td>
<td>-</td>
<td>1,000</td>
</tr>
<tr>
<td>Belfast</td>
<td>-</td>
<td>-</td>
<td>2,000</td>
</tr>
</tbody>
</table>
### Appendix 10

<table>
<thead>
<tr>
<th>Base</th>
<th>Authorised Reserve</th>
<th>Actual Stock 2nd March 1917</th>
<th>Average monthly expenditure during the last six months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In Colliers</td>
<td>In Hulks, lighters, ashore or on rail</td>
<td>Total</td>
</tr>
<tr>
<td>No.</td>
<td>Quantity tons</td>
<td>No.</td>
<td>Quantity tons</td>
</tr>
<tr>
<td>Total</td>
<td>343,900</td>
<td>232,300</td>
<td>243,230</td>
</tr>
</tbody>
</table>

Notes

(a) At the three fleet bases combined the aggregate monthly expenditure during the previous six months was 102,000 tons. The heaviest month in 1915 was April (228,000 tons) and in 1916 it was May (159,000 tons).

(b) This constituted a ‘special emergency stock’ held to enable colliers to be rapidly replenished during period of ‘exceptional Fleet activity, and also as a safety against delays in replenishment by sea arising from submarine activities, labour troubles, bad weather etc.’

(c) ‘Special reserve to meet strategic emergencies due to raiding operations, embargoes on sailings through submarine activity etc. also for reinforcing Dover, Portsmouth & Southampton during a prolonged embargo.

(d) Excludes Yorkshire coal supplies direct from collieries.

(e) Partly transported by rail.

(f) Includes Yorkshire coal for transports (expenditure about 12,600 tons monthly).

(g) Transported by rail.

(Source, Admiralty paper for Cabinet, March 1917. ADM1/9216 and ADM116/1514).
Appendix 11

Weekly Statement of 26th April 1916, Showing Distribution of Admiralty Colliers at Home and Abroad.

<table>
<thead>
<tr>
<th>Fleet Coaling Service</th>
<th>Arrived</th>
<th>En Route</th>
<th>Allocated</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bases:-</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Home</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fleet Bases</td>
<td>103</td>
<td>12</td>
<td>18</td>
<td>133</td>
</tr>
<tr>
<td>Liverpool, Southampton and Thames</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Dockyards and Depots</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Trawlers and Drifters Bases</td>
<td>25</td>
<td>5</td>
<td>7</td>
<td>37</td>
</tr>
<tr>
<td><strong>Mediterranean</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fleet</td>
<td>33</td>
<td>23</td>
<td>7</td>
<td>63</td>
</tr>
<tr>
<td>Transports</td>
<td>11</td>
<td>13</td>
<td>8</td>
<td>32</td>
</tr>
<tr>
<td>Other Foreign Stations</td>
<td>36</td>
<td>28</td>
<td>2</td>
<td>66</td>
</tr>
<tr>
<td><strong>Loading Ports</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Wales</td>
<td>11</td>
<td>16</td>
<td>-</td>
<td>27</td>
</tr>
<tr>
<td>Humber and Tyne</td>
<td>6</td>
<td>11</td>
<td>-</td>
<td>17</td>
</tr>
<tr>
<td>Forth and Clyde</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total Fleet Coaling Service</strong></td>
<td></td>
<td></td>
<td></td>
<td>390 1,399,040</td>
</tr>
</tbody>
</table>

| Allied Government Service |         |          |           |       |
| French Marine           | 5       | 6        | 2         | 13    |
| French Government Railways | 20  | 8 | 22 | 50 |
| Italian Government      | 4       | 5        | 5         | 14    |
| Russian                 | 15      | -        | -         | 15    |
| Egyptian State Railways etc. | 2 | 5 | 2 | 9 |
| **Total Allied Government Service** | | | | 101 395,300 |
### Appendix 11

<table>
<thead>
<tr>
<th>Bases:</th>
<th>Arrived</th>
<th>En Route</th>
<th>Allocated</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>Cargo Capacity</td>
<td>No. Cargo Capacity</td>
<td>No. Cargo Capacity</td>
</tr>
<tr>
<td>Other Services</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yard Purpose Coal and other Admiralty cargoes, Home.</td>
<td>3</td>
<td>3,600</td>
<td>3</td>
<td>5,470</td>
</tr>
<tr>
<td>Yard Purpose Coal and other Admiralty cargoes, Abroad.</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>2,800</td>
</tr>
<tr>
<td>War Office Account</td>
<td>9</td>
<td>21,300</td>
<td>3</td>
<td>3,670</td>
</tr>
<tr>
<td>Return Government Cargoes</td>
<td>28</td>
<td>123,600</td>
<td>33</td>
<td>159,000</td>
</tr>
<tr>
<td>Special Services</td>
<td>6</td>
<td>13,350</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total Other Services</td>
<td></td>
<td></td>
<td></td>
<td>160</td>
</tr>
<tr>
<td>Grand Total</td>
<td></td>
<td></td>
<td></td>
<td>651</td>
</tr>
<tr>
<td>Owner's account, home</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Owner's account, abroad</td>
<td></td>
<td></td>
<td></td>
<td>151</td>
</tr>
<tr>
<td>Total Owner's account</td>
<td></td>
<td></td>
<td></td>
<td>154</td>
</tr>
<tr>
<td>Requisitioned, but not yet available</td>
<td></td>
<td></td>
<td></td>
<td>14</td>
</tr>
</tbody>
</table>

Includes all colliers (72,350 tons) detained in White Sea During Winter.

(Source: ADM116/1514)
Appendix 12

Details of Colliers and Tankers Sunk While on Admiralty Service August 1914- November 1918

<table>
<thead>
<tr>
<th>Cause (So far as is known)</th>
<th>Number</th>
<th>Gross Tonnage of Vessels Lost</th>
<th>Gross Tonnage of Cargoes Lost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enemy cruisers and raiders</td>
<td>4</td>
<td>15,521</td>
<td>15,626</td>
</tr>
<tr>
<td>Sea Plane</td>
<td>1</td>
<td>2,784</td>
<td>3,500</td>
</tr>
<tr>
<td>Submarine</td>
<td>169</td>
<td>500,727</td>
<td>635,974</td>
</tr>
<tr>
<td>Mine or submarine</td>
<td>33</td>
<td>81,278</td>
<td>104,804</td>
</tr>
<tr>
<td>Total Enemy Action</td>
<td>207</td>
<td>600,320</td>
<td>759,904</td>
</tr>
<tr>
<td>Stress of Weather etc.</td>
<td>46</td>
<td>115,524</td>
<td>132,535</td>
</tr>
<tr>
<td>Total</td>
<td>253</td>
<td>715,844</td>
<td>892,439</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cause</th>
<th>1914</th>
<th>1915</th>
<th>1916</th>
<th>1917</th>
<th>1918</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cruiser Raider</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Seaplane</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Submarine</td>
<td>-</td>
<td>20</td>
<td>26</td>
<td>81</td>
<td>38</td>
</tr>
<tr>
<td>Mine or Submarine</td>
<td>-</td>
<td>9</td>
<td>6</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>Unknown, stress, weather or accident</td>
<td>-</td>
<td>4</td>
<td>7</td>
<td>25</td>
<td>10</td>
</tr>
<tr>
<td>Total*</td>
<td>2</td>
<td>31</td>
<td>42</td>
<td>119</td>
<td>55</td>
</tr>
</tbody>
</table>

*Year unknown for 4 vessels.

Known Monthly Collier Losses to submarines 1917

<table>
<thead>
<tr>
<th>Jan 1917</th>
<th>May</th>
<th>September</th>
<th>7</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb</td>
<td>8</td>
<td>June</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>March</td>
<td>10</td>
<td>July</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>April</td>
<td>6</td>
<td>August</td>
<td>6</td>
<td>11</td>
</tr>
</tbody>
</table>
### Appendix 12

#### Descriptions of Colliers' Cargoes Lost 1914-1918

<table>
<thead>
<tr>
<th>Description</th>
<th>Count</th>
<th>Type</th>
<th>Count</th>
<th>Type</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welsh</td>
<td>151</td>
<td>Dockyard</td>
<td>6</td>
<td>Small</td>
<td>1</td>
</tr>
<tr>
<td>Empty</td>
<td>29</td>
<td>Locomotive</td>
<td>3</td>
<td>Foundry</td>
<td>1</td>
</tr>
<tr>
<td>North Country</td>
<td>30</td>
<td>Steam Vessel</td>
<td>2</td>
<td>Scottish</td>
<td>1</td>
</tr>
<tr>
<td>Bituminous</td>
<td>19</td>
<td>House</td>
<td>2</td>
<td>Unknown</td>
<td>1</td>
</tr>
<tr>
<td>Mixed</td>
<td>6</td>
<td>Yorkshire</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Source: ADM1/9224).

#### Number and Tonnage Tankers Lost on Admiralty Service 1914-18

<table>
<thead>
<tr>
<th>Cause</th>
<th>Number</th>
<th>Gross Tonnage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enemy cruisers and raiders</td>
<td>1</td>
<td>5,528</td>
</tr>
<tr>
<td>Submarine</td>
<td>33</td>
<td>164,317</td>
</tr>
<tr>
<td>Mine</td>
<td>3</td>
<td>11,104</td>
</tr>
<tr>
<td>Total due to Enemy Action</td>
<td>37</td>
<td>180,949</td>
</tr>
<tr>
<td>Unknown, Weather, Accident etc.</td>
<td>7</td>
<td>32,210</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
<td>213,159</td>
</tr>
</tbody>
</table>

#### Tankers Lost on Admiralty Service (Year)

<table>
<thead>
<tr>
<th>Cause</th>
<th>1914</th>
<th>1915</th>
<th>1916</th>
<th>1917</th>
<th>1918</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enemy cruisers and raiders</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Submarine</td>
<td>-</td>
<td>7</td>
<td>3</td>
<td>17</td>
<td>6</td>
</tr>
<tr>
<td>Mine</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total due to Enemy Action</td>
<td>-</td>
<td>8</td>
<td>3</td>
<td>19</td>
<td>7</td>
</tr>
<tr>
<td>Unknown, Weather, Accident etc.</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>-</td>
<td>8</td>
<td>6</td>
<td>21</td>
<td>9</td>
</tr>
</tbody>
</table>
Appendix 12

<table>
<thead>
<tr>
<th></th>
<th>January</th>
<th>May</th>
<th>September</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>February</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>April</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

(Source: MT25/67)
### Appendix 13

**Petroleum Products supplied by APOC/AIOC to the Admiralty 1913-38**

<table>
<thead>
<tr>
<th>Year</th>
<th>Oil fuel supplied to Admiralty (tons)</th>
<th>Per cent of refinery production taken by Admiralty</th>
<th>Oil fuel contracted for by Admiralty in peacetime.</th>
<th>Approx. excess supply over contracted for in peace time*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1913-14</td>
<td>30,000</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1914-15</td>
<td>72,791</td>
<td>41</td>
<td>50-70,000</td>
<td>3,000</td>
</tr>
<tr>
<td>1915-16</td>
<td>108,831</td>
<td>66</td>
<td>90-120,000</td>
<td></td>
</tr>
<tr>
<td>1916-17</td>
<td>225,681</td>
<td>68</td>
<td>100-150,000</td>
<td>76,000</td>
</tr>
<tr>
<td>1917-18</td>
<td>399,192</td>
<td>69</td>
<td>300-350,000</td>
<td>49,000</td>
</tr>
<tr>
<td>1918-19</td>
<td>424,228</td>
<td>66</td>
<td>300-350,000</td>
<td>74,000</td>
</tr>
<tr>
<td>1919-20</td>
<td>64,253</td>
<td>53</td>
<td>300-350,000</td>
<td>44,000</td>
</tr>
<tr>
<td>1920-21</td>
<td>n/a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1921-22</td>
<td>n/a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1922-23</td>
<td>434,493</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1923-24</td>
<td>473,394</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1924-25</td>
<td>509,817</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1925-26</td>
<td>492,235</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1926-27</td>
<td>492,235</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1927-28</td>
<td>509,357</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1928*</td>
<td>512,804</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1929</td>
<td>556,558</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1930</td>
<td>621,118</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1931</td>
<td>472,935</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1932</td>
<td>559,819</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1933</td>
<td>528,910 (Plus 67,641 loan scheme)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1934</td>
<td>591,314 (Plus 119,940 loan scheme)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1935</td>
<td>708,745 (Plus 106,255 loan scheme)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1936</td>
<td>982,996 (Plus 77,518 loan scheme)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1937</td>
<td>1,300,829 (Plus 59,859 loan scheme)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In addition APOC supplied the following petroleum products for 'Mesopotamian Services:' 1916/17 2,537 tons, 1917/18 38,854 tons, 1918/19 148,368 and 1919/20 64,260.

*APOC's changed its accounting year from the tax year (April to March) to the calendar year in 1928. Consequently, deliveries for 1928 are from 1st April 1928 to December 1928.

(Sources: ADM116/1219, ADM116/2318B, BP109194).
Appendix 14

Oil Stocks and Expenditure 1914-17

<table>
<thead>
<tr>
<th>Month</th>
<th>Stock on 1st of Month. (tons)</th>
<th>Total expenditure during month (tons)</th>
<th>Number of months which stock was expected to last</th>
<th>Receipts during the month. (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1914</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>August</td>
<td>665,167</td>
<td>81,000</td>
<td>7.7</td>
<td>47,434</td>
</tr>
<tr>
<td>September</td>
<td>588,601</td>
<td>67,000</td>
<td>8.8</td>
<td>77,775</td>
</tr>
<tr>
<td>October</td>
<td>599,376</td>
<td>77,500</td>
<td>7.2</td>
<td>160,891</td>
</tr>
<tr>
<td>November</td>
<td>682,767</td>
<td>65,000</td>
<td>10.5</td>
<td>101,379</td>
</tr>
<tr>
<td>December</td>
<td>719,146</td>
<td>61,000</td>
<td>11.7</td>
<td>67,365</td>
</tr>
<tr>
<td>1914 total</td>
<td>-</td>
<td>352,000</td>
<td></td>
<td>454,844</td>
</tr>
<tr>
<td>1915</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>January</td>
<td>725,011</td>
<td>80,500</td>
<td>9</td>
<td>163,625</td>
</tr>
<tr>
<td>February</td>
<td>808,136</td>
<td>64,500</td>
<td>12.5</td>
<td>87,709</td>
</tr>
<tr>
<td>March</td>
<td>831,345</td>
<td>76,000</td>
<td>10.9</td>
<td>115,381</td>
</tr>
<tr>
<td>April</td>
<td>870,726</td>
<td>98,500</td>
<td>8.8</td>
<td>85,868</td>
</tr>
<tr>
<td>May</td>
<td>858,094</td>
<td>104,500</td>
<td>8.2</td>
<td>83,433</td>
</tr>
<tr>
<td>June</td>
<td>837,027</td>
<td>101,000</td>
<td>8.3</td>
<td>123,109</td>
</tr>
<tr>
<td>July</td>
<td>859,136</td>
<td>97,000</td>
<td>8.8</td>
<td>85,395</td>
</tr>
<tr>
<td>August</td>
<td>847,531</td>
<td>106,000</td>
<td>8</td>
<td>111,804</td>
</tr>
<tr>
<td>September</td>
<td>853,335</td>
<td>95,500</td>
<td>8</td>
<td>190,244</td>
</tr>
<tr>
<td>October</td>
<td>948,079</td>
<td>104,000</td>
<td>9</td>
<td>145,912</td>
</tr>
<tr>
<td>November</td>
<td>989,991</td>
<td>104,000</td>
<td>9.5</td>
<td>185,299</td>
</tr>
<tr>
<td>December</td>
<td>1,071,290</td>
<td>79,000</td>
<td>13.6</td>
<td>65,082</td>
</tr>
<tr>
<td>1915 total</td>
<td></td>
<td>1,110,500</td>
<td></td>
<td>1,442,861</td>
</tr>
</tbody>
</table>
### Appendix 14

<table>
<thead>
<tr>
<th>Month</th>
<th>Stock on 1st of Month. (tons)</th>
<th>Total expenditure during month (tons)</th>
<th>Number of months which stock was expected to last</th>
<th>Receipts during the month. (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1916</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>January</td>
<td>1,057,372</td>
<td>86,500</td>
<td>12.7</td>
<td>152,266</td>
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<tr>
<td>February</td>
<td>1,123,138</td>
<td>107,500</td>
<td>10.4</td>
<td>143,281</td>
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<td>March</td>
<td>1,458,919</td>
<td>119,000</td>
<td>9.8</td>
<td>102,599</td>
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<td>April</td>
<td>1,142,518</td>
<td>124,000</td>
<td>9.2</td>
<td>104,454</td>
</tr>
<tr>
<td>May</td>
<td>1,122,972</td>
<td>167,000</td>
<td>6.7</td>
<td>122,028</td>
</tr>
<tr>
<td>June</td>
<td>1,078,000</td>
<td>112,000</td>
<td>9.6</td>
<td>70,834</td>
</tr>
<tr>
<td>July</td>
<td>1,036,834</td>
<td>158,500</td>
<td>6.5</td>
<td>104,228</td>
</tr>
<tr>
<td>August</td>
<td>982,562</td>
<td>160,500</td>
<td>6.1</td>
<td>165,708</td>
</tr>
<tr>
<td>September</td>
<td>987,770</td>
<td>156,500</td>
<td>6.3</td>
<td>158,287</td>
</tr>
<tr>
<td>October</td>
<td>989,557</td>
<td>165,500</td>
<td>5.9</td>
<td>133,562</td>
</tr>
<tr>
<td>November</td>
<td>957,619</td>
<td>158,000</td>
<td>6.1</td>
<td>123,108</td>
</tr>
<tr>
<td>December</td>
<td>922,727</td>
<td>174,000</td>
<td>5.3</td>
<td>155,666</td>
</tr>
<tr>
<td>1916 total</td>
<td></td>
<td>1,689,000</td>
<td></td>
<td>1,536,021</td>
</tr>
<tr>
<td>1917</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>January</td>
<td>191,000</td>
<td>904,393</td>
<td>4.7</td>
<td>128,252</td>
</tr>
<tr>
<td>February</td>
<td>164,000</td>
<td>841,645</td>
<td>5.1</td>
<td>191,528</td>
</tr>
<tr>
<td>March</td>
<td>190,500</td>
<td>869,173</td>
<td>4.6</td>
<td>134,386</td>
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<tr>
<td>April</td>
<td>213,000</td>
<td>813,059</td>
<td>3.8</td>
<td>147,533</td>
</tr>
<tr>
<td>May</td>
<td>255,000</td>
<td>747,592</td>
<td>2.9</td>
<td></td>
</tr>
</tbody>
</table>

(Source: MT25/1)
Appendix 15
Estimates Total Requirements of Petroleum Products of the Allies.
April 1st 1918 to March 31st 1919

<table>
<thead>
<tr>
<th>Type</th>
<th>Great Britain</th>
<th>France</th>
<th>Italy</th>
<th>America</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel Oil</td>
<td>4,031,500</td>
<td>93,000</td>
<td>368,400</td>
<td>487,800</td>
<td>4,980,700</td>
</tr>
<tr>
<td>Gas Oil</td>
<td>142,500</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>142,500</td>
</tr>
<tr>
<td>Kerosene</td>
<td>613,500</td>
<td>358,600</td>
<td>217,000</td>
<td>9,800</td>
<td>1,198,900</td>
</tr>
<tr>
<td>Aviation Spirit</td>
<td>130,500</td>
<td>154,200</td>
<td>42,000</td>
<td>50,000</td>
<td>376,700</td>
</tr>
<tr>
<td>Petrol</td>
<td>548,000</td>
<td>627,800</td>
<td>237,000</td>
<td>147,000</td>
<td>1,559,800</td>
</tr>
<tr>
<td>Other Spirit</td>
<td>21,600</td>
<td>30,000</td>
<td>-</td>
<td>-</td>
<td>51,600</td>
</tr>
<tr>
<td>Total</td>
<td>5,487,600</td>
<td>1,263,600</td>
<td>864,400</td>
<td>694,600</td>
<td>8,310,200</td>
</tr>
</tbody>
</table>

Tanker Capacity required 1,054,701 279,124 206,174 128,234 1,668,233

Requirements of petroleum products of United Kingdom
April 1st 1918 to March 31st 1919

<table>
<thead>
<tr>
<th>Source</th>
<th>Oil Fuel</th>
<th>Gas Oil</th>
<th>Kerosene</th>
<th>Aviation Spirit</th>
<th>Petrol</th>
<th>Other Spirits</th>
<th>Lubricating oils</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home Source</td>
<td>216,000</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>216,000</td>
</tr>
<tr>
<td>USA (Northern Ports)</td>
<td>2,714,500</td>
<td>130,000</td>
<td>544,000</td>
<td>130,500</td>
<td>430,600</td>
<td>-</td>
<td>303,000</td>
<td>4,252,000</td>
</tr>
<tr>
<td>Texas</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mexico</td>
<td>360,000</td>
<td>12,500</td>
<td>64,000</td>
<td>-</td>
<td>30,000</td>
<td>-</td>
<td>45,000</td>
<td>511,500</td>
</tr>
<tr>
<td>Trinidad &amp; Curacao</td>
<td>146,000</td>
<td>-</td>
<td>5,000</td>
<td>-</td>
<td>10,000</td>
<td>-</td>
<td>-</td>
<td>161,000</td>
</tr>
<tr>
<td>Egypt</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Persia</td>
<td>540,000</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>540,000</td>
</tr>
<tr>
<td>Burmah</td>
<td>7,000</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>7,000</td>
</tr>
<tr>
<td>Sumatra</td>
<td>-</td>
<td>-</td>
<td>500</td>
<td>-</td>
<td>3,000</td>
<td>-</td>
<td>-</td>
<td>3,500</td>
</tr>
<tr>
<td>Borneo</td>
<td>48,000</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>74,000</td>
<td>21,600</td>
<td>-</td>
<td>144,000</td>
</tr>
<tr>
<td>Total</td>
<td>4,031,500</td>
<td>142,500</td>
<td>613,500</td>
<td>130,500</td>
<td>548,000</td>
<td>21,600</td>
<td>348,000</td>
<td>5,835,600</td>
</tr>
</tbody>
</table>
# Appendix 15

Requirements of petroleum products of United Kingdom

April 1st 1918 to March 31st 1919

Services for Which Required**

<table>
<thead>
<tr>
<th>Source</th>
<th>Oil Fuel</th>
<th>Gas Oil</th>
<th>Kerosene</th>
<th>Aviation Spirit</th>
<th>Petrol</th>
<th>Other Spirits</th>
<th>Lubricating oils</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navy</td>
<td>3,820,000</td>
<td>-</td>
<td>11,000</td>
<td>11,500</td>
<td>33,000</td>
<td>-</td>
<td>17,700</td>
<td>3,893,200</td>
</tr>
<tr>
<td>Civil Purposes</td>
<td>-</td>
<td>142,500</td>
<td>507,500</td>
<td>-</td>
<td>222,000</td>
<td>-</td>
<td>295,300</td>
<td>1,167,300</td>
</tr>
<tr>
<td>Additions to reserve</td>
<td>211,500</td>
<td>-</td>
<td>60,000</td>
<td>-</td>
<td>27,000</td>
<td>-</td>
<td>-</td>
<td>298,500</td>
</tr>
<tr>
<td>Total</td>
<td>4,031,500</td>
<td>142,500</td>
<td>613,500</td>
<td>130,500</td>
<td>548,000</td>
<td>21,600</td>
<td>348,000</td>
<td>5,835,600</td>
</tr>
</tbody>
</table>

* These figures include provision for the BEF, but not the Army’s requirements in other theatres.

** The Air Force requirements are included in its former services.

Appendix 16

Sources Naval Oil Fuel Imported into Britain by the Admiralty 1932-39

<table>
<thead>
<tr>
<th>Year</th>
<th>Trinidad tons</th>
<th>%</th>
<th>Persian tons</th>
<th>%</th>
<th>Total tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1932</td>
<td>139,594</td>
<td>50.27</td>
<td>138,110</td>
<td>49.73</td>
<td>277,704</td>
</tr>
<tr>
<td>1933</td>
<td>148,330</td>
<td>47.40</td>
<td>164,575</td>
<td>52.60</td>
<td>312,905</td>
</tr>
<tr>
<td>1934</td>
<td>117,848</td>
<td>36.68</td>
<td>221,934</td>
<td>65.32</td>
<td>339,782</td>
</tr>
<tr>
<td>1935</td>
<td>123,315</td>
<td>42.73</td>
<td>165,220</td>
<td>57.27</td>
<td>288,535</td>
</tr>
<tr>
<td>1936</td>
<td>217,767</td>
<td>40.42</td>
<td>320,982</td>
<td>59.58</td>
<td>538,749</td>
</tr>
<tr>
<td>1937</td>
<td>215,577</td>
<td>55.14</td>
<td>175,364</td>
<td>44.86</td>
<td>390,941</td>
</tr>
<tr>
<td>1938</td>
<td>228,901</td>
<td>56.84</td>
<td>173,753</td>
<td>43.15</td>
<td>402,654</td>
</tr>
<tr>
<td>1939</td>
<td>276,628</td>
<td>38.71</td>
<td>356,865</td>
<td>49.94</td>
<td>714,621*</td>
</tr>
<tr>
<td>Total</td>
<td>1,467,960</td>
<td>44.95</td>
<td>1,716,803</td>
<td>52.57</td>
<td>3,265,891</td>
</tr>
</tbody>
</table>

*Includes 57,977 tons (8.11%) from Curacao imported after September and 23,151 tons (3.24%) ex-Admiralty stock at Aden and Gibraltar origin not stated. (Source, POWE 33/212)
### Appendix 17

**Oil Requirements for the Fleet in a Far East War in 1924**

#### The Main Fleet in Eastern Waters—

<table>
<thead>
<tr>
<th>Tons</th>
<th>Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>The main fleet would require 3,300,000 tons</td>
<td></td>
</tr>
<tr>
<td>1,100,000 being available in tanks at Singapore</td>
<td></td>
</tr>
<tr>
<td>300,000 at Rangoon</td>
<td></td>
</tr>
<tr>
<td>100,000 being then yearly output of the Burmah Oil Fields</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>Of which the tankers would consume</td>
<td></td>
</tr>
<tr>
<td>Leaving to be delivered at Singapore</td>
<td></td>
</tr>
<tr>
<td>From the Persian Oil Fields we get a yearly Output of 1,200,000, which would have shrunk To 960,000 on delivery to Singapore</td>
<td></td>
</tr>
<tr>
<td>From the United Kingdom we should require To take from our reserves 1,370,000, which Would have shrunk to 870,000 on delivery to Singapore, thus making the amount up to the 3,300,000 required for operations.</td>
<td></td>
</tr>
</tbody>
</table>

#### Requirement for Main Fleet in Eastern Waters

- 3,300,000
- Consumed as fuel during transportation from Burma, Persia, and then United Kingdom to Singapore 770,000
- **Grand Total 4,070,000**

#### Protection of Trade—

- For the protection of trade, that is, for the Provision of fuel for the light cruisers And armed merchant cruisers
- 1,791,000 tons would be required
- To transport port this large quantity of oil 681,000 tons of oil would be consumed
- Making a total of 2,472,000

#### Units of the Fleet— Other than Main Fleet—

- This would leave only 597,000 tons for the Consumption of the remainder of the ships Which do not form part of the main Fleet and Would represent an allowance sufficient for Only four and a half months of war.
- **Grand Total 597,000**
- **Grand Total 7,139,000**

(Source: CID, 11/2/1924. CAB2/4)
Appendix 18

**Underground Oil Fuel Storage**

The Admiralty's proposal for underground storage in December 1936, the whole scheme, if approved, was expected take 5-6 years to complete.

<table>
<thead>
<tr>
<th>Place</th>
<th>Position under present approved scheme when completed</th>
<th>Position if proposed scheme is approved</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Over ground</td>
<td>Underground</td>
</tr>
<tr>
<td>Home (tons)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sheerness</td>
<td>245,100</td>
<td>Nil</td>
</tr>
<tr>
<td>Felixstowe</td>
<td>5,000*</td>
<td>Nil</td>
</tr>
<tr>
<td>Killingholme</td>
<td>302,100</td>
<td>Nil</td>
</tr>
<tr>
<td>Rosyth</td>
<td>514,600</td>
<td>Nil</td>
</tr>
<tr>
<td>Port Edgar</td>
<td>32,000</td>
<td>Nil</td>
</tr>
<tr>
<td>Grangemouth</td>
<td>32,000</td>
<td>Nil</td>
</tr>
<tr>
<td>Invergordon</td>
<td>425,700</td>
<td>Nil</td>
</tr>
<tr>
<td>Lyness</td>
<td>176,000</td>
<td>Nil</td>
</tr>
<tr>
<td>Old Kilpatrick</td>
<td>708,000</td>
<td>Nil</td>
</tr>
<tr>
<td>Pembroke</td>
<td>443,400</td>
<td>Nil</td>
</tr>
<tr>
<td>Devonport</td>
<td>282,200</td>
<td>Nil</td>
</tr>
<tr>
<td>Portland</td>
<td>175,195</td>
<td>Nil</td>
</tr>
<tr>
<td>Portsmouth</td>
<td>228,000</td>
<td>Nil</td>
</tr>
<tr>
<td>Total home</td>
<td>3,569,295</td>
<td>Nil</td>
</tr>
<tr>
<td>Abroad</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gibraltar</td>
<td>23,400</td>
<td>28,000</td>
</tr>
<tr>
<td>Malta</td>
<td>57,000</td>
<td>47,580</td>
</tr>
<tr>
<td>Port Said</td>
<td>16,000</td>
<td>Nil</td>
</tr>
<tr>
<td>Port Sudan</td>
<td>24,000</td>
<td>Nil</td>
</tr>
<tr>
<td>Aden</td>
<td>588,000</td>
<td>Nil</td>
</tr>
<tr>
<td>Colombo</td>
<td>72,000</td>
<td>Nil</td>
</tr>
<tr>
<td>Trincomalee</td>
<td>1,248,000</td>
<td>Nil</td>
</tr>
</tbody>
</table>
### Appendix 18

<table>
<thead>
<tr>
<th>Location</th>
<th>Tons 1</th>
<th>Tons 2</th>
<th>Tons 3</th>
<th>Tons 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rangoon</td>
<td>102,000</td>
<td>102,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Singapore</td>
<td>1,328,000</td>
<td>1,328,000</td>
<td>500,000</td>
<td></td>
</tr>
<tr>
<td>Hong Kong</td>
<td>51,000</td>
<td>24,000</td>
<td>27,000</td>
<td></td>
</tr>
<tr>
<td>Bermuda</td>
<td>16,000</td>
<td>16,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jamaica</td>
<td>16,000</td>
<td>16,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cape of Good Hope</td>
<td>96,000</td>
<td>96,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>60,000</td>
<td>60,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Falkland Islands</td>
<td>16,000</td>
<td>16,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia and New Zealand</td>
<td>120,000 (about)</td>
<td>120,000 (about)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total abroad</td>
<td>3,833,400</td>
<td>75,580</td>
<td>3,614,400</td>
<td>832,580</td>
</tr>
<tr>
<td>Grand Total</td>
<td>7,402,695</td>
<td>75,580</td>
<td>6,954,695</td>
<td>2,007,580</td>
</tr>
</tbody>
</table>

* Hired storage to be dispensed with when underground storage is provided
† Part of existing storage to be converted to bombproof storage.
A rough estimate of the cost of the ‘underground and bomb proof storage’ was between £8,000,000 to £9,200,000 at home and between £6,000,000 to £6,800,000 abroad.
(Sources: OB paper for the CID 1286-B, 1/12/1936. CAB4/25)

---

Priorities allocated to the Admiralty underground storage scheme by the Chiefs of Staff.

Priority in which storage from the strategic and operational points of view should be given first consideration:

<table>
<thead>
<tr>
<th>Location</th>
<th>Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rosyth</td>
<td>200,000</td>
</tr>
<tr>
<td>Lyness</td>
<td>100,000</td>
</tr>
<tr>
<td>Harwich</td>
<td>50,000</td>
</tr>
<tr>
<td>Invergordon</td>
<td>100,000</td>
</tr>
<tr>
<td>Singapore</td>
<td>200,000</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>27,000</td>
</tr>
<tr>
<td>Aden</td>
<td>50,000</td>
</tr>
<tr>
<td>Portsmouth</td>
<td>100,000</td>
</tr>
<tr>
<td>Humber</td>
<td>50,000</td>
</tr>
<tr>
<td>Portland</td>
<td>75,000</td>
</tr>
<tr>
<td>Devonport</td>
<td>50,000</td>
</tr>
<tr>
<td>Lyness</td>
<td>100,000</td>
</tr>
<tr>
<td>Harwich</td>
<td>100,000</td>
</tr>
<tr>
<td>Invergordon</td>
<td>100,000</td>
</tr>
<tr>
<td>Singapore</td>
<td>300,000</td>
</tr>
<tr>
<td>Malta</td>
<td>38,000</td>
</tr>
<tr>
<td>Aden</td>
<td>142,000</td>
</tr>
<tr>
<td>Humber</td>
<td>100,000</td>
</tr>
<tr>
<td>Devonport</td>
<td>50,000</td>
</tr>
</tbody>
</table>
Appendix 18

The three stages of construction recommended were:

1st Stage.
Authority required by the 1st April 1937.

<table>
<thead>
<tr>
<th>Location</th>
<th>Part</th>
<th>Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rosyth</td>
<td>one unit only</td>
<td>200,000</td>
</tr>
<tr>
<td>Lyness</td>
<td>1st part</td>
<td>100,000</td>
</tr>
<tr>
<td>Harwich</td>
<td>1st part</td>
<td>50,000</td>
</tr>
<tr>
<td>Invergordon</td>
<td>1st part</td>
<td>100,000</td>
</tr>
<tr>
<td>Singapore</td>
<td>1st part</td>
<td>200,000</td>
</tr>
<tr>
<td>Hong Kong</td>
<td></td>
<td>27,000</td>
</tr>
<tr>
<td>Aden</td>
<td>1st part</td>
<td>50,000</td>
</tr>
<tr>
<td>total</td>
<td></td>
<td>727,000</td>
</tr>
</tbody>
</table>

Estimated cost £5,500,000 to £6,500,000.

2nd Stage.
Authority required by the 1st April 1938.

<table>
<thead>
<tr>
<th>Location</th>
<th>Part</th>
<th>Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portsmouth</td>
<td></td>
<td>100,000</td>
</tr>
<tr>
<td>Humber</td>
<td>1st part</td>
<td>50,000</td>
</tr>
<tr>
<td>Portland</td>
<td></td>
<td>75,000</td>
</tr>
<tr>
<td>Devonport</td>
<td>1st part</td>
<td>50,000</td>
</tr>
<tr>
<td>Singapore</td>
<td>2nd part</td>
<td>300,000</td>
</tr>
<tr>
<td>Aden</td>
<td>2nd part</td>
<td>142,000</td>
</tr>
<tr>
<td>total</td>
<td></td>
<td>717,000</td>
</tr>
</tbody>
</table>

Estimated cost £5,250,000 to £5,750,000.

3rd Stage.
Authority required by 1st April 1939.

<table>
<thead>
<tr>
<th>Location</th>
<th>Part</th>
<th>Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lyness</td>
<td>2nd part</td>
<td>100,000</td>
</tr>
<tr>
<td>Harwich</td>
<td>2nd part</td>
<td>100,000</td>
</tr>
<tr>
<td>Invergordon</td>
<td>2nd part</td>
<td>100,000</td>
</tr>
<tr>
<td>Malta</td>
<td></td>
<td>38,000</td>
</tr>
<tr>
<td>Humber</td>
<td>2nd part</td>
<td>100,000</td>
</tr>
<tr>
<td>Devonport</td>
<td>2nd part</td>
<td>50,000</td>
</tr>
<tr>
<td>total</td>
<td></td>
<td>488,000</td>
</tr>
</tbody>
</table>

Estimated cost £3,250,000 to £3,750,000.

The probable stages of completion were anticipated to be;
1 10%, (Rosyth) about December 1939
2 16.5% by the of the financial year 1940
3 50% by the of the financial year 1941
4 100% by the of the financial year 1942

(Source: CID paper 1300-B, 15/2/1937. CAB4/25)
**Public Record Office Kew**

**Admiralty Papers**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADM</td>
<td>Correspondence</td>
</tr>
<tr>
<td>7</td>
<td>Miscellanea</td>
</tr>
<tr>
<td>53</td>
<td>Ships' Logs</td>
</tr>
<tr>
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**Board of Trade**

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Records inherited by the National Coal Board
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Colonial Office
CO 537 General correspondence

Department of Scientific and Industrial Research
DSIR 8 Fuel Research Board minutes, papers and annual reports 1915-61

Foreign Office
FO 371 General correspondence 1906-66

Ministry of Munitions
MUN 4 Records of the central registry 1909-37
5 Munitions Council Historical Records Branch 1901-43

Ministry of Power
POWE 16 Coal division correspondence and papers 1896-53
33 Ministry of Technology petroleum division and predecessors correspondence and papers 1901-1971

Ministry of Transport
MT 23 Admiralty Transport Department correspondence and papers 1795-1917
25 Ministry of Shipping 1917-1921 correspondence and papers 1914-38
40 Sea Transport correspondence and papers 1903-79

Records of the railway companies
RAIL 226 Great Central Railway Company 1852-1958
1057 Miscellaneous paper and records 1836-1973
1135 Rules and regulations and general instructions to staff

Treasury papers
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5 Letters out to Admiralty 1849-1920
108 Subject registers 1830-1920
160 Finance Department registered files (F series) 1887-1948
161 Supply Department registered files (S series) 1905-61

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National Archives and Records Administration (NARA), Washington DC, United States

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RG  38  Office of Naval Operations
     45  Office of Naval Intelligence
     80  General Records of the Department of the Navy

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William C. Bridgeman, 1st Viscount Bridgeman,
Churchill College Cambridge  BGMN

Sir Winston S. Churchill
Churchill College Cambridge  CHAR

Vice-Admiral Kenneth G. B. Dewar
National Maritime Museum Greenwich DEW

Captain Arthur Duckworth
Imperial War Museum

Admiral Lord Fisher of Kilverstone
Churchill College Cambridge  FISR

Sir Eric Geddes
PRO ADM116/1804-10

Sir Maurice P. A. Hankey, 1st Baron Hankey
Churchill College Cambridge  HNKY

Walter H. Long, 1st Viscount Long
PRO ADM 116/3623

Admiral Sir William H. May
National Maritime Museum Greenwich MAY

Admiral Sir Archibald B. Milne, 2nd Baronet.
National Maritime Museum Greenwich MLN

Admiral Sir William C. Pakenham
National Maritime Museum Greenwich MS

Captain Stephen W. Roskill
Churchill College Cambridge  ROSK

Admiral Sir Edmund J. W. Slade
National Maritime Museum Greenwich MRF

Sir E. H. W. Tennyson D'Eyncourt
National Maritime Museum Greenwich DEY

Admiral Rosslyn E. Wemyss, Baron
Wester Wemyss

Arnold H. White
National Maritime Museum Greenwich WHI

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