GROUPE EUROTUNNEL S.A. / SEAFRANCE S.A. MERGER INQUIRY REMITTAL

GROUPE EUROTUNNEL S.A. SUBMISSION REGARDING MATERIAL CHANGE IN CIRCUMSTANCES

SUMMARY

- Since the publication of the 2013 Report, a number of significant developments on the Short Sea have occurred, each of which undermines the CMA's SLC analysis contained in its 2013 Report
- The most significant of these concerns the certain introduction from 1 January 2015 of new environmental regulations which are widely expected to result in a 6-16% shift of North Sea and Western Channel traffic to the Short Sea
- Other significant developments relating to both the market as a whole include:
  - much higher than anticipated volume growth on the Short Sea market; and
  - evidence of continued and sustainable economic growth in the UK and Europe
- Significant developments relating to individual market players include:
  - DFDS remaining on the Dover-Calais route (despite previous threats to the contrary) and significantly increasing its freight market share to 24% for 2013; and
  - material declines in both P&O's and Eurotunnel's freight market shares for the same period
- GET considers that these developments, both individually and together, mean that the CMA should revisit the SLC analysis in its 2013 Report
- GET also considers that the factors are sufficient to require the CMA, pursuant to s41(3) Enterprise Act 2002, to consider adopting fundamentally different, and less draconian, remedies than those imposed in the CMA's 2013 Report
- GET has therefore set out alternative remedies, which it considers to be more proportionate to address any concerns that the CMA might have

1. INTRODUCTION

Context of submission

1.1 On 6 June 2013 the Competition Commission[1] (the '**CMA**') published its report into the completed acquisition by Groupe Eurotunnel S.A. ('**GET**') of certain assets of former SeaFrance S.A. (the '**Transaction**') (the '**2013 Report**'). The 2013 Report concluded that the Transaction might be expected to result in a substantial lessening of competition ('**SLC**') in the Short Sea freight and passenger markets. Consequently, the 2013 Report announced that certain measures were required of GET and MyFerryLink ('**MFL**') in order to remedy this perceived SLC.

1.2 Since the publication of the 2013 Report, there have been a number of significant developments on or relating to the Short Sea market, each of which not only undermines the SLC analysis contained in the CMA's 2013 Report, but also renders the remedies proposed therein unnecessary and disproportionate. These developments relate to both the market as a whole, and to the performance of individual market players.

1.3 In its letter dated 13 January 2014 to the CMA on the conduct of the remittal, GET stated, "*if the CC decides that a relevant merger situation has been created, that interested third parties should be able to make submissions on the Provisional Findings as to the impact of any material changes in circumstance since the CC's report of 6 June 2013 both on considerations relevant to whether a finding of a substantial lessening of competition on the basis of the relevant statutory test ("SLC") can be made and on considerations of what (if any) remedies should be imposed to address that SLC finding.*"

1.4 Given the provisional findings on the issue of enterprise published by the CMA on 21 March 2014, GET considers that the CMA should revisit the SLC analysis in its 2013 Report. Section 35(1)(a) of the Enterprise Act 2002 (the '**Act**') states that on a reference of a completed merger under section 22 the CMA must decide "*whether a relevant merger situation has been created, and if so, whether the creation of that situation has resulted, or may be expected to result, in a substantial lessening of competition within any market or markets in the United Kingdom for goods or services.*"

1.5 Given that the CMA has now reached a provisional finding that a relevant merger situation has been created, it should address the second question of whether an SLC may **now** be expected to result. GET submits, as it did previously, that the CMA cannot simply now readopt its SLC findings from the 2013 Report but must reach a **new** decision on whether an SLC will result from the Transaction. In line with its previous submission, GET considers that section 35(1) means the CMA should therefore consider now whether its previous findings on SLC can still stand, taking account of "*the impact of any material changes in circumstance since the CC's report of 6 June 2013",*

1.6 Further, section 41(3) of the Act requires the CMA to consider if the remedies it proposed in the 2013 Report are still appropriate and if "*there has been a material change in circumstances since the preparation of the report or the Commission otherwise has a special reason for deciding differently*". GET therefore considers that the CMA cannot now properly decide the question of remedies without considering whether a material change in circumstances since the 2013 Report, or special reasons, mean that there has been a change in the nature or extent of any SLC that the remedies must address. In addition, the remedies themselves must be reconsidered in the light of whether there has been a material change in circumstances since the 2013 Report, or to take account of any special reasons that

[1] For convenience's sake, all references in this submission are to the Competition and Markets Authority regardless of whether they relate to events before or after 1 April 2014, rather than distinguishing between it and the Competition Commission

may exist. GET considers that the changes in circumstances detailed in this document are certainly material enough to require, pursuant to section 41(3) of the Act, fundamental changes to the CMA's previous SLC findings and to whether any (and if so what) remedies should be imposed. In addition, GET considers that the changes described in this submission would also be sufficient to constitute a 'special reason' for materially changing the SLC finding and remedies previously adopted by the CMA.

1.7 Given the above, the remedies imposed by the CMA in the 2013 Report are, in GET's opinion, unnecessary and disproportionate and it is therefore necessary to revisit the question of appropriate remedies to be imposed. The remedies which GET would propose instead of those adopted by the CMA in its 2013 Report are outlined at section 12, and discussed in more detail at **Annex 2** below.

Specific material changes in circumstances

1.8 A very significant market development since the 2013 Report concerns the introduction from 1 January 2015 of new environmental regulations which are widely expected to result in increased prices for cross-Channel operators (and therefore for their customers)[2]. The highest increases will be seen on North Sea and Western Channel routes, which are longer than Short Sea routes. A very detailed independent expert study anticipates that there will be a material (6-16%) shift in customers from these routes to the Short Sea, thus considerably boosting the Short Sea market.

1.9 Other very important developments which also have the effect of increasing the Short Sea market are as follows:

1.9.1 Much higher than anticipated volume growth on the Short Sea market since the CMA's 2013 Report; and

1.9.2 Evidence of continued and sustainable economic growth in the UK and Europe, at much higher rates than anticipated at the time of the 2013 Report.

1.10 **All of these factors indicate that the size and value of the Short Sea market is set to grow over the coming years at much higher rates than anticipated at the time of the 2013 Report.**

1.11 In addition, GET notes that the performance and positioning of the operators on the Short Sea has changed considerably since the publication of the 2013 Report. In particular:

1.11.1 DFDS has remained on the Dover-Calais route (despite earlier protestations that it would depart as early as October 2013) and has significantly increased its freight market share on the Short Sea (increasing 5% from 19% for 2012 to 24% for 2013);

1.11.2 P&O's and Eurotunnel's freight market shares meanwhile have both materially declined during this period, P&O's freight market share decreasing over 7% to 28.7% for 2013, and Eurotunnel's decreasing almost 5% to 38.2%.

1.12 These results therefore place DFDS in a very strong position on the Short Sea, as a very close competitor to P&O. This seriously undermines DFDS' assertions at the time of the 2013 Report that it would exit at least the Dover-Calais route if MFL continued operating.

[2] At the time of the 2013 Report it had been widely anticipated that these environmental regulations would either not be implemented at all, or would be implemented in a materially different format or on a much longer timescale. It has only become apparent since the 2013 Report that these regulations would come into force in the same format and on 1 January 2015.

1.13 GET considers that these factors, as explained in detail below in this document, undermine the CMA's conclusions on the likelihood of an SLC occurring as a result of the Transaction to such a great extent that the CMA's findings on this point should not be allowed to stand and a fresh analysis should be undertaken by the CMA. Even if the CMA elects not to do this, GET considers that the factors are sufficient to require the CMA, pursuant to s41(3) of the Act, to consider adopting different, less draconian, remedies.

1.14 GET notes that, in assessing whether there has been a material change in circumstances since the preparation of the CMA's 2013 Report, the CMA must take into account the cumulative impact of all of the factors, as well as reviewing each individual factor in its own right.

2. SHORT SEA MARKET: MUCH HIGHER THAN ANTICIPATED ECONOMIC GROWTH AND VOLUME SINCE JUNE 2013

2.1 One of the central tenets underpinning the CMA's conclusions on the likelihood of a SLC occurring was that there was insufficient traffic on the Short Sea to support three ferry operators, plus Eurotunnel. GET disputed this finding at the time, citing significant future market growth as one of the principal reasons for this view. The CMA rejected GET's arguments however, taking the view that there was excess capacity on the Short Sea market up to the level of between two and three vessels[3]. The CMA also decided to reject GET's market growth forecasts, which decision has subsequently been shown to be wrong.

2.2 The evidence now available bears out GET's contentions during the initial inquiry. The market growth anticipated by GET over 2013 is very much in evidence in the operators' financial results for the same period, and this growth is widely predicted to continue into 2014 and beyond. Both freight and passenger volumes on the Short Sea have grown well ahead of forecasts. Both GET and DFDS, in their respective Annual Reports for 2013, noted that the Short Sea market had grown by 4.7% during 2013 for freight, and by 2.8% for cars. GET also noted that the Short Sea market for coach had increased by 8%. These figures are substantially higher than the growth predicted for this period by the CMA (which was 2% growth in the freight market and no growth in the passenger market)[4]. The freight figure is key, as this market was the focus of the CMA's objections in the 2013 Report.

2.3 In addition, GET notes in its 2013 Annual Report that the Short Sea freight transport market is still estimated to be 5% behind its 2007 (i.e. pre-recession) levels, meaning that there remains considerable room for organic growth in the immediate future.

2.4 An article published in Lloyds List on 10 March 2014 indicates that the number of commercial vehicle units being handled by the Port of Dover increased by 12% in 2013 compared to 2012 figures. This article, which is attached as **Appendix 1**, also provides freight market shares for the four Short Sea operators. These show Eurotunnel with a 39% market share, P&O with 26%, DFDS close behind with 25% and MFL in last place with 10%. The author of the article, UK Managing Director of logistics provider Dachser, notes that there is "*a very competitive situation on the Channel, and long may that continue*".

2.5 MFL's freight market shares are now stabilising, as are those of DFDS. The changes to operators' market shares that have already occurred since the 2013 Report, and the implications of these for ferry companies' future market shares, are of sufficient scale as to be material. This evidence therefore clearly indicates that the Short Sea market is, and will remain, capable of supporting three operators, fundamentally undermining the CMA's contrary findings in the 2013 Report.

[3] See Appendix E of the 2013 Report
[4] Ibid.

3. SHORT SEA MARKET: CONTINUED AND SUSTAINABLE GROWTH PREDICTED IN THE UK AND EUROPE

3.1 On a wider scale, there are strong signs of continued and sustainable economic growth in Europe in general, and the UK in particular, at rates higher than those anticipated in the 2013 Report. Indeed, there are signs that UK economic growth rates may exceed even the recent robust growth. The most recent figures published by the Office for Budget Responsibility estimate that UK GDP growth will increase by 2.7% during 2014, a significant increase on GDP growth in 2013, which was 1.8%[5]. This estimate is also 0.3% ahead of previous OBR forecasts for 2014, which put 2014 GDP growth at 2.4%. The impact of the improving GDP growth on travel and trade between the UK and France, including on the Short Sea, is considerable, and provides yet another cogent reason why the Short Sea market can be expected to continue to grow at a swift and sustainable pace, and at a materially faster (and more sustained) rate than that anticipated in the 2013 Report.

4. SHORT SEA MARKET: IMPACT OF INTRODUCTION OF REGULATIONS ENFORCING ANNEX VI OF MARPOL

4.1 As noted above, this is an extremely significant development since the publication of the 2013 Report. It now appears that MARPOL will lead to the most important changes in the entire European shipping industry seen in recent years.

4.2 MARPOL is the International Convention for the Prevention of Pollution from Ships 1973, as modified by the Protocol of 1978. Annex VI of MARPOL, which came into force in May 2005, set a cap of 1.5% on the sulphur content of marine fuel in certain Sulphur Emissions Control Areas ('**SECA**'s), which comprise the Baltic Sea, the North Sea and the English Channel. The Short Sea is therefore included in the SECAs, as are the neighbouring North Sea and Western Channel. In 2008, Annex VI was amended to specify, within the SECAs, a reduction of sulphur content to 1% from 1 July 2010 and then a further reduction to 0.1% from 1 January 2015.

4.3 Therefore, as from 1 January 2015, regulations will come into force under the revised MARPOL Annex VI, imposing new lower limits of emissions of air pollutants (including sulphur oxides and nitrous oxides) in ships' exhaust gases (the '**MARPOL Regulations**'). This means that vessel operators in Europe will need to ensure that their vessels do not exceed the new limits by the time the regulations become effective on 1 January 2015.

4.4 In order to do this, EU ship operators can choose from three options: (a) to convert the scrubbing systems onboard the chimneys of each vessel; (b) to put in place equipment which allows the ships to run on LNG fuel; or (c) to switch to a lower sulphur fuel. This lower sulphur fuel is 35-45% more expensive than the fuel generally used by ships in the EU at the current time[6].

4.5 According to an independent expert report (the '**MARPOL Report**') compiled by the UK Chamber of Shipping and Amec Environment & Infrastructure UK Limited entitled *Impact on Jobs and the Economy of Meeting the Requirements of MARPOL Annex VI*, published in March 2013, option (b) was found to be unsuitable in practice for many vessels operating to and from the UK given their age and configuration. The MARPOL Report noted that, whilst there was some potential for new ships to take up this option, "*the limited availability of bunkering facilities, space at port and fuel infrastructure*

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[5] See OBR's Economic and Fiscal Outlook – March 2014: http://budgetresponsibility.org.uk/economic-fiscal-outlook-march-2014

[6] DFDS notes in its 2013 Annual Report that it is 40-50% more expensive (page 34).

[rendered] this option unviable for the foreseeable future"[7]. A copy of the MARPOL Report is included at **Appendix 4**.

4.6 As concerns option (a), the MARPOL Report also showed that, while scrubbing systems had "*the potential to be a viable technology in the future*", a "*review of the current state of development, and operators' direct experience of trialling systems [did] not provide sufficient confidence that the investments required would result in the emission reductions required to ensure compliance*". The MARPOL Report concluded that: "*[g]iven the technical and practical unavailability of LNG and scrubbers in the immediate future the only viable means of meeting the requirements of MARPOL Annex VI [was] through switching to lower sulphur fuel*". Similar reports on the effect of the MARPOL Regulations have also been carried out on other European shipping markets (for example by MDS Transmodal Limited on the impact on the Scotland-Continent ferry service (April 2013)[8].

4.7 In line with these findings, the vast majority of ship operators have chosen not to convert their vessels, nor to put in place equipment to enable use of LNG fuel, but instead to purchase the more expensive, lower-sulphur fuel. This means that, from 1 January 2015, the fuel costs for EU ship operators will be 35-45% higher by GET's estimations[9]. Therefore, ferry operators operating longer routes, such as on the Western Channel and the North Sea, will be more severely impacted than operators on shorter routes such as the Short Sea, as they use considerably more fuel per crossing.

4.8 Ferry operators within the EU have indicated that they are intending to pass the increased cost of fuel on to their customers, meaning that the prices charged by ferry operators on the North Sea and Western Channel will increase considerably more than those operating shorter sea crossings, in order to cover the increased fuel costs. It has been estimated that, if all of the cost is passed on to customers, the price of a freight crossing will increase by 8-29% on the Western Channel routes, and by 5-21% on the North Sea routes[10]. An increase of £6 is expected for a freight journey on the Dover-Calais route, although GET estimates that this will be closer to [✂].

4.9 As a result, the Western Channel and North Sea routes are likely to become less attractive (or potentially even economically unviable) for a number of freight customers. By contrast, the Short Sea (which will see comparatively smaller price increases as a result of the MARPOL Regulations due to its shorter crossings) is likely to be much more attractive to freight customers. It is widely expected that the volume of freight traffic on the Short Sea will increase at the expense of, for example, the Western Channel and the North Sea routes. This trend is expected to be especially pronounced on the shortest route, Dover-Calais.

4.10 There is therefore an increased likelihood, over and above any organic market growth, that the Dover-Calais route will be able comfortably to sustain three ferry operators plus Eurotunnel in the long term, thus making it even more unlikely that DFDS will exit the Dover-Calais route. This logic is particularly strong, given that this is the route set to benefit most from the MARPOL Regulations.

4.11 The impact of the MARPOL Regulations should not be underestimated. There are three items of expenditure for ferry operators, which together make up the vast majority of an operator's outgoings. These are (a) fuel; (b) staff; and (c) taxes and duties. Typically, fuel will be the most significant of these, constituting approximately one-third of a ferry operator's fixed costs. A 35-45% increase in fuel will therefore have a very significant impact on ferry operators' operating costs and business model.

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[7] See report by UK Chamber of Shipping and Amec Environment & Infrastructure UK Limited entitled *Impact on Jobs and the Economy of Meeting the Requirements of MARPOL Annex VI*, published in March 2013 (Executive Summary, page iv)

[8] http://www.mdst.co.uk/attachments/downloads/MDST%20paper%20on%20Impact%20of%20the%20SECA%20on%20the%20Scotland-Continent%20ferry%20service%20(STAR%20Conference,%2017%20April%202013).pdf

[9] DFDS estimates that these costs will be 40-50% higher (see DFDS Annual Report 2013, page 34)

[10] UK Chamber of Shipping report, Ibid.

4.12 The impact on ferry operators is evident from Brittany Ferries' submission to the UK Parliamentary Transport Committee in October 2011 where the company stated that: "*Because of our longer routes, which unavoidably use more fuel, our passenger fares and freight rates are already significantly higher than those on the Dover Straits. We are, consequently, relatively more sensitive to fuel prices so these increases would make us uncompetitive...This will result, at the very least, in a reduction in frequency of services and the closure of routes and, at the worst, a cessation of business*." The full document is attached as **Appendix 2**.

4.13 The introduction of the MARPOL Regulations has been discussed previously by market participants and commentators (for example through submissions such as that by Brittany Ferries noted at paragraph 4.12 above). However, until recently it was widely anticipated that the MARPOL Regulations' implementation would either be postponed or scrapped entirely. The uncertainty surrounding the MARPOL Regulations during the initial inquiry was communicated to both the Office of Fair Trading ('**OFT**') and the CMA at several points by GET. For example, in its Response to the OFT's information request of 29 August 2012 GET noted that the MARPOL Regulations were subject to "*considerable debate and lobbying*"[11] whilst in its Response to the Financial Questionnaire Response (3 December 2012), GET noted that the MARPOL Regulations were "*currently in discussion*"[12]. At the time of the 2013 Report there was such uncertainty about whether the MARPOL Regulations would be implemented that the issue is not even referred to by the CMA in the 2013 Report or its appendices.

4.14 It is only in the past year that it has become certain that the MARPOL Regulations will come into force as planned on 1 January 2015, and therefore only very recently that ferry operators have seriously begun to address the issue. Illustrative of this is the fact that DFDS dedicates almost a whole page of its 2013 Annual Report (a copy of which is provided at **Appendix 5**) to a discussion of the impact of the MARPOL Regulations, written by DFDS CEO and President Niels Smedegaard, whilst in its 2012 Annual Report there was no mention of them at all. In addition, DFDS has engaged greatly in recent times with the implications of the MARPOL Regulations, with Poul Woodall, DFDS Director for Sustainability & Environment and Sean Potter, Managing Director of DFDS Seaways PLC, hosting a seminar on 5 March 2014 (attended by over 60 DFDS employees) to discuss the impact of the MARPOL Regulations on the Northern European shipping industry. GET has no information about what was discussed, but notes that the UK Chamber of Shipping/AMEC Report referred to above considered that the impact would be significant on the Short Sea market.

5. IMPACT OF MARPOL AND HIGHER THAN PROJECTED MARKET GROWTH: ECONOMIC ANALYSIS

5.1 GET considers that the factors listed at paragraphs 2, 3 and 4 above, if considered individually but even more so when taken together, will have such a material impact on the volume of freight traffic on the Short Sea as to merit a complete reassessment by the CMA of its SLC analysis. Even if the CMA elects not do so, GET considers that these factors' impact is certainly material enough to necessitate a fresh consideration by the CMA of appropriate remedies.

5.2 RBB Economics has assessed the likely impact on the volume of freight traffic on the Short Sea as a result of the higher than expected rates of economic growth and the newly emerged certainty about the introduction on 1 January 2015 of the MARPOL Regulations. It is important to note that both of these factors are new considerations that have occurred since, and were not considered in, the 2013 Report.

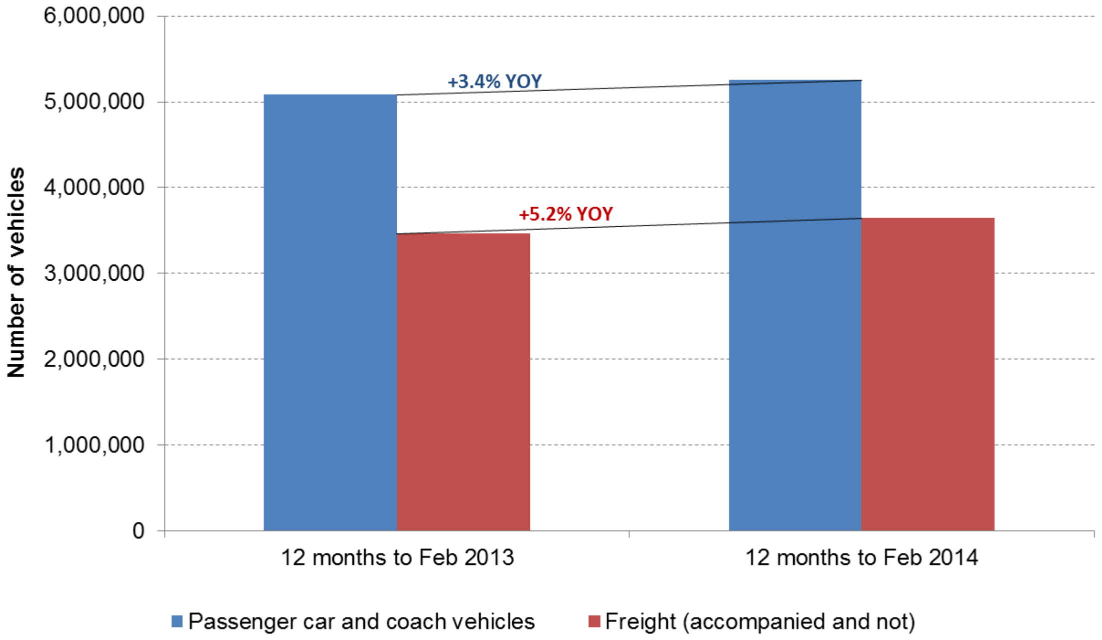
Demand impact: increase in organic demand growth

[11] See para 20.2, GET Response to the OFT's information request of 29 August 2012
[12] See Q3, GET Financial Questionnaire Response

5.3 The available data on freight and passenger traffic since the 2013 Report was issued indicate that the demand growth has substantially exceeded the demand projections made by the CMA at the time of the 2013 Report.

5.4 **Annex 3** sets out the freight and passenger numbers on the Short Sea, and on the Dover-Calais route in particular, as published by Ferrystat and Freightstat, from January 2013 until February 2014. Contrary to the assumptions in the 2013 Report, where the CMA assumed that freight demand would grow by only 2-3% per annum, while there would be no increase in passenger demand, the available data indicate that year on year growth in the twelve months to 2014, relative to the previous twelve month period, of 5.2% for freight, and 3.4% for passenger vehicles. Ferrystat's reported increase in demand by passenger numbers was even higher than by vehicle numbers, at 5.1% year-on-year.

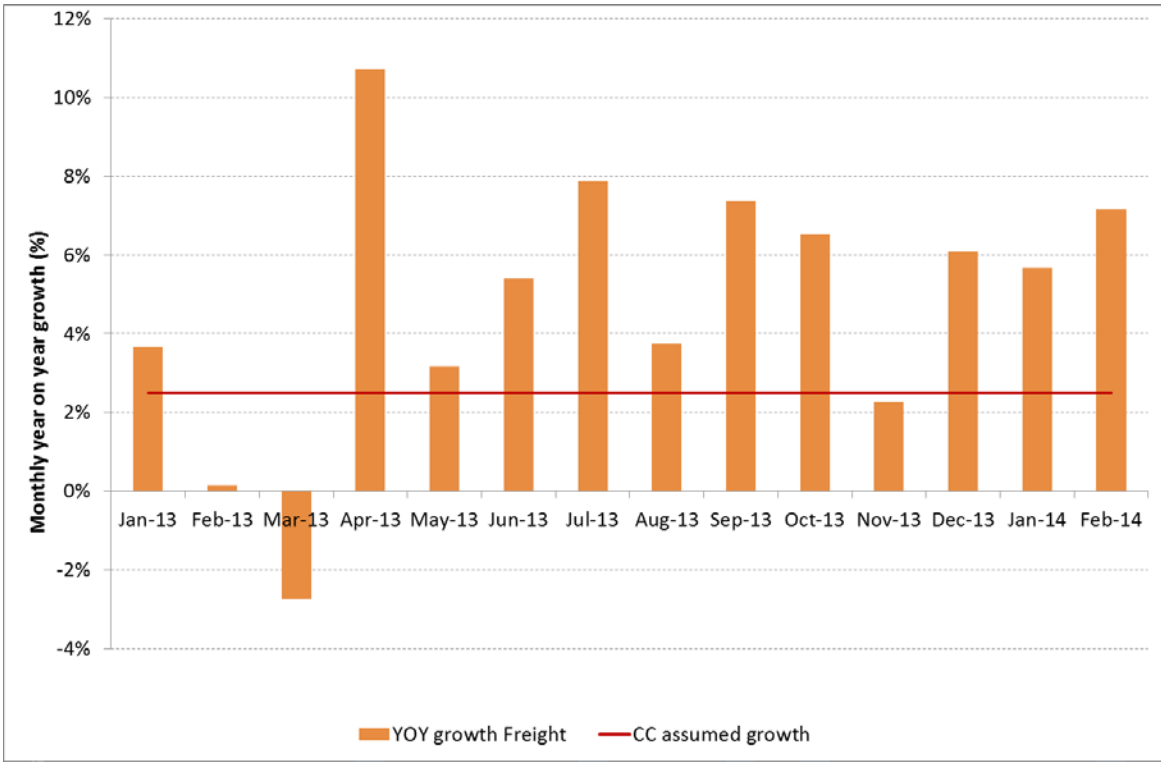
Figure 1: Year on year increase in Short Sea demand, passenger and freight vehicles, YTE Feb 2014 vs YTE Feb 2013



Source: Ferrystat, Freightstat

5.5 For freight, in all but one of the months since the CMA's 2013 Report was published, the year on year growth compared to the same month in 2012 was substantially in excess of the CMA's assumptions, and has in the past quarter been consistently above 5%. (See Figure 2 below) For passengers also, there has been a clear uptake in demand, while in August 2013 alone, the traffic was 14% higher than in August 2012.

Figure 2: Monthly year on year increase in Short Sea demand, freight vehicles, Jan 2013 – Feb 2014

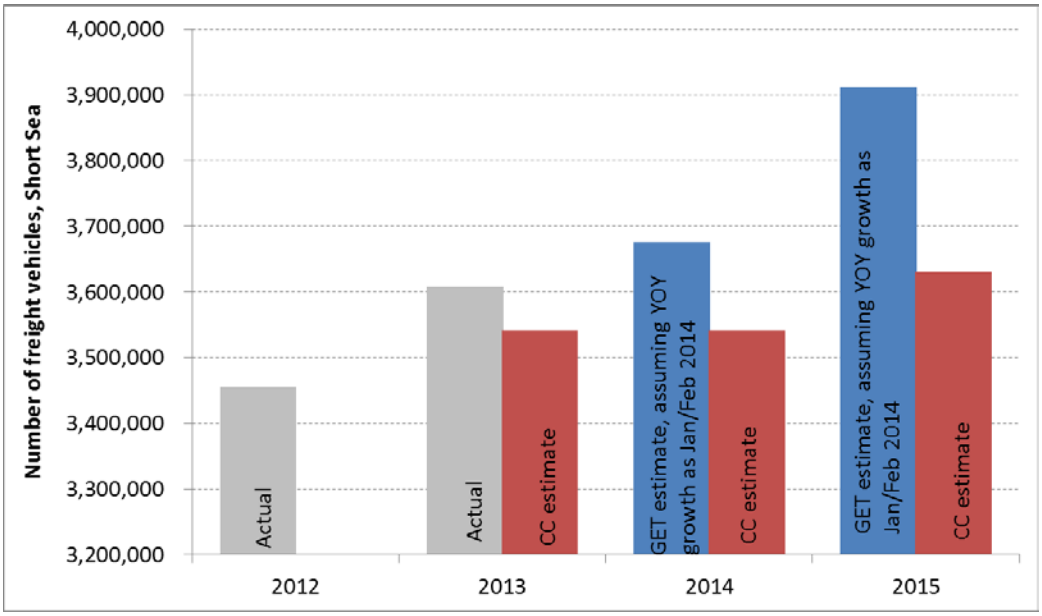


Source: Freightstat, Data includes accompanied and accompanied vehicles

5.6 If the increase in demand for freight in 2014 continues as has been indicated in the first two months of the year – and wider macroeconomic indicators of continued economic recovery would support such a proposition – the growth in demand on the Short Sea in 2014 will be even stronger than in 2013; at a year on year growth rate of 6.4%. On this basis, the market size by 2014 would be 5.8% higher than would have been expected under the CMA's own estimates, and 11.1% higher than the market size in 2012 (relative to which the CMA had made much of its determination).

5.7 Similar continued freight growth for 2015 would imply that in 2015 total Short Sea freight demand would be 9.8% higher than the CMA had estimated, and 18.3% than in 2012.

Figure 3: Updated forecasts of freight demand growth



5.8 Furthermore, annual growth in the number of passenger cars and coaches of even 2.5% (which is lower than both the annual growth in 2013 and in the first two months of 2014) would further act to produce substantial further "room" in the market, relative to what the CMA had anticipated.

Demand impact of the MARPOL Regulations

5.9 Over and above the demand increases due to the economic recovery witnessed to date, as of 1 January 2015, the implementation of the MARPOL Regulations can be expected to further affect demand for Short Sea crossings, in particular since GET understands that most operators have not, and are unlikely to in the short to medium term, convert their systems to LNG or scrubbers, instead opting to use more expensive low sulphur fuel in their ferries.

5.10 The primary impact of the MARPOL Regulations as set out in third party documents, including the MARPOL Report referred to previously, is expected to be a shift away from longer sea routes towards shorter crossings, to reflect the relative increase in price that these routes (which are reliant on substantially more fuel) will be expected to face. According to the MARPOL Report, it is expected that the MARPOL Regulations will, all else equal, give rise to a **modal shift from Western Channel and the North Sea to the Short Sea equal to between 6% and 16% of all freight traffic on the North Sea and Western Channel routes**.

5.11 Based on the fact that the Western Channel and the North Sea accounted for approximately 21% freight on the Short Sea[13], and even assuming no subsequent growth in traffic on these routes, such a shift would represent an increase in the growth of freight on the Short Sea of **1.6% to 4.3%, over and above any other increases in demand**.

5.12 It is of course the case that the impact of the MARPOL Regulations may not be equal across all of the Short Sea routes and operators, and may depend on: (i) the relative benefits to Dover-Calais of being a shorter crossing than Dover-Dunkirk, and therefore facing a lower cost impact of the MARPOL Regulations, which are also likely to give

[13] Based on estimates in the MARPOL Report, table 3.5

rise to diversion between routes on the Short Sea; (ii) the origin and destination of freight traffic, which will determine the extent to which diversion from the North Sea and Western Channel will benefit different routes; and (iii) the relative benefit to Eurotunnel of attracting more passengers as a result of the fact that it will not face a cost increase due to the MARPOL Regulations, set against the capacity constraints that Eurotunnel is likely to face at least in the short to medium term, in accommodating more traffic. However, while it is difficult to model precisely these effects, it is clear from third party reports that the predominant effect can be expected to be an increase in Short Sea demand.

5.13 Furthermore, while the MARPOL Report has focussed on the impact in the freight sector, it may also be expected that some modal shift would arise from passengers using cars and coaches to shift from longer to shorter crossings of the Short Sea. Even if this is notably more limited in its overall impact than the demand increase in freight, it would add to increasing the overall market growth further.

Effect of projected demand growth on sustainability of three operators on Dover-Calais

5.14 The impacts both of the higher organic demand growth than predicted by the CMA, and of the likely effects of the MARPOL Regulations, give rise to a substantial change in circumstances relative to the information available when the CMA's 2013 Report was published.

5.15 Combined, the impacts of demand growth and the MARPOL Regulations indicate an increase in freight traffic on the Short Sea of between 11.6% and 14.5%, relative to the forecast made by the CMA for 2015, and of between 20.2% and 23.3% relative to the freight traffic observed in 2012. This level of growth is almost double the CMA's assumptions that "*over a period of four to five years, this level of growth would potentially add volume to the short sea freight market that would be equivalent to a 10 to 13 per cent share of the freight market in today's terms*".[14] Moreover, it is expected in a shorter timeframe, by 2015.

5.16 Furthermore, rather than demand staying flat for passenger transport, best indications of 2015 traffic indicate an uplift of 8.8%, if no effect as a result of the MARPOL Regulations is assumed, up to 12%, were the MARPOL Regulations to lead to a 3% passenger uplift on the Short Sea routes.

Table 1: GET Traffic Projections compared to the CMA's projections

	2013	2014	2015	2015 with low MARPOL freight modal switch	2015 with high MARPOL freight modal switch
Total short sea demand (000 trucks/cars)					
Freight Traffic	3,609	3,840	4,086	4,151	4,260
Passenger Traffic	5,084	5,228	5,376	5,430	5,538
Additional Traffic in excess of CMA forecast					
Freight Traffic	1.9%	5.8%	9.8%	11.6%	14.5%
Passenger Traffic	2.8%	5.8%	8.8%	9.8%	12.0%
Additional traffic in excess of 2012 demand					
Freight Traffic	4.5%	11.1%	18.3%	20.2%	23.3%
Passenger Traffic	2.8%	5.8%	8.8%	9.8%	12.0%

[14] CMA 2013 Report, 8.48

5.17 These demand additions substantially change the CMA's analysis regarding the viability of retaining three ferry operators on the Dover-Calais route in particular. Even as a simple estimate, the potential additional volume from market growth, relative to that assumed in the 2013 Report is almost doubled.

5.18 The fact that this would increase the viability of all of the operators is indeed clear from reviewing the implied capacity utilisation of the operators, were they to retain their current crossings on the Short Sea.

5.19 Noting the difficulties in estimating comparable demand across operators, GET has nevertheless in **Annex 4** set out its best estimates of capacity utilisation across operators on the Short Sea. For Eurotunnel estimates of future capacity have been included in as consistent a methodology to the data for the ferries:[15] however, it should be noted that so doing gives rise to much higher capacity, and lower utilisation, than Eurotunnel considers applies in practice. In addition, such estimates of annual capacity inevitably ignore the very real constraints on capacity utilisation in peak times, which is an ever-increasing issue both for Eurotunnel and for the ferry operators.

5.20 Figures 4 and 5 below set out the capacity utilisation in 2013, based on GET's understanding of total capacity in 2013, and total traffic (both in lane metres) in the same time period. Similar capacity utilisation estimates are then estimated for 2014 and 2015, assuming annual demand increases in line with the freight and passenger demand growth observed in January and February 2014 (relative to the same months the previous year), and also taking into the account the modal shift effects from the MARPOL Regulations estimated in the MARPOL Report.

5.21 While GET is unable to fully replicate the CMA's analysis in Appendix E of its Final report (set out in Table 2 below), as it does not have access to other operators' data, on the basis of its best estimates, the load factors observed in 2013 appear to be substantially in excess of 49% estimated by the CMA.[16] As indicated in paragraph 5.22 below, however, overall short sea capacity in 2013 was in fact operating at 55.1% utilisation.

Table 2: Competition Commission estimates of average daily capacity utilisation, Short Sea

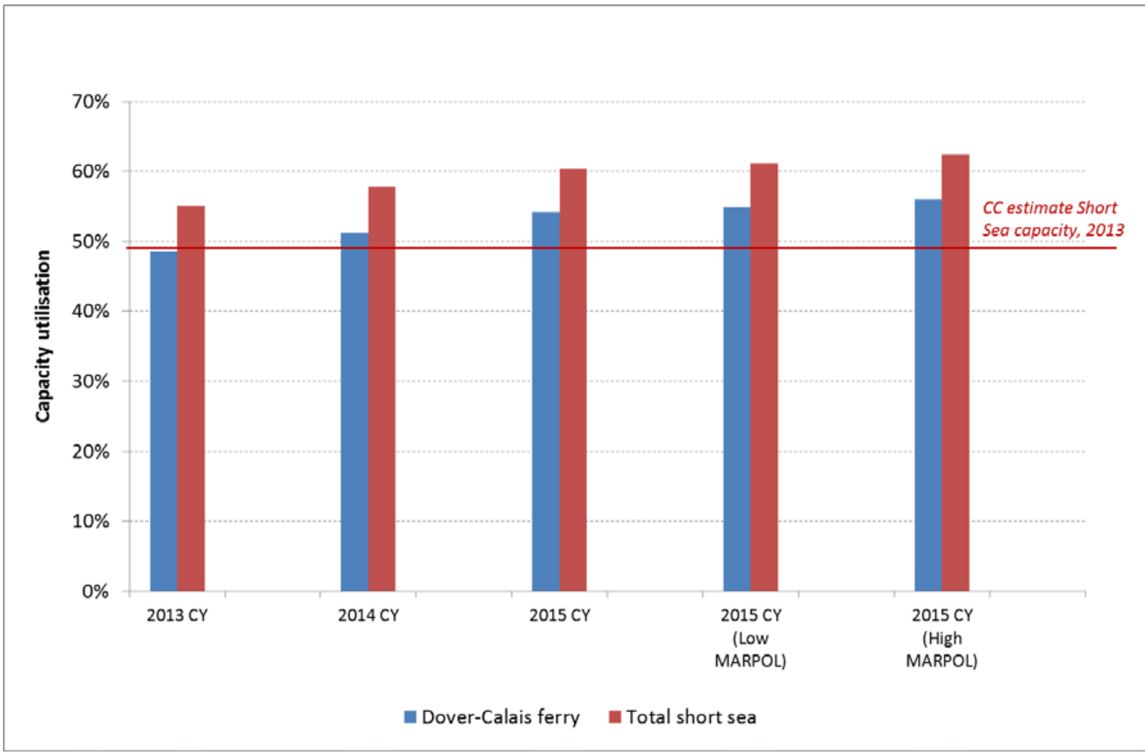
	2007	2008	2009	2010	2011	2012	2013
Short Sea capacity (lane meters)	374,489	346,483	361,013	344,463	342,604	349,569	388,214
Overall capacity utilisation	54	56	47	51	54	54	49

5.22 As a result, these data indicate that, already in 2013, there has been a substantial improvement in load factors, both on the Short Sea market as a whole, and in relation to the Dover-Calais ferry operators in particular. As Figure 4 highlights, even in 2013, the overall short sea capacity is operating at 55.1% utilisation, notably above the utilisation figures for 2010 or 2012. Furthermore, for the full year 2013, the capacity utilisation on Dover-Calais ferries was close to 50%.

[15] Please note that this is different to the approach set out in GET's response to the Provisional Findings during the CMA's first investigation: in particular, GET has adjusted the car length in line with more typical ferry estimates of 3.5 metres. Such an approach produces very similar estimates of Short Sea capacity for 2013 to those assumed by the CMA (excluding Newhaven Dieppe and Ramsgate-Ostend, 384,503 daily lane metre capacity versus 388,214 presented by the CMA.)

[16] 2013 Report, 8.45

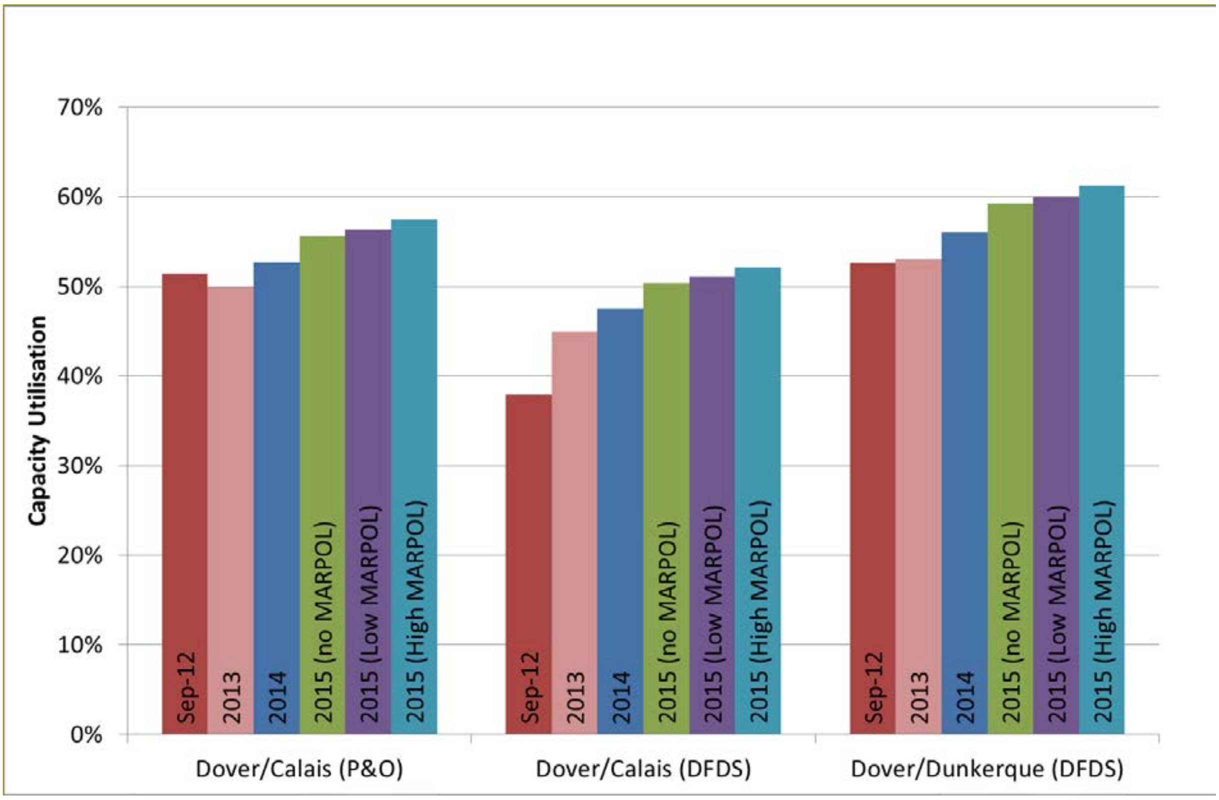
Figure 4: Capacity utilisation on the Short Sea, and for Dover-Calais maritime sector, 2013 actual and GET forecasts



Note: Data and methodology are set out in ***Annex 4***

5.23 In addition, there has been an improvement in the operating capacity of the individual operators on Dover-Calais, notably of DFDS and MFL. For example, the figure below provides an estimate of capacity utilisation by operator, relative to their capacity utilisation in September 2012, immediately following MFL's entry. The substantial increase in DFDS utilisation over this time period (alongside a decrease in utilisation of P&O and Eurotunnel) highlights the ever increasing viability of both DFDS and MFL as operators on Dover-Calais, as demand continues to grow.

Figure 5: Capacity utilisation on the Short Sea by operator, September 2012, 2013 actual and GET forecasts



Note: Data and methodology are set out in ***Annex 4***

5.24 This picture is moreover only expected to improve if demand continues to increase at this pace. Even absent the MARPOL Regulations, Dover-Calais maritime capacity could increase to almost 55%. The MARPOL Regulations would only add to improve to the viability of the current capacity on the Dover-Calais route.

5.25 It should also however be noted that these data assumed that Eurotunnel is able to accommodate further demand growth going forward. However, as GET has previously submitted, [✂] further help to increase the load factors, and hence the viability of three ferry operators on Dover-Calais. See paragraph 2 of Appendix 12 to GET's Initial Submission dated 19 November 2012 for more detail on this.

6. IMPROVED FINANCIAL PERFORMANCE OF DFDS

6.1 DFDS is clearly consolidating its position as Northern Europe's largest short sea shipping and logistics group. The results published in its 2013 Annual Report, as well as recent comments in the financial press, indicate that its financial performance on the Short Sea has improved and that it is set to continue that way. This is entirely logical, given that it will be anticipating a shift in traffic to shorter sea routes as a result of the MARPOL Regulations. DFDS' 2013 Annual Report quantifies its improvement on the Short Sea as a market share increase of 5% in the Short Sea freight market, up from 19% in 2012 to 24% in 2013. The most recent market share figures (for February 2014) record DFDS with a 22.1% share of this market[17].

[17] See page 20, DFDS 2013 Annual Report

6.2 In this context, the 2013 Report stated at paragraph 8.35 that, "*We therefore consider that a share of at least [5–15] per cent of passengers and [10–20] per cent of freight on the short sea is necessary for a Dover–Calais service to cover operating costs*". The CMA's 2013 Report indicated that this was an important consideration in its decision-making at the time. The Ferrystat Short Sea data indicate however that DFDS is in fact already extremely close to meeting both these thresholds, with shares of 9.84% and 5.82% for freight and passenger traffic respectively for the 2013 calendar year on the Dover-Calais route. If DFDS' performance on the Short Sea generally is taken into account it is even more obvious that these thresholds have been met. This is therefore commensurate with DFDS's commercial performance having improved, and of it achieving sufficient scale, in line with the 2013 Report, to cover its operating costs.

6.3 As concerns the future, the key message from its Annual Report, as noted in its press release announcing the same is that: "*DFDS is strongly positioned, both financially and strategically"* for 2014, that it "*will continue to work on creating synergies by expanding [its] European network through acquisitions*" and that "*streamlining will continue at full strength*". These messages are therefore at odds with any intention to exit the Dover-Calais route.

6.4 DFDS' positive outlook is also highlighted in an article published in the *Journal de Marine Marchand* on 28 February 2014. This article notes that the company "*compte développer ses lignes tant à Calais qu'à Dunkerque*" (English translation: "*plans to develop its Calais and its Dunkirk routes*"), and that it has decided to invest €12m to refurbish its cross-Channel terminal at Loon-Plage, Dunkirk, and its road access at the West Port. These are by no means the actions of a company that is struggling on the Short Sea. The article, entitled "*Après un exercice atypique, DFDS Seaways retrouve son rythme*" (English translation: "*After an atypical financial year, DFDS Seaways is finding its groove again*") is attached as **Appendix 3**.

6.5 In view of the above, GET considers that in deciding what (if any) remedies should be imposed the CMA must take proper account of DFDS' improved performance since the 2013 Report, acknowledging that any remedies must take account of the even greater uncertainty about whether there is any likelihood of DFDS' exiting the Dover-Calais route. In this context, GET considers that the greater clarity since the 2013 Report about the robustness of DFDS' financial performance means that the CMA should revisit the central tenet of its theory of harm that, without intervention by the CMA, DFDS is likely to exit the Dover-Calais route in the short to medium term.

7. EXPIRATION OF DFDS CHARTERPARTY OVER *MOLIÈRE*

7.1 The charterparty for one of the vessels DFDS used on the Short Sea, the *Molière*, expired in October 2013. It was comments that DFDS made during the initial merger inquiry regarding the expiry of this charterparty which caused the CMA to revise its views about the timing of DFDS' exit (changing the expected timing for exit from *'short to medium term*' to '*short term*').

7.2 However, given that October 2013 has now long passed and DFDS has not exited, nor shown any indication that it might do so, DFDS' claims during the initial inquiry appear to have been unfounded. Indeed, GET understands that the charterparty in question has been extended until November 2014, thus showing both DFDS' commitment to the Short Sea in seeking this extension, and its overstatement of the urgency and likelihood of its exit during the initial merger inquiry. GET understands that the *Molière* was sold to Stena Group. Although no information has been released regarding her future deployment, there have been rumours that she is going to be moved to the Black Sea.

7.3 To GET's knowledge, DFDS has not made any claims during the remittal process relating to any plans to exit the Short Sea in general, or the Dover-Calais route in particular. Presumably, this is because DFDS anticipates being able to procure a ready replacement for the *Molière,* because it cannot assume (even under the remedies previously adopted by the CMA) that GET will sell any of the Vessels to DFDS. This in turn undermines the CMA's claims in the revised provisional findings dated 21 March 2014 that "*there is a lack of alternative vessels which could operate the route at any one point in time*"[18]

7.4 If DFDS still maintains its claim that it will cease operating in the short term, if MFL continues operating, GET considers that DFDS should be required to release into a confidentiality ring all relevant internal documents. GET considers that such disclosure is necessary in order to be able to understand properly the gist of DFDS' claims in this respect, which is obviously fundamental to the issue of what (if any) remedies should be imposed on GET. Indeed, GET considers that this is made all the more imperative given that the "gist" provided to GET by the CMA during the initial inquiry relating to DFDS' erstwhile (unfounded) claims that it would exit the route in October 2013 has been shown to be so obviously inaccurate.

8. DECLINE IN P&O FREIGHT PERFORMANCE

8.1 P&O's freight share in 2013 decreased to 28.7% (from 36% in Q4 2012 as recorded by the CMA in its 2013 Report). As at February 2014, this share was 30%. It is obvious from the shift in market shares on the Short Sea generally that this decline in P&O's performance on the Short Sea is linked to the improvement in performance of DFDS (and MFL) during the same period. It also indicates an even greater likelihood of P&O rationalising its capacity on the Short Sea (an action which the CMA ruled out in its 2013 Report) than DFDS. The analysis in section 5 above would indicate strongly that, of all the ferry operators, P&O should (despite the CMA's comments at paragraph 8.51 of the 2013 Report) rationalise its capacity on the Short Sea.

8.2 If such P&O capacity rationalisation does not materialise, GET submits that this would only be because of the material expected market growth as a result of both MARPOL and general improvement in GDP growth, which means that there would be sufficient overall demand to sustain three ferry operators and Eurotunnel. Either way, GET considers that the change in P&O's market performance since the 2013 Report is another reason why the remedies previously adopted by the CMA are no longer appropriate.

9. DECLINE IN EUROTUNNEL FREIGHT PERFORMANCE

9.1 GET's 2013 Annual Report shows that, despite the Short Sea freight market increasing by an estimated 4.7% in 2013 compared to 2012, the number of trucks transported by Eurotunnel has reduced by 7% over the same period. Eurotunnel's share of the freight stood at 38.2% for 2013, compared with 42.9% for 2012. This is a reduction of almost 5%. In February 2014, the market share was slightly lower again, standing at 37.7%.

9.2 Therefore, MFL and DFDS appear to be gaining market share at the expense of P&O and Eurotunnel, rather than MFL gaining market share at the expense of DFDS. GET notes that this strengthening of MFL's market position has not occurred as a result of MFL charging aggressively low prices only made possible through subsidisation by Eurotunnel (as erroneously predicted by P&O); given the terms of the interim undertakings agreed between GET and the CMA during its initial inquiry, as well as those agreed by GET with the FCA), this would not have been feasible. MFL's success has been due to the quality of its customer offering, its sales success, general market growth and efficient operations.

10. DATA UNDERLYING SLC ANALYSIS IN THE CMA'S 2013 REPORT IS OUT-OF-DATE

[18] Revised provisional findings dated 21 March 2014 paragraph 3.141

10.1 In addition to the general points made above, GET has noted a significant number of data points in the CMA's 2013 Report which are, in light of market developments since its preparation, entirely out-of-date and thus inaccurate. These data points are listed below at **Annex 1**. In respect of each, the relevant paragraph in the 2013 Report is noted, along with a fuller description of the defects in the CMA's data. Up-to-date data is provided where available. It is GET's position that the volume of these data points, together with their centrality to the CMA's SLC reasoning, means that the CMA's economic analysis on SLC is sufficiently out-of-date as to (a) merit a revision of the CMA's entire SLC analysis, and (b) necessitate a consideration of alternative remedies as set out at **Annex 2**.

11. CUMULATIVE IMPACT

11.1 In assessing whether there has been a material change in circumstances, the CMA must take account of each factor in its own right but also their cumulative impact.

12. REMEDIES PROPOSED BY GET

12.1 It is evident that, since the publication of the CMA's 2013 Report on 6 June 2013, the market has, absent any of the remedies proposed by the CMA in its 2013 Report, grown and developed in such a way as to mean that three efficient ferry operators, plus Eurotunnel, can be sustainable on the Short Sea. This is despite the fact that MFL has been subject to a "Sword of Damocles" hanging above its head during this time in relation to its potential removal from the Short Sea. Therefore, even if the CMA decides not to revisit its SLC analysis, GET considers that the CMA must revise any remedies imposed on GET/MFL.

12.2 As noted above, the CMA is able, under section 41(3) of the Act, to implement new remedies if there has been a "*material change in circumstances since the preparation of the report or the Commission otherwise has a special reason for deciding differently*". Section 1.28 of the CMA's Guidelines on Merger Remedies mirrors this provision, but does not provide any further guidance as to what constitutes such "*material change in circumstances*" or "*special reason*". GET considers that the impact of the changes in circumstances detailed in this document is sufficiently material to necessitate a reconsideration of remedies by the CMA. In addition, GET considers that the changes would also be sufficient to constitute a 'special reason' as to why the CMA's previous remedies are no longer appropriate.

12.3 In this regard, GET draws the CMA's attention to the recent inquiry into the *Ecowaste/Stericycle* merger, and the resultant decision by the CMA that Ecowaste Southwest be divested by a specified date (the '**Divestment Decision'**). The CMA considered that, given the application by Stericycle's UK subsidiary SRCL Limited to the Competition Appeal Tribunal for review of the Divestment Decision, the timing of the stated divestment date would not be sufficient to ensure effective divestment under its Divestment Decision. Therefore it decided SRCL Limited's application for review amounted to a material change in circumstances for the purposes of section 41(3) of the Act, which justified an extension to the divestment date for Stericycle. Given that a period of 39 days was sufficient here to constitute a material change in circumstances under section 41(3) of the Act, GET considers that there are even more compelling arguments for finding there to have been a material change in circumstances in the immediate case, where both the time period has been much longer and there have been significant, and pertinent, market developments during this time (market growth and improvement in DFDS' performance), along with the emergence of fundamental market developments in the very near future (the MARPOL Regulations).

12.4 GET also notes parallels between the immediate case and a provisional decision by the OFT on 14 May 2013 not to instigate a market investigation into the personal banking market, due to "*a number of developments affecting the market in the coming months that may have a significant impact on competition in this market*". Whilst the context was obviously different, in that it concerned an OFT decision regarding whether or not to instigate a market investigation, and therefore did not engage section 41(3) of the Act, the principle that can be drawn from this example is that competition authorities should refrain from interfering with a market where there is evidence of future developments that may have a significant impact on competition in that market. Applying this logic to the immediate case, GET considers that the CMA should therefore, in devising any remedies on GET, if the SLC finding is upheld, take account of the fact that the Short Sea market is evolving significantly and quickly. Any remedies imposed on GET should therefore be temporary, proportionate and take account of imminent highly likely market changes (e.g. growth in Short Sea freight volumes as a result of the MARPOL Regulations and GDP growth). This means that the draconian and long-term structural remedies previously adopted by the CMA are no longer appropriate.

12.5 If the CMA does still deem it necessary to impose remedies, GET considers that the following would be appropriate to address any concerns that the CMA might have:

12.5.1 **Option 1**: Maintain the current FCA Hold Separate regime for an additional period in order to allow for the impact of the MARPOL Regulations and market growth to become evident (e.g. three years or until June 2017 to coincide with the expiry of the Inalienability Clause). At the end of this period, the CMA would then either automatically (or the CMA would have discretion as to whether to) open a market study into whether further action (i.e. a full market investigation reference) is needed in relation to the provision of ferry services on the Short Sea route

12.5.2 **Option 2**: Maintain the current, more stringent, UK-type of Hold Separate regime for the same further period, and with the same potential for a CMA market study, as outlined in Option 1.

12.5.3 **Option 3**: Temporarily suspend operating the *Nord Pas de Calais* from the Port of Dover.

12.6 GET notes the CMA's requirements, under section 35(4) of the Act, and as expanded in its Guidelines on Merger Remedies, to have regard to the need to achieve as comprehensive a solution as is reasonable and practicable to remedy the SLC and any adverse effects resulting from it. GET considers that the remedies proposed above satisfy these requirements.

12.7 These remedies are discussed in more detail in **Annex 2**.

4 April 2014

ANNEX 1: SPECIFIC EXAMPLES OF OUT-OF-DATE DATA IN CMA'S FINAL REPORT

Data Reference	Explanation
Paragraph 2.9: **GET demand forecasts for Short Sea**	These are out-of-date – GET predicted that truck traffic would increase by 1.3% in 2013, and by 1.9% annually to 2015, whilst passenger traffic would increase by 1.3% in 2013, and an average of 1.7% annually to 2015. ***Update: In fact, truck traffic increased by 4.7% during 2013. Car traffic increased by 2.8% and freight traffic increased by 8%. Demand is expected to increase even further during 2014. Please see section 5 above for a discussion on this.***
Paragraph 3.45 – 3.46 **Capacity utilisation figures for Eurotunnel**	GET is reported as saying that, [✂]
Paragraph 3.55 **Market growth in 2012**	This refers to GET's Business Plan for 2012 – 2016, produced in December 2011, which states that very limited growth is expected in the freight market during this period. In respect of the passenger market, the Business Plan assumed no growth in 2012, and a small upturn from 2013 onwards. ***Update: In fact, there was a 3% increase in the freight market in 2012, and a 4.7% increase in 2013. In the passenger market meanwhile, there was a 2.8% increase for cars and an 8% increase for coach.***
Paragraph 3.60 **Analyst reports**	These are out-of-date – they were produced between January 2012 and October 2012 and, as such, some are over two years out of date.
Paragraph 8.16 **2013 target market shares for MFL**	These are out-of-date ***Update: In fact MFL had a 5.7% (not 8%) market share for passengers in 2013 and 9.1% (not 8%) for freight. DFDS is still outperforming MFL.***

Data Reference	Explanation
Paragraph 8.18 **Market shares used by CMA for economic analysis**	The CMA notes that the 2013 market share figures quoted by GET were at the lower end of those noted in internal documents, and therefore concluded that these were "*unlikely to be representative of the likely position of MFL in the time frame within which [the CMA] considered it appropriate to assess the effect of the transaction*". ***Update: In fact, however, this theory of the CMA's has not been borne out in practice, given MFL's actual market share figures for 2013.***
Paragraph 8.48 **Growth in the market in the short/medium term**	These are out-of-date: The CMA estimated that the freight market would grow at an average annual rate of 2.5% in the short term, and that the passenger market would remain flat. ***Update: In fact, the growth in the passenger market (ferries-only) was 4% as at October 2013. For a review of market growth generally in 2013, see paragraph 3.55 above.***
Paragraph 8.51 **P&O capacity**	The CMA states that P&O "*has a strong incentive to maintain its capacity in the short term*". However, the analysis in section 5 above would indicate strongly that P&O should rationalise its capacity on the Short Sea.
Paragraph 8.59 **DFDS end of charterparty**	DFDS' comments to the CMA related to the expiry date of a charter agreement for one of the vessels that it was using on the Short Sea, namely, October 2013. ***Update: DFDS has, in fact, been able to extend the charterparty until November 2014. GET is not aware that DFDS is intending to cease operating on the Dover-Calais route, given that the Molière has been sold by its owner and given that DFDS cannot assume GET would transfer the Vessels to it even if remedies are imposed by the CMA.***
Paragraph 8.64 – 8.65 **DFDS profit and growth predictions for 2013 (redacted)**	Out-of-date – we now possess the figures showing how DFDS performed during 2013. ***Update: If the CMA does not consider that P&O will exit/reduce capacity, with market shares of 28.7% for freight and 27.9% for passenger, GET does not understand why it is considered that DFDS will do so, given that its 2013 market shares were 24% for freight and 17.1% for passenger.***
Paragraph 8.68	See 8.59 above.

<table>
<tr><th>Data Reference</th><th>Explanation</th></tr>
<tr><td>DFDS – end of charterparty</td><td>The fact that DFDS is still operating, despite its previous strong submissions to the CMA on this point, calls into question any further statements from DFDS that it would exit the Dover-Calais route (in particular that it would do so in the short term) if MFL continues operating.</td></tr>
<tr><td>Table 14

Shares of volume on the Short Sea</td><td>Out-of-date – these only cover the period up to April 2013 and, as such, are now a year out-of-date.

Update: The 2013 figures are as follows:

Freight
<table>
<tr><td>P&O</td><td>28.7%</td></tr>
<tr><td>MFL</td><td>9.1%</td></tr>
<tr><td>DFDS</td><td>24%</td></tr>
<tr><td>Eurotunnel</td><td>38.2%</td></tr>
<tr><td>TOTAL</td><td>100%</td></tr>
</table>
Passenger
<table>
<tr><td>P&O</td><td>27.9%</td></tr>
<tr><td>MFL</td><td>5.7%</td></tr>
<tr><td>DFDS</td><td>17.1%</td></tr>
<tr><td>Eurotunnel</td><td>49.3%</td></tr>
</table>
</td></tr>
</table>

Data Reference	Explanation
	TOTAL ***100%***
Paragraph 8.98 **Charterparty end date has passed**	Given that a key part of the CMA's theory of harm relied on DFDS' exit from the Dover-Calais route in the short term, the fact that DFDS has not exited (and indeed shows no signs of doing so despite its (ill-founded) assertions to the contrary during the CMA's initial inquiry), means that the CMA now needs to revise its SLC analysis, and its consideration of what remedies would be required if the SLC finding is upheld.
Paragraph 8.110 and Table 15 **Reference to counterfactual**	***Update: The CMA's counterfactual is already well on its way to occurring – DFDS has increased its volume market share to 17.1% for passenger and 24% for freight on the Short Sea. These figures are only slightly lower than those estimated by the CMA for the counterfactual (which are 27.9% and 28.7% respectively).*** GET notes that it is not able to calculate updated market shares by value, as this requires the input of confidential pricing data from other operators to which GET does not have access. GET notes however that these market shares are likely to have changed in the same way as the market shares by volume.
Paragraph 8.129 **MFL pricing policy - internalisation effect**	The reasoning used here by the CMA is based on MFL's (temporary) pricing policy when it first entered the market 18 months ago, and as such is so out of date as to be entirely irrelevant to any current analysis. MFL's pricing was changed very quickly after launch, when it became obvious that it had set its prices too high (see comments made by Patrick Etienne on this topic during GET's hearing with the CMA held on 17 January 2012). Since then, prices have remained at this lower level.
Paragraph 9.2 **Excess capacity and DFDS exit**	The CMA considered that due to the "*current level of excess capacity on the short sea*" it was likely that one of DFDS and MFL would withdraw from the Dover-Calais route. However, given the growth in the market over 2013, the level of excess capacity will now have substantially decreased, meaning that the CMA's conclusion is no longer valid. It is not necessarily the case that one of the operators will withdraw.

Data Reference	Explanation
	Further, the conclusion that DFDS is more likely than MFL to exit in the short-term is no longer valid, given that it extended its charterparty over the *Molière* and its strong performance in 2013. With the impact of the MARPOL Regulations being to favour the shortest sea route, this means DFDS is less likely to exit from Dover-Calais (which is the shortest route and also the most valuable one). Therefore, the CMA's reasoning is flawed and out-of-date and needs to be revised.
Appendix C: Event analysis	The figures in this Appendix are out-of-date – they only go as far as October 2012, and are thus 1.5 years out of date.
Appendix D: Prices and volumes	The figures in this Appendix are out-of-date – they only go as far as October 2012, and are thus 1.5 years out of date.
Appendix E: Capacity and utilisation	The capacity and utilisation figures are out-of-date – they only go as far as October 2012, and are thus 1.5 years out of date. They also contain predictions for 2013, when now actual data for this period could be used. Please see the capacity utilisation figures included at section 5 above.
Appendix G: **Diversion ratios (GUPPI and IPR)**	The diversion ratios are out-of-date – they are based on MFL's initial target market shares, which are 18 months out of date, and have subsequently been revised downwards. The CMA would now be able to perform a much more reliable and better-informed analysis based on actual recorded figures for 2013. The pricing data are also out of date -– they only go as far as October 2012, and are thus 1.5 years out of date. The counterfactual analysis is also out-of-date – see comments above on para 8.110.
Appendix H: Likelihood of entry **Excess capacity section**	The figures relating to 'excess capacity' are out-of-date – they relate to the situation in 2012, over 1.5 years ago. Therefore, the analysis should be re-run, using up-to-date figures. Please see the capacity utilisation figures included at section 5 above.

ANNEX 2: REMEDIES PROPOSED BY GET

1. INTRODUCTION

1.1 GET sets out in more detail below the remedies which it would be willing to offer to the CMA, if the SLC finding should be upheld, taking into account the material changes in circumstances noted in GET's written submission. As noted at paragraph 12.6 above, GET considers that each of these remedies satisfies the CMA's obligations, under section 35(4) of the Act (and as expanded in its Guidelines on Merger Remedies) to have regard to the need "*to achieve as comprehensive a solution as is reasonable and practicable to the SLC and any adverse effects resulting from it*".

1.2 GET also notes the remedies proposed by the CMA during the initial inquiry and discusses how and why these would be disproportionate, given the material changes in circumstances documented above.

2. REMEDIES PROPOSED BY THE CC DURING INITIAL INQUIRY

2.1 The CMA's proposed remedies, set out in its 2013 Report prohibit GET (and any interconnected body corporate of GET) from operating, directly, or indirectly, ferry services at the port of Dover with the *Berlioz* and the *Rodin*, for ten years. In the meantime, GET may divest itself of the *Berlioz* and the *Rodin* to a purchaser satisfactory to the CMA, but may not then reacquire these vessels (including by chartering them) for ten years from the date of divestiture. Further, GET is prohibited from operating ferry services at the port of Dover <u>with any vessel</u> for a period of two years from the date the prohibition comes into effect.

2.2 GET considers that, in light of the material changes in circumstances documented in GET's written submission above, these alternative remedies are disproportionate to address the CMA's SLC finding, particularly given that the most up-to-date market information significantly weakens the CMA's theory of harm in relation to the SLC. The growth which has already occurred on the Short Sea market, and that which is anticipated in the foreseeable future, indicate that the market is now better able than ever to support three efficient ferry operators. Therefore, GET considers that interfering with the market through the imposition of the draconian structural remedies which the CMA has proposed would lead to a lessening in competition rather than its promotion.

2.3 In relation to the outright prohibition specifically, GET considers that, given the growth which is apparent in the market, both the length and the terms of the prohibitions on GET providing any ferry services at the port of Dover (whether using the *Berlioz* and *Rodin*, or otherwise) are excessive. There is every reason to believe that the Short Sea market will go from strength to strength and therefore to deny an operator the possibility of competing fairly on it would weaken competition on the market rather than promoting it.

2.4 In relation to the divestment remedy specifically, GET notes that there is a serious disconnect between this remedy and the CMA's assessment of the value of the vessels. The CMA made much in its 21 March 2014 Provisional Findings of its view that a great deal of the value of the *Berlioz* and the *Rodin* lay in the fact that they were sister ships, and that they therefore provided a higher level of service operating together than two non-sister vessels operating together would have done. It is therefore logical that the removal of one of these sister vessels from MFL's Short Sea operations would have a disproportionately significant impact on MFL's operations than would the removal of one non-sister vessel.

2.5 GET also considers that the prohibition periods of ten years are excessively long, and disproportionate, in the context of a market that is expected to grow very significantly and swiftly in size because of the factors discussed in GET's written submission.

2.6 GET acknowledges the CMA's obligation to provide a "*comprehensive*" solution to the perceived SLC but also notes that this should be "*reasonable*". Given the material changes that have occurred in the Short Sea market since the publication of the 2013 Report, as well as the emergence of changes which are anticipated to alter it even more fundamentally, GET considers that the remedies proposed by the CMA in its 2013 Report are no longer "*reasonable*". GET therefore sets out below a number of alternative remedies, each of which it considers better fulfil the CMA's obligation for reasonableness whilst still at the same time providing a "*comprehensive*" solution to the perceived SLC. GET also considers that the remedies it has proposed below are clear-cut and certain.

3. PROPOSED REMEDY 1: IMPLEMENT HOLD-SEPARATES OF THE KIND IMPOSED BY THE FRENCH COMPETITION AUTHORITY

3.1 Under this remedy, GET would maintain for an additional period of time Hold Separate undertakings at the level agreed with the French Competition Authority on 6 November 2012.

3.2 This would ensure, for the period of time agreed with the CMA (which GET suggests would be three years or until June 2017), that:

3.2.1 in respect of freight transport, MFL and Eurotunnel would maintain separate agreements for the former's ferry services, and for the latter's shuttle services. In addition, these agreements would be marketed by separate sales teams negotiating independently of each other;

3.2.2 Eurotunnel would not grant – on its rates for rail freight transport across the Short Sea – any rebate contingent on the relevant customer using its sea transport services and, in particular, Eurotunnel would not take into account, in connection with the annual rail rates negotiation, the freight volumes transported by MFL; and

3.2.3 Eurotunnel would not discriminate in any manner whatsoever against any of its customers that do not use MFL for their sea freight transport across the Channel.

3.3 Again, this would enable any impact of the MARPOL Regulations, as well as that of organic market growth, on the Short Sea, to become evident. If, when the continued Hold Separates expire, the CMA still has concerns in relation to competition in the market, it could order a market study into whether further action (i.e. a market investigation reference) were necessary in relation to the provision of freight and passenger ferry services on the Short Sea.

3.4 GET suggests that a suitable period for the maintenance of the Hold Separate undertakings would be three years, or until June 2017, to coincide with the expiry of the Inalienability Clause.

4. PROPOSED REMEDY 2: MAINTAIN HOLD-SEPARATES OF THE KIND ALREADY IMPOSED BY THE CMA

4.1 Under this remedy, GET would maintain for an additional period the current Hold Separate regime enforced by the CMA's Interim Undertakings, which were agreed on 29 November 2012. This would enable any impact of the MARPOL Regulations, as well as that of organic market growth, to become evident. If, when the continued Hold Separate undertakings expire, the CMA still has concerns in relation to competition in the market, it could order a market study into whether further action (i.e. a market investigation reference) were necessary in relation to the provision of freight and passenger ferry services on the Short Sea.

4.2 This would prevent, for the period of time agreed with the CMA, any further integration of the MFL business with all or any part of GET, and/or the impairment of the ability of MFL to compete independently in the Short Sea freight and passenger markets. In particular:

4.2.1 MFL would be carried on separately and under a separate brand identity from Eurotunnel. Separate sales would also be maintained;

4.2.2 there would be no further integration of the information technology systems (including booking systems) of MFL with the information technology systems of GET;

4.2.3 the customer lists of each of MFL and Eurotunnel would continue to be operated and updated separately and any negotiations with MFL's customers in relation to MFL would continue to be carried out by MFL alone;

4.2.4 all existing contracts would continue to be served by the entity to which they were awarded;

4.2.5 there would be no further key staff transfers between MFL and GET; and

4.2.6 there would be restrictions on the confidential information which as allowed to pass between GET and MFL.

4.3 This remedy has the advantage of being tried, tested, and trusted, as it has proved successful in maintaining a competitive environment on the Short Sea market during the past 16 months.

4.4 GET suggests that a suitable period for the maintenance of the Hold Separate undertakings would be three years, or until June 2017, to coincide with the expiry of the Inalienability Clause.

5. PROPOSED REMEDY 3: TEMPORARY SUSPENSION OF OPERATING THE NORD PAS DE CALAIS FROM THE PORT OF DOVER

5.1 As noted above, GET considers that the Short Sea market is now, and will continue to be, capable of supporting three efficient ferry operators, plus Eurotunnel. GET notes the CMA's concerns that DFDS may chose to exit the Dover-Calais route if it is unable to achieve sufficient utilisation on its ferries.

5.2 On the basis of MFL's experience, GET considers that there is clearly scope for annual volumes to be achieved on the Short Sea that would be sufficient to ensure that three ferry operators (P&O, DFDS and MFL) and Eurotunnel would each have sufficient minimum traffic volume to be able to thrive. GET believes that it can clearly justify this conclusion by the analysis in section 5 above and would be willing to provide further analysis to support its views.

5.3 Should the CMA be minded to continue with its previously proposed remedy, GET proposes instead that it temporarily suspend operating the *Nord Pas de Calais* from the Port of Dover. This would allow the CMA to address in full the competition concerns arising from its SLC finding in the 2013 Report, whilst avoiding disproportionate effects of imposing a structural prohibition in relation to a market that is growing faster than expected and is expected to continue to grow swiftly to a level that would enable all current operators to achieve a minimum efficient scale of operations.

5.4 In this context, GET notes that the significant (and unexpectedly large) growth in demand on the Short Sea and the entry into force of the MARPOL Regulations will together have the effect of materially increasing capacity utilisation of Short Sea ferry operators and the Eurotunnel Shuttle operations, such that GET's temporary suspension of operating the *Nord Pas de Calais* from the Port of Dover on its own would represent a comprehensive and clear-cut remedy to the SLC which would have been identified by the CMA.

6. DURATION OF THE REMEDIES

6.1 Even if the CMA should reject all of the above remedies, GET considers that the remedies originally proposed by the CMA in the 2013 Report are disproportionate given all of the considerations identified in this submission. In particular, GET has the following observations, in case the CMA should be minded to re-adopt the remedies contained in the 2013 Report:

6.2 Firstly, the original prohibition on GET (and any interconnected body corporate of GET) directly, or indirectly through arrangements with any associated person or other body over which it has control, operating ferry services at the port of Dover with the *Berlioz* and the *Rodin* applied for a period of ten years from the date the prohibition comes into effect. If GET divests the *Berlioz* and the *Rodin*, the prohibition on GET reacquiring or chartering them applied for a period of ten years from the date of divestiture. GET considers that given the very material changes in market size, the imminent impact of the MARPOL Regulations and the other changes identified above, the prohibition periods should be reduced in each case to a period of five years from the date when the Transaction completed, if the restriction is not to be disproportionately restrictive. As discussed above, GET considers that a prohibition period of five years from the date of the Transaction's completion would be sufficient to remedy any SLC identified by the CMA.

6.3 Secondly, given the extent to which the Short Sea market is expected to develop, any remedies adopted by the CMA should contain an express requirement for them to be reviewed formally by the CMA in June 2017, to coincide with the expiry of the Inalienability Clause. This would help to reduce the risk of the remedies being maintained in their adopted form and having a disproportionate and adverse effect on competition, contrary to consumers' best interests, if the Short Sea market does develop in the way that GET anticipates.

7. OTHER COMMENTS

7.1 The remedy originally imposed by the CMA in this case is extremely unusual, insofar as it envisages, and in fact requires, the withdrawal of ferry capacity from the Short Sea, rather than requiring the Vessels to be transferred to an independent third party operator to be used on the Short Sea. GET therefore considers that there is no justification for the CMA's prior permission to be required prior to the sale or other divestment by GET of its interests in any Vessel, so long as the sale or divestment was not to: (a) an associated person or other body over which it has control; or (b) a person who is, or is an associated person with an entity that is, providing freight or passenger transport services on the Short Sea at the time of such transaction.

7.2 Given the remedy in this case is intended to remove MFL as a ferry operator to reduce capacity on the Short Sea, rather than to ensure MFL's business is acquired and maintained by an independent operator, it is irrelevant whether a purchaser or lessee of the Vessels has a sound financial position, so long as it is independent of GET and operates the Vessels independently of GET. Equally, in this context there is no justification for GET to be required to seek the CMA's approval of the identity of the purchaser (unless it is already a competing operator on the Short Sea), so long as GET complies with the objectives described above.

7.3 GET has no current view on what it wishes to do with the Vessels. If, however, it sells or divests the Vessels to an independent purchaser, who is not an associated person of GET and who is not providing freight or passenger transport services on the Short Sea at the time of the transaction, then GET submits that there should be no requirement for it to seek the CMA's prior approval. GET submits that it would otherwise impose an unduly onerous approval process, make such a sale or divestment significantly more difficult and the Vessels more unattractive to a potential purchaser.

7.4 GET notes that the CMA's concerns – and its legal ability to impose remedies - arise from the fact that GET entered into the Transaction which is considered to represent a relevant merger situation giving rise to an SLC. GET believes strongly that it should not be prevented (whether directly or indirectly, or with or without doing so with associated persons) at any time in the future from: (a) separately launching a new ferry service on the Short Sea (or otherwise) without operating the Vessels; or (b) operating any of the Vessels at any time on routes other than Dover-Calais. Given the significant market changes that have already occurred and which are expected to continue in the future, GET does not exclude the possibility that it may in fact wish to provide maritime freight and passenger transport services in the future on routes including the UK. GET therefore believes that the extent of any remedies imposed by the CMA should be strictly proportionate in nature and extent to remedying the specific SLC found to have arisen from the Transaction. GET considers that any other approach not taking account of the above would amount to a disproportionate and unlawful restriction on inter-State trade and on GET's future commercial operations, going significantly beyond what might even reasonably be required for so-called 'anti-avoidance' reasons.

8. CONCLUSION

8.1 As set out above, GET considers that:

8.1.1 the remedies proposed by the CMA during its initial inquiry are disproportionate and excessive in light of the changes in circumstances detailed in GET's written submission, and that they can no longer be considered to comply with section 35(4) of the Act in terms of being "*reasonable*";

8.1.2 the changes in circumstances detailed are sufficiently material to necessitate a reconsideration of potential remedies under section 41(3) of the Act (and additionally that they provide the CMA with a special reason for such a reconsideration); and

8.1.3 and that each of the potential remedies which GET has provided to the CMA above, better fulfils the CMA's obligation for reasonableness whilst still at the same time providing the "*comprehensive*" solution to the perceived SLC required under section 35(4) of the Act.

8.2 GET considers that each of the remedies identified above would, in the context of a materially growing Short Sea market (reflecting the impact of the MARPOL Regulations and organic growth attributable to the GDP growth which is faster and greater than anticipated in the 2013 Report) and the other factors identified in GET's written submission be sufficient to ensure that DFDS and P&O continued to operate on the Short Sea alongside Eurotunnel and an independently operated MFL. GET considers that the remedies identified above would more than adequately address even the SLC which the CMA identified in the 2013 Report. At the same time, GET considers that these remedies would avoid the potential loss of customer benefits and the disproportionate impact that would result from imposing structural remedies or long-term prohibitions on GET operating ferries from the port of Dover of the type which the CMA adopted in the 2013 Report.

8.3 GET would be pleased to discuss its new proposed remedies with the CMA during the Hearing on 11 April 2014.

ANNEX 3: FERRYSTAT AND FREIGHTSTAT FIGURES FOR FREIGHT AND PASSENGER VEHICLES ON THE SHORT SEA, AND ON THE DOVER-CALAIS ROUTE, JANUARY 2013 - FEBRUARY 2014

			2013												2014	
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Passenger Vehicles	Cars ('000s)	Dover - Calais (DFDS)	17.8	15.5	14.4	20.6	23.3	25.5	39.7	56.9	33.3	20.5	14.5	14.0	12.4	6.3
		Dover - Calais (MFL)	8.7	7.5	14.7	20.0	34.0	34.2	51.7	65.0	26.1	20.8	16.5	25.5	16.7	7.4
		Dover - Calais (P&O)	45.4	57.4	69.0	83.9	116.5	119.6	161.6	228.1	117.6	81.0	65.8	72.1	46.2	51.6
		Dover - Dunkirk (DFDS)	29.4	24.7	41.3	40.4	54.8	54.6	93.2	123.1	60.7	42.0	28.2	38.0	27.0	28.4
		Newhaven - Dieppe (Trasmanche)	2.6	3.3	5.1	7.0	8.4	10.2	13.6	16.6	10.6	6.6	4.2	4.6	2.7	2.6
		Eurotunnel	132.4	148.3	170.4	192.9	220.3	223.1	280.7	364.0	222.2	180.3	161.6	226.1	144.2	161.6
		Total Short Sea	**236.3**	**256.7**	**314.9**	**364.7**	**457.3**	**467.2**	**640.6**	**853.7**	**470.5**	**351.2**	**290.8**	**380.2**	**249.1**	**257.9**
		Total Dover - Calais (incl. ET)	**204.3**	**228.7**	**268.5**	**317.4**	**394.1**	**402.4**	**533.7**	**714.0**	**399.2**	**302.6**	**258.4**	**337.7**	**219.4**	**226.9**
		Total Dover - Calais (excl. ET)	**71.9**	**80.3**	**98.1**	**124.5**	**173.8**	**179.4**	**253.0**	**350.0**	**177.0**	**122.3**	**96.8**	**111.6**	**75.3**	**65.3**
	Coach ('000s)	Dover - Calais (DFDS)	0.2	0.4	0.5	0.7	0.9	0.7	0.8	0.5	0.5	0.4	0.3	0.3	0.2	0.2
		Dover - Calais (MFL)	-	-	<0.1	<0.1	0.2	<0.1	0.1	0.1	0.1	<0.1	<0.1	0.1	0.1	0.2
		Dover - Calais (P&O)	2.7	4.2	6.6	7.6	8.9	9.4	10.4	7.8	6.6	5.3	3.5	5.5	3.1	4.3
		Dover - Dunkirk (DFDS)	0.1	0.3	0.6	0.6	0.7	0.6	0.5	0.4	0.4	0.4	0.2	0.2	0.1	0.4
		Newhaven - Dieppe (Trasmanche)	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1
		Eurotunnel	3.3	3.6	5.8	6.3	7.4	7.3	6.2	4.2	4.8	5.2	4.5	5.8	3.3	3.6
		Total Short Sea	**6.4**	**8.6**	**13.4**	**15.2**	**18.2**	**18.0**	**18.1**	**13.1**	**12.4**	**11.3**	**8.5**	**11.9**	**6.8**	**8.6**
		Total Dover - Calais (incl. ET)	**6.3**	**8.3**	**12.9**	**14.6**	**17.4**	**17.4**	**17.5**	**12.6**	**12.0**	**10.9**	**8.3**	**11.7**	**6.7**	**8.2**

		2013												2014	
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
	Total Dover - Calais (excl. ET)	**2.9**	**4.6**	**7.1**	**8.3**	**10.0**	**10.1**	**11.3**	**8.4**	**7.2**	**5.7**	**3.7**	**5.9**	**3.4**	**4.6**
Passengers ('000s)	Dover - Calais (DFDS)	79.5	83.4	77.3	107.9	113.7	112.3	167.9	198.5	124.0	102.4	82.8	82.3	73.4	43.0
	Dover - Calais (MFL)	36.7	38.1	67.4	83.1	128.7	114.1	183.3	238.0	101.7	90.1	76.5	103.3	82.1	59.3
	Dover - Calais (P&O)	334.7	442.1	579.1	658.8	793.4	785.5	996.9	1,135.5	662.7	534.7	403.4	516.2	346.3	429.7
	Dover - Dunkirk (DFDS)	115.3	112.7	169.2	167.0	202.0	183.6	313.9	392.3	201.4	164.9	121.7	149.3	112.4	139.0
	Newhaven - Dieppe (Trasmanche)	10.1	11.8	16.7	22.3	24.6	27.1	38.3	51.9	26.6	18.8	13.6	14.5	9.3	9.2
	Eurotunnel	553.0	639.6	815.0	833.7	971.1	936.2	1,132.0	1,250.4	807.3	766.4	682.2	941.2	588.9	674.9
	Total Short Sea	**1,129.3**	**1,327.7**	**1,724.8**	**1,872.8**	**2,233.4**	**2,158.8**	**2,832.4**	**3,266.5**	**1,923.7**	**1,677.2**	**1,380.2**	**1,806.7**	**1,212.4**	**1,355.1**
	Total Dover - Calais (incl. ET)	**1,003.9**	**1,203.2**	**1,538.9**	**1,683.5**	**2,006.9**	**1,948.1**	**2,480.1**	**2,822.4**	**1,695.7**	**1,493.6**	**1,244.8**	**1,642.9**	**1,090.7**	**1,207.0**
	Total Dover - Calais (excl. ET)	**450.9**	**563.6**	**723.9**	**849.8**	**1,035.8**	**1,011.9**	**1,348.1**	**1,571.9**	**888.4**	**727.2**	**562.6**	**701.7**	**501.8**	**532.0**
Freight Vehicles ('000s)	Dover - Calais (DFDS)	27.2	27.0	22.4	26.7	27.2	30.7	33.1	28.6	33.1	35.9	35.7	27.3	32.0	17.8
	Dover - Calais (MFL)	11.8	18.3	26.7	27.1	28.6	28.8	33.8	29.7	30.3	33.1	32.6	25.5	28.8	30.4
	Dover - Calais (P&O)	93.0	86.5	89.8	88.3	86.6	86.3	91.5	77.3	84.9	88.0	84.7	69.2	84.6	89.1
	Dover - Dunkirk (DFDS)	35.3	37.4	44.4	40.2	41.5	41.1	44.9	39.5	44.9	48.2	46.7	35.9	38.0	47.8
	Newhaven - Dieppe (Trasmanche)	3.6	3.5	3.7	3.5	3.0	3.2	3.3	2.7	3.0	3.3	3.4	2.5	3.1	3.0
	Eurotunnel	113.2	107.4	112.5	112.9	116.9	114.7	120.5	100.5	114.0	125.6	118.3	106.3	113.7	112.1
	Total Short Sea	**284.1**	**280.1**	**299.5**	**298.7**	**303.8**	**304.9**	**327.0**	**278.3**	**310.1**	**334.3**	**321.3**	**266.7**	**300.2**	**300.2**
	Total Dover - Calais (incl. ET)	**245.2**	**239.2**	**251.4**	**255.0**	**259.4**	**260.6**	**278.9**	**236.1**	**262.2**	**282.7**	**271.3**	**228.2**	**259.1**	**249.4**
	Total Dover - Calais (excl. ET)	**131.9**	**131.8**	**138.9**	**142.1**	**142.4**	**145.9**	**158.3**	**135.7**	**148.3**	**157.0**	**153.0**	**121.9**	**145.4**	**137.3**

ANNEX 4: CAPACITY UTILISATION ESTIMATES

This Annex sets out the estimates of capacity utilisation. These estimates are based on: the capacity data provided by Eurotunnel and MFL, estimating the maximum theoretical capacity on the basis of numbers of crossings and fleet size, and GET's best estimates of the capacity of competing short sea operators, as calculated using publically available information of vessel capacity and crossing frequencies. For capacity figures in 2014 and 2015, GET has provided a forecast of its expected Eurotunnel capacity in these years; for all other operators we assume that capacity remains unchanged from 2013. In the months of January, February and December, lower capacity has been assumed for ferry operators to take into account maintenance – the assumptions on lost numbers of crossings are based on GET best information of loss of crossings due to maintenance in the period December 2013 – February 2014.[19]

The capacity, calculated in lane metres, is based on the assumption that the average length of a car, truck and coach is 3.33m, 16.5m and 12m respectively.

To obtain data on capacity utilisation, capacity is compared to demand, tabulated by each vehicle type and broken down by operator, and in the case of historic data, taken from the IRN Ferrystat February 2014 database. The same assumptions on vehicle lane metre lengths are applied as for capacity.

As 2014 data are only available up until February, the calendar year demand data for Table 2014 CY and 2015 CY are forecast using the year on year growth figures for January and February from 2013 to 2014 (6.4% for freight and 2.8% for passenger vehicles). Further, MARPOL adjustments were made for freight demand in Tables "2015 CY (high MARPOL)" and "2015 CY (low MARPOL)". It is assumed that the MARPOL effect will boost freight demand by 1.6% if the effect is "low" and 4.3% if "high".

[19] It is assumed that in each year, the number of days' maintenance in each of these months is as was the case in December 2013, January 2014 and February 2014.

2013 CY	Car demand (number of cars)	Freight demand (number of trucks)	Coach demand (number of coaches)	Total demand (lane metres)	Capacity (lane metres)	Capacity utilisation
Dover/Calais (P&O)	1,217,927	1,025,892	78,592	21,930,038	43,962,800	**49.9%**
Dover/Calais (SeaF)	-	-	-	-	-	
Dover/Calais (MyFerrylink)	324,722	326,269	722	6,474,498	13,474,999	**48.0%**
Dover/Calais (DFDS)	296,119	355,117	6,054	6,919,132	15,405,000	**44.9%**
Dover/Dunkerque (DFDS)	630,386	500,026	5,031	10,412,067	19,638,880	**53.0%**
Eurotunnel	2,522,221	1,362,846	64,507	31,668,362	[✂]	[✂]
Newhaven/Dieppe (Transm)	92,744	38,595	92	947,065	1,854,200	**51.1%**
Ramsgate-Ostend	21,812	26,656	604	519,778	978,200	**53.1%**
Dover-Calais ferry total	**1,838,768**	**1,707,278**	**85,368**	**35,323,668**	**72,842,799**	**48.5%**
Dover-Calais total	**4,360,989**	**3,070,124**	**149,875**	**66,992,031**	[✂]	[✂]
Total short sea	**5,084,119**	**3,608,745**	**154,998**	**78,870,940**	[✂]	[✂]
2014 CY	Car demand (number of cars)	Freight demand (number of trucks)	Coach demand (number of coaches)	Total demand (lane metres)	Capacity (lane metres)	Capacity utilisation
Dover/Calais (P&O)	1,252,435	1,091,624	80,678	23,154,665	43,962,800	**52.7%**
Dover/Calais (SeaF)	-	-	-	-	-	
Dover/Calais (MyFerrylink)	333,922	347,174	741	6,850,327	13,474,999	**50.8%**
Dover/Calais (DFDS)	304,509	377,870	6,215	7,324,456	15,405,000	**47.5%**
Dover/Dunkerque (DFDS)	648,247	532,064	5,165	11,001,831	19,638,880	**56.0%**
Eurotunnel	[✂]	[✂]	[✂]	[✂]	[✂]	[✂]
Newhaven/Dieppe (Transm)	95,372	41,068	94	996,656	1,854,200	**53.8%**
Ramsgate-Ostend	-	-	-	-	-	
Dover-Calais ferry total	**1,890,866**	**1,816,668**	**87,634**	**37,329,448**	**72,842,799**	**51.2%**
Dover-Calais total	[✂]	[✂]	[✂]	[✂]	[✂]	[✂]
Total short sea	[✂]	[✂]	[✂]	[✂]	[✂]	[✂]

2015 CY (No Marpol effect)	Car demand (number of cars)	Freight demand (number of trucks)	Coach demand (number of coaches)	Total demand (lane metres)	Capacity (lane metres)	Capacity utilisation
Dover/Calais (P&O)	1,287,921	1,161,567	82,819	24,452,708	43,962,800	**55.6%**
Dover/Calais (SeaF)	-	-	-	-	-	
Dover/Calais (MyFerrylink)	343,384	369,418	761	7,249,132	13,474,999	**53.8%**
Dover/Calais (DFDS)	313,137	402,081	6,380	7,754,678	15,405,000	**50.3%**
Dover/Dunkerque (DFDS)	666,614	566,155	5,302	11,627,196	19,638,880	**59.2%**
Eurotunnel	[✂]	[✂]	[✂]	[✂]	[✂]	[✂]
Newhaven/Dieppe (Transm)	98,074	43,699	97	1,049,110	1,854,200	**56.6%**
Ramsgate-Ostend	-	-	-	-	-	
Dover-Calais ferry total	**1,944,441**	**1,933,066**	**89,960**	**39,456,517**	**72,842,799**	**54.2%**
Dover-Calais total	[✂]	[✂]	[✂]	[✂]	[✂]	[✂]
Total short sea	[✂]	[✂]	[✂]	[✂]	[✂]	[✂]

2015 CY (low MARPOL)	Car demand (number of cars)	Freight demand (number of trucks)	Coach demand (number of coaches)	Total demand (lane metres)	Capacity (lane metres)	Capacity utilisation
Dover/Calais (P&O)	1,287,921	1,180,093	82,819	24,758,391	43,962,800	**56.3%**
Dover/Calais (SeaF)	-	-	-	-	-	
Dover/Calais (MyFerrylink)	343,384	375,310	761	7,346,349	13,474,999	**54.5%**
Dover/Calais (DFDS)	313,137	408,494	6,380	7,860,491	15,405,000	**51.0%**
Dover/Dunkerque (DFDS)	666,614	575,185	5,302	11,776,188	19,638,880	**60.0%**
Eurotunnel	[✂]	[✂]	[✂]	[✂]	[✂]	[✂]
Newhaven/Dieppe (Transm)	98,074	44,396	97	1,060,610	1,854,200	**57.2%**
Ramsgate-Ostend	-	-	-	-	-	
Dover-Calais ferry total	**1,944,441**	**1,963,898**	**89,960**	**39,965,232**	**72,842,799**	**54.9%**
Dover-Calais total	[✂]	[✂]	[✂]	[✂]	[✂]	[✂]
Total short sea	[✂]	[✂]	[✂]	[✂]	[✂]	[✂]

2015 CY (high MARPOL)	Car demand (number of cars)	Freight demand (number of trucks)	Coach demand (number of coaches)	Total demand (lane metres)	Capacity (lane metres)	Capacity utilisation
Dover/Calais (P&O)	1,287,921	1,210,970	82,819	25,267,863	43,962,800	**57.5%**
Dover/Calais (SeaF)	-	-	-	-	-	
Dover/Calais (MyFerrylink)	343,384	385,130	761	7,508,379	13,474,999	**55.7%**
Dover/Calais (DFDS)	313,137	419,183	6,380	8,036,847	15,405,000	**52.2%**
Dover/Dunkerque (DFDS)	666,614	590,234	5,302	12,024,508	19,638,880	**61.2%**
Eurotunnel	[✂]	[✂]	[✂]	[✂]	[✂]	[✂]
Newhaven/Dieppe (Transm)	98,074	45,558	97	1,079,777	1,854,200	**58.2%**
Ramsgate-Ostend	-	-	-	-	-	
Dover-Calais ferry total	**1,944,441**	**2,015,283**	**89,960**	**40,813,089**	**72,842,799**	**56.0%**
Dover-Calais total	[✂]	[✂]	[✂]	[✂]	[✂]	[✂]
Total short sea	[✂]	[✂]	[✂]	[✂]	[✂]	[✂]

Appendix 1: Article from Lloyds Loading List, Monday 10 March entitled: "*The Critical Importance of the Cross-Channel Freight Market*"

Appendix 2: Submission by Brittany Ferries to UK Parliamentary Transport Committee on the effect of the MARPOL Regulations

Appendix 3: Article from 'Journal de la Marine Marchand', dated 28 February 2014 entitled: "*Après un exercice atypique, DFDS Seaways retrouve son rythme*"

Appendix 4: Report by UK Chamber of Shipping and Amec Environment & Infrastructure UK Limited entitled "*Impact on Jobs and the Economy of Meeting the Requirements of MARPOL Annex VI*"

Appendix 5: DFDS Annual Report 2013

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GUEST EDITOR: The critical importance of the cross-Channel freight market

Monday, 10 March 2014

Managing director of Dachser UK Nick Lowe discusses transport over and under the Channel Tunnel

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As Britain continues to steadily emerge from recessionary times, we read more and more about the need to rebalance our economy and give more priority to exports. Europe is on our door-step of course, and presents great opportunities. Yet sometimes it's easy to forget that we're an island! Stuttgart to Saarlouis, Lisbon to Livorno, load the truck and drive! Not possible from Birmingham to Basel. Without an efficient choice of transport links; the Channel Tunnel; ferry services across the Channel and the North Sea; short-sea container services, no trade would be possible.

The roll-on roll-off freight market over (and under!) the English Channel provides an interesting barometer reflecting the state of UK-European trade. There were some 3.6 Million commercial vehicle movements in 2013. This represented an annual growth of around 4 % according to some industry sources. Eurotunnel handled 1.4 M units, and the ferries, via Dover 2.2 M. Dover's numbers show a 12% increase compared to 2012, well above the overall level of growth. This high level of increase is no doubt partially attributable to some early displacement of traffic from the North Sea ahead of the introduction in 2015 of the Low Sulphur Directive for marine fuels. There will be unavoidable cost increases as a result of this, on the longer routes in particular.

Of the 3.6 M units, the business is shared nowadays between four companies: Eurotunnel with 39% market share, P&O with 26 %, DFDS with 25% and the newest entrant, My Ferry Link (a stand-alone subsidiary of Eurotunnel) taking the remaining 10 %.

So we have a very competitive situation on the Channel and long may that continue. If we compare the actual as well as real, inflation-adjusted, cost of freight crossings over the past twenty years or so, there has clearly been a significant drop. The effect on UK export opportunities might have been subtle but it was very tangible, a really favourable impact on the overall cost of distribution between the UK and Europe. The frequency of services, along with the development of sophisticated electronic booking systems, have all contributed to a highly efficient conduit for trade.

3.6 M crossings represents, to say the least, a lot of trucks! If they were all stuck in a traffic jam, I for one wouldn't want to be at the end of the queue. This represents, in one year, over 30,000 miles of vehicle length: one and a third times round the world. Much less than half of this of course is represented by loaded export vehicles from the UK to Europe – our trade imbalance sees to that – but nonetheless equivalent to the distance between, say, Aberdeen and Darwin, Australia. Who said exports were a thing of the past for the UK? With continued investment and healthy competition in the short-sea cross channel market, at least one barrier to growth will be kept firmly at bay.

Contact the Editor to comment on this story

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Transport Committee

Written evidence from Brittany Ferries (SES 13)

We have pleasure in submitting the following on behalf of Brittany Ferries:

Brittany Ferries is a French company that operates nine vessels on five western channel routes to France and three to Spain from the UK ports of Portsmouth, Poole and Plymouth. Our annual turnover is approximately £300 million and we carry approximately 2.6 million passengers and 200,000 freight vehicles each year. It is estimated that visitors to the UK account for 1.75 million bed-nights and an expenditure of £100 million.

MARPOL (the International Maritime Organisation's Marine Pollution Convention) Annex VI came into force in May 2005 setting a global cap of 4.5% on the sulphur content of marine fuel whilst limiting it to 1.5% in certain Sulphur Emissions Control Areas (SECAs) comprising the Baltic and North Sea and the English Channel.

In 2008, the following amendments to Annex VI, specifying more stringent controls, were made:

> A reduction in the global cap from 1st January 2012 to 3.5%.
>
> A further reduction to 0.5% from 1 January 2020 (subject to a feasibility study).
>
> Within the SECAs a reduction to 1% from 1 July 2010 *and then a further reduction to 0.1% from 1st January 2015.*

All Brittany Ferries' services between the UK, France and Spain fall within a SECA and are, therefore, subject to these stricter provisions of MARPOL Annex VI.

Brittany Ferries is a strong advocate of finding ways to improve the environmental performance of shipping and has invested in excess of £500 million in new ships over the past 10 years. We have embraced the progressive reduction in sulphur in our fuels, namely:

> The 2005 limit of 1.5% in SECAs as opposed to 4.5% worldwide.
>
> The 2008 limit of 1.5% for passenger ships calling into European ports.
>
> The 2011 limit of 1% in SECAs as opposed to 3.5% worldwide from 2012.
>
> The 0.1% limit alongside when moored for over 2 hours in European ports.

Therefore, there has been an almost 80% reduction of permissible sulphur content in our area of operation between 2005 and 2011 (1% vs 4.5%). As 4.5% fuel has historically not been common in our market, the real reductions are lower; more like 1% against 2.5%. But then if you include the specific European requirement of 0.1% at berth, a net reduction of around 65 percent has been achieved in only six years.

However, we also believe that all regulations governing emissions must be sustainable with tangible environmental, social and economic benefits.

It has been demonstrated scientifically that a lowering of sulphur content to 1% has proven beneficial to society, which is why it has not been contested by us. There are, however, no studies indicating that lowering from 1.0% to 0.1% will yield any additional environmental benefits. On the other hand, we know very well that there will be massive social costs: Not only fuel costs, but also external costs from the modal back shift, such as increased levels of carbon dioxide emissions, congestion, noise pollution, accidents and infrastructural wear and tear.

The Impact on Shipping of More Stringent Limits on Sulphur Content in Fuel, Due to Revisions to Annex VI of the IMO's Marine Pollution Convention (MARPOL)

1. The use of fuel with 0.1% sulphur content in 2015 will increase our fuel bill by *a minimum of* 60% from £65 million p.a. to £104 million p.a. This is at current prices which will inevitably increase in 2015 because of availability of suitable fuel.

2. To absorb additional costs of this magnitude passenger fares and freight rates would have to increase by 20% which will inevitably result in a fall in business.

3. Because of our longer routes, which unavoidably use more fuel, our passenger fares and freight rates are already significantly higher than those on the Dover Straits. We are, consequently, relatively more sensitive to fuel prices so these increases would make us uncompetitive, particularly as the Tunnel will not be affected by these regulations.

4. This will result, at the very least, in a reduction in frequency of services and the closure of routes and, at the worst, a cessation of business.

Possible Implications for Other Sectors, such as Road Haulage

5. *Employment*: In the UK we employ 300 staff in the ports of Portsmouth, Poole and Plymouth and, of course, many others dependent upon us are employed by the port authorities. We estimate that as many as 1,000 jobs could be lost, both in the ports and in the wider community.

6. *Local economies*: We estimate that our operation generates a total of £180 million in Devon, Dorset and Hampshire by purchasing fuel and stores, the cleaning of our ships, the money spent by incoming tourists, staff salaries, etc. In Portsmouth alone we pay the City Council, who own and run the port, in excess of £10 million every year which is used to support housing, welfare and the city's infrastructure.

7. *The environment*: The University of Antwerp/Leuven and others have conducted studies that suggest a shift of freight traffic from sea to road by up to a 50%, particularly on 'medium' length routes (400–750 km). Brittany Ferries' services between Spain and the UK are, therefore, most at risk and could cause a shift of up to 30,000 lorries on to the roads. This is very much at odds with the EU's long-standing commitment to a modal shift from road to sea (Marco Polo, Motorways of the Sea, etc) and will have a significant detrimental effect on the environment, particularly in Kent where congestion will worsen.

8. *National economy*: Fuel with 0.1% sulphur content is essentially diesel so an increase in demand, with no additional refining capacity in Europe, will cause forecourt prices to rise which will directly affect leisure and business drivers, hauliers and farmers, thereby adding to inflation. It should be noted that an increase in road diesel prices due to the increased marine demand, will not in any way soften the competitive distortion stemming from the change of the marine regulation; it is the leap frog between fuel types that is the most detrimental to the marine industry. The future supply/demand imbalance, that will

trigger increased diesel prices for trucks, will scarcely affect the new competitive situation; just making transport more expensive overall for the transport buyers. Moreover, as an island, the UK's dependence on the maritime sector for vital exports and imports is necessarily greater than that of countries contained within mainland Europe. The logic is, therefore, that the adverse effects, social and economic, of too hasty a reduction in the sulphur limit to 0.1% will be more greatly felt in the UK than elsewhere, where essential goods may easily be sourced without recourse to shipping services.

Steps which the UK Government could take to Assist the Maritime Sector to meet its Obligations under MARPOL

9. It is often said that "scrubbers" can be fitted to ships to remove the sulphur dioxide from the emissions thus enabling vessels to continue to use current heavy fuel oil and at the same time comply with MARPOL VI. However, it is not feasible to retro-fit these to most existing vessels because the equipment is bulky and heavy and would therefore sacrifice capacity. They also create stability issues, are expensive and, even though high efficiency can be demonstrated on some pilot installations, MARPOL requires 100% compliance. There is no room for any temporary disruptions. Scrubbers can, of course, be incorporated in any new ship design provided the technology becomes more reliable and the UK Government can assist in this regard by facilitating research in scrubber technology and setting standards.

10. LNG (Liquefied Natural Gas) is being mooted as the most likely alternative fuel as it has the best environmental profile. However, it is widely recognized that, as LNG is not even commonplace for new designs, the challenges of converting existing vessels are thus far insurmountable. There are still many regulatory and supply issues which are unlikely to be resolved within the next three years. Brittany Ferries recognises the potential that LNG offers and is presently engaged in a research and development project with the ship builder STX Europe to study the feasibility of developing this technology for future use. We believe the UK Government has a role to play in encouraging the development of a robust LNG supply infrastructure.

Recommendations

11. Brittany Ferries agrees with the aims of MARPOL VI and reducing sulphur levels to 0.1% but believes that it should be delayed from 2015 until the implementation of the global move to 0.5% in 2020 at the earliest.

12. Any new ships introduced after 2015 should comply with MARPOL VI.

13. The UK government should conduct a full impact assessment and review of the IMO decision. There are unintended consequences of the decision that require urgent reconsideration so that more appropriate solutions, such as those we ourselves have outlined above, can be agreed and applied.

14. In particular, the UK government should assess the cost/benefit balance between the current 1.0% regime in the SECA and the debated 0.1% regime in the SECA from 2015. The often quoted health benefits come from lowering the globally permissible levels from 4.5% to 0.5%, not from any future marginal differences in Northern Europe, since reductions of 65% have already been enforced there, with industry acceptance, between 2006 and 2011.

15. The UK government should support and work towards bringing forward the 2018 feasibility study (already mandated within the revised MARPOL Annex VI) to 2012–13 and should support the proposal that the remit of that study be expanded to include an

impact assessment on the consequences of the reduction in fuel within SECAs to 0.1% from 2015.

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Prepared 8th March 2012

DUNKERQUE

Après un exercice atypique, DFDS Seaways retrouve son rythme

« Si le trafic transmanche présente une légère baisse en 2013, il faut se méfier de la comparaison avec les chiffres de 2012 qui n'est pas à périmètre constant. » Le service statistiques du Grand port maritime de Dunkerque tient à le répéter.


© H.D.

En 2012, suite à l'arrêt de Seafrance à Calais, la compagnie DFDS Seaways a renforcé son service roulier transmanche en alignant un quatrième navire, le *Norman-Spirit*, entre le 1er janvier et la mi-février. Au terme de l'exercice, plus de 519 840 camions et remorques avaient emprunté la ligne Dunkerque-Douvres.

Avec le retour à la normale du service et trois navires assurant chacun quatre départs par jour, le trafic diminue logiquement de 6 % avec 12,3 Mt et 499 000 camions et remorques (- 4 %°). Le nombre de passagers diminue quant à lui de 8 % pour s'établir à plus de 2,3 millions de voyageurs et chauffeurs. Si l'on excepte la particularité de 2012, les volumes fret sont en augmentation de 7 % par rapport à 2011 (465 613 remorques et camions) et de 11 % par rapport à 2010.

Optimisme

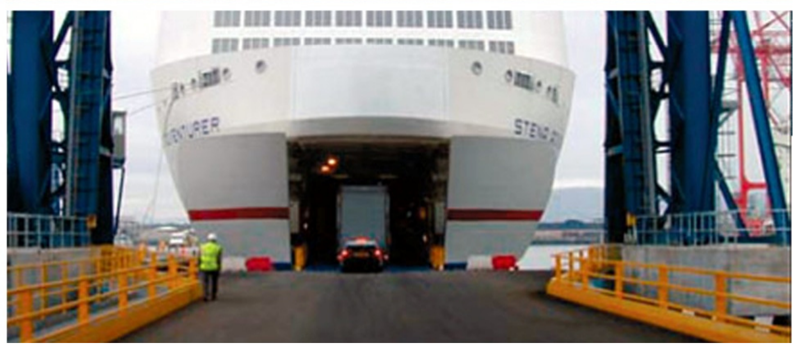
Ni la montée en puissance de LD Lines, ni le démarrage de MyFerryLink, à Calais, n'affectent l'optimisme de DFDS Seaways, seul opérateur transmanche à Dunkerque. En reprenant ses 12 rotations quotidiennes, la compagnie compte bien reprendre le rythme de croissance jusque-là continu depuis 2010. Peder Gellert Pedersen, directeur de la division shipping de la compagnie, l'a encore annonçé en décembre : l'opérateur compte développer ses lignes tant à Calais qu'à Dunkerque. Pour le port de Dunkerque, ce trafic représente 77 % de l'ensemble des marchandises diverses. Il a décidé d'investir 12 M€ pour réaménager le terminal transmanche, à Loon-Plage, et l'ensemble des accès routiers au port Ouest. Les travaux démarrent cette année pour s'achever en 2015. ■

Philippe Allienne

UK Chamber of Shipping

Impact on Jobs and the Economy of Meeting the Requirements of MARPOL Annex VI

Final Report



AMEC Environment & Infrastructure UK Limited

March 2013

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UK Chamber of Shipping

Impact on Jobs and the Economy of Meeting the Requirements of MARPOL Annex VI

Final Report

AMEC Environment & Infrastructure UK Limited

March 2013

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Executive Summary

This report identifies significant impacts on the UK short sea shipping industry in meeting the requirements of Marpol annexe VI.

In addition to direct costs to operators, the report identifies modal shift and threats to the viability of routes with consequent knock on effects for jobs in the port and ferry industry.

Review of options for meeting the requirements

The report contains a technical review of three possible means of achieving the required standards; retrofit scrubbing systems, retrofit conversion to LNG and use of lower sulphur fuel (in place of heavy fuel oil).

Retrofitting LNG was found, in practice, to be unsuitable for much of the UK fleet given the age and configuration of the existing ships. Whilst there is some potential for new ships to take up this option the limited availability of bunkering facilities, space at port and fuel infrastructure render this option unviable for the foreseeable future.(Section 1.3)

This report shows that scrubbing has the potential to be a viable technology in the future. However a review of the current state of development, and operators direct experience of trialling systems, does not provide sufficient confidence that the investments required would result in the emission reductions required to ensure compliance. (Section 2.3).

Given the technical and practical unavailability of LNG and scrubbers in the immediate future the only viable means of meeting the requirements of MARPOL Annex VI will be through switching to lower sulphur fuel.

Analysis of the economic impacts of fuel switching

The consequences of using lower sulphur fuel within the ECA from 2015 are that there will be significant increases in costs associated with fuel purchases of between an additional $275 and $350 per tonne of fuel used. (Section 2)

Due to the current financial position of most operators on these routes it is assumed that the full cost of fuel price increases will be passed on directly as increased ticket prices.

The direct impacts of increased costs on the shipping industry in the UK could be considerable leading to increases in fuel costs faced by operators in the Western Channel and North Sea of more than £300 million. The effect on ticket prices charged (simply to recover these additional costs) on North Sea routes would require price increases of between 5 and 21% (Table3.3) and on Western Channel routes of between 8 and 29% (Table 3.2) (section 3.4).

Limited UK and EU refinery capacity for middle distillate fuels are likely to have knock on effects in terms of fuel imports, and as highlighted by a recent Swedish study (Sweco 2012) this could impact on the price faced by road diesel users. An increase in the costs of road fuel diesel as estimated in the Sweco study (Box 1) would increase the costs faced by road diesel users by more than £700 Million per year.

Increased ticket prices on longer sea routes will result in haulage operators switching from longer sea routes to shorter sea routes which require longer road journeys. This “modal shift” away from ferries to road journeys will lead to reduced viability of some routes threatening thousands of jobs as well as an increase in congestion and other detrimental affects.

Depending upon the costs faced by hauliers for road Km travelled and the scale of increases in tariffs the expected modal shift for the North Sea and Western Channel is modelled to be between 6 and 16% of all freight traffic with the switching being most noticeable for routes near to Dover Calais which is the shortest available cross channel route.

Our analysis suggests that modal shift will threaten the viability of routes in the North Sea Western Channel. (section 4) The loss of viability of routes and port operations has the potential to displace thousands of (good quality) jobs (Section 4). Overall, as many as 2,000 full time, part time and contract positions are likely to be at risk in the UK and on the continent, in maritime engineering, navigation, catering, customer service, cleaning and administrative occupations from those routes that are potentially unviable or would be threatened from the traffic reductions identified. The analysis further indicates that modal shift will affect between 1.3-3.6 Million tonnes of freight leading to between 1.5-10 million additional road kilometres. This is expected to lead to increased congestion on the roads and local environmental problems. A conservative estimate of the scale of harm to the UK from externalities of “modal shift” is that it results in an addition burden of approximately £3.75 Million in external costs (Section 4).

A one to one relationship between price increase and loss in quantity demanded is predicted for the leisure market. . This would suggest that a 10% increase in price would lead to a reduction of 10% in market volumes.

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1. Introduction

1.1 Purpose of this Report

This report has been prepared for the UK Chamber of Shipping, on behalf of several North Sea and Western Channel shipping operators, to establish the economic effect of compliance with the requirements of MARPOL Annex VI regulations, which sets sulphur limits for fuels in SOx Emission Control Area (SECA) currently 1%, since 1 July 2010; being further reduced to 0.1%, effective from 1st January 2015.

The report has considered three potential options by which shipping operators' services within the SECA can comply with the requirements. First, by switching fuel from Heavy Fuel Oil (HFO) to a Low Sulphur Fuel (LSF). Second by installing ship exhaust scrubber systems and third by using alternative fuels, such as liquefied natural gas (LNG). There are substantial commercial and practical problems associated with the implementation of all three of these options in order to comply with the 2015 deadline.

1.2 Report Structure

The report is structured as follows:

- Section 2 reviews the three potential options in greater detail and establishes the costs and practical issues associated with their implementation in order to comply with the requirements of the regulation;
- Section 3 examines the impacts expected to arise from fuel switching from HFO to LSF. The analysis is undertaken in a series of steps. First the costs of switching fuel are estimated and subsequently the effect this will have on ticket prices. Potential impacts on route switching and modal shift are then considered;
- Section 4 investigates the wider economic and route viability impacts of meeting the requirements identifying the scale of risk to the industry and to the wider economy and
- Summary and conclusions are set out in Section 5.

1.3 Policy context

1.3.1 Existing MARPOL Annex VI Regulations

The International Maritime Organization (IMO) Regulations for the Prevention of Air Pollution from Ships were adopted in the 1997 Protocol to MARPOL 73/78 and are included in Annex VI of the Convention, which entered into force in May 2005. MARPOL Annex VI sets limits on SOx and NOx emissions from ship exhausts. It includes a global cap of 4.5% by mass on the sulphur content of fuel oil and also set provisions allowing for special Sulphur Emission Control Areas (SOx ECAs, 'SECAs') where either the sulphur content of fuel oil used on board ships must not exceed 1.5% m/m, or ships must fit technologies to achieve equivalent SOx emissions. Limits on emissions of NOx from diesel engines are also set. The Baltic Sea is designated as a SECA in the Protocol and the North Sea was adopted as a SECA in July 2005 (the North Sea SECA entered into force on 21st November 2006, to be fully implemented 12 months later, on 22nd November 2007).

Figure 1.1 Baltic and North Sea SECA

Source: ECG, Sulphur content in marine fuels, 2011, p7.

1.3.2 Sulphur Content of Marine Fuels Directive

The SCMF Directive[1] entered into force on 6th July 2005, amending the existing Sulphur Content of Liquid Fuels Directive (SCLFD)[2]. The SCMFD is linked to MARPOL Annex VI and sets the maximum permissible sulphur content of marine fuels used in SECAs. The main elements of the Directive include:

i) A 1.5% sulphur limit for fuels used by all ships in the SECAs of the Baltic Sea, from 11th August 2006, and the North Sea and English Channel, from either 11th August 2007 or 12 months after the entry into force of the International Maritime Organisation designation, whichever is the earlier;

---

[1] Directive 2005/33/EC of the European Parliament and of the Council of 6 July 2005 amending Directive 1999/32/EC as regards the sulphur content of marine fuels.

[2] Council Directive 1999/32/EC of 26 April 1999 relating to a reduction in the sulphur content of certain liquid fuels and amending Directive 93/12/EEC. OJ L 121, 11/05/1999 p.13-18.

ii) A 1.5% sulphur limit for fuels used by passenger vessels on regular services between EU ports, from 11th August 2006; and

iii) A 0.1% sulphur limit[3] on fuel used by inland waterway vessels and by seagoing ships at berth in EU ports, from 1st January 2010.

As an alternative to the use of low sulphur marine fuels to comply with Articles 4a and 4b of the Directive, Member States can '*… allow ships to use an approved emission abatement technology, provided that these ships continuously achieve emission reductions which are at least equivalent to those which would be achieved through the limits on sulphur in fuel specified in [the] Directive*' (Article 4c, paragraph 4).

1.3.3 Revised MARPOL Annex VI Regulations

In April 2008, IMO's Marine Environment Protection Committee (MEPC) approved proposed amendments to the MARPOL Annex VI Regulations to reduce harmful emissions from ships. MEPC unanimously adopted the amendments to Annex VI and the NO_x Technical Code when it met for its 58th session (from 6 to 10 October 2008)[4]. These amendments set more stringent limits on SO_x and NO_x emissions from ship exhausts than the existing Annex VI.

The revised MARPOL Annex VI Regulations entered into force on 1st July 2010, under the tacit acceptance amendment procedure. Some of the key provisions include:

- A reduction in the global limit of sulphur content in fuel to 3.5% by mass (from the current 4.5%) effective from 1st January 2012; then to 0.5%, effective from 1st January 2020 subject to a feasibility review to be completed no later than 2018);
- A reduction in sulphur limits for fuels in SOx ECAs to 1%, beginning on 1 July 2010; being further reduced to 0.1%, effective from 1st January 2015;
- As with the existing MARPOL Annex VI, the revised regulations allow for the use of suitable abatement equipment as an alternative to the fuel switching requirements described above on the basis that equivalent SOx emissions are achieved on a continuous basis; and
- Tiered reductions in NO_x emissions from marine engines (with the most stringent controls on "Tier III" engines, i.e. those installed on ships constructed on or after 1st January 2016, operating in Emission Control Areas).

[3] The 0.1% sulphur limit on fuels used by inland waterway vessels and ships at berth does not apply to:

a) Ships due to be at berth for less than two hours according to published timetables.

b) Inland waterway vessels that carry a certificate proving conformity with the International Convention for the Safety of Life at Sea, 1974, as amended, while those vessels are at sea.

c) Ships which switch off all engines and use shoreside electricity while at berth in ports.

[4] http://www.imo.org/Newsroom/mainframe.asp?topic_id=1709&doc_id=10262

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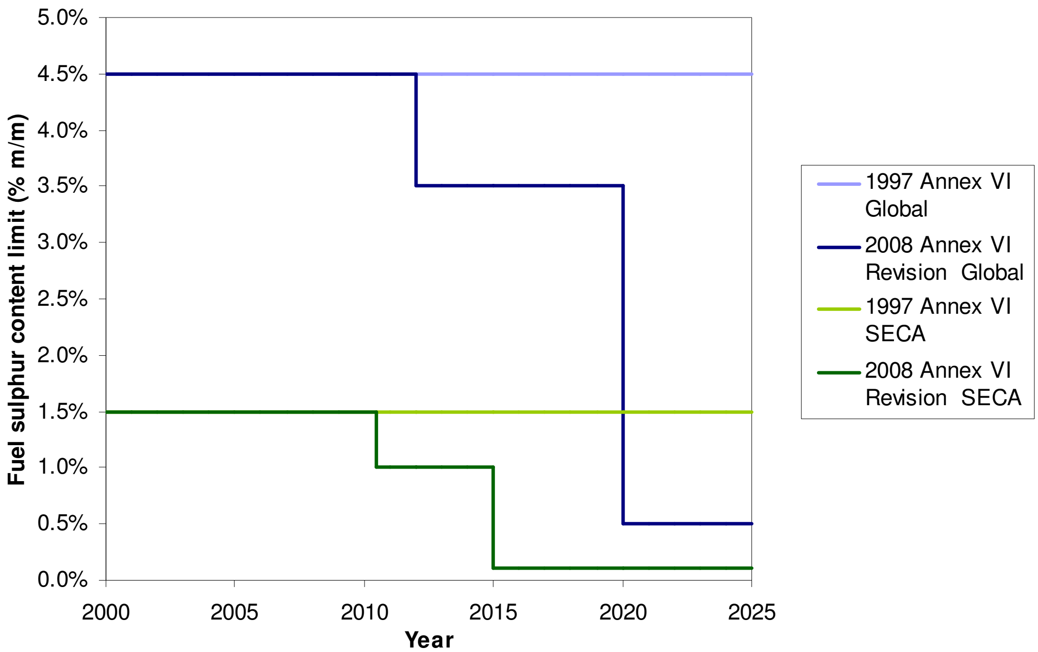
The time-limited sulphur content limits are represented graphically in Figure 1.2 below.

Figure 1.2 Revised MARPOL Annex VI - Fuel Sulphur Limits



The revised Annex VI will also allow for Emission Control Areas (ECAs) to be designated to limit emissions of SOx, particulate matter or NOx, or all three pollutant species, from ships subject to a proposal from a Party or Parties to the Annex which would be considered for adoption by the IMO if supported by a demonstrated need to prevent, reduce and control one or all three of those types of emissions from ships.

1.3.4 Revised Sulphur Content of Marine Fuels Directive (2012)

The revised SCMF Directive[5] entered into force on 21st November 2012, amending the existing Sulphur Content of Liquid Fuels Directive (SCLFD)[6]. The revised SCMFD is linked to MARPOL Annex VI and sets the maximum permissible sulphur content of marine fuels used in SECAs and in EU Waters outside of SECAs.

[5] Directive 2012/33/EU Of The European Parliament And Of The Council of 21 November 2012

[6] Council Directive 1999/32/EC of 26 April 1999 relating to a reduction in the sulphur content of certain liquid fuels and amending Directive 93/12/EEC. OJ L 121, 11/05/1999 p.13-18.

2. Review of options for meeting the requirements

2.1 Introduction

This chapter examines the technical feasibility and associated impacts of three options to comply with the requirements of MARPOL Annex VI. Consultation with the operators and the UK Chamber of Shipping as well as a review of relevant literature indicates there are three realistic options open to operators for long term compliance with the requirements of the legislation. These are:

- **Option One: Fuel switching from 'Heavy Fuel Oil (HFO), to Low Sulphur Fuel (LSF**). This option is technically feasible, with limited up-front investment costs (except for change of designation and use of some fuel tanks from HFO to LSF involving tank cleaning of those tanks). However, significant operational costs are likely to be incurred by operators, arising from the price differential between HFO and LSF; the latter being significantly more expensive. These increased operational costs are likely to be passed on, in the form of increased ticket prices to passengers and freight/container customers, given operating margins on the routes analysed. The potential effects arising from such an increase is the subject of chapter three and is not considered in detail here.

  A consequential and wider issue relates to the impact of an associated increase in the demand for middle distillate fuel, and the ability of European refineries to meet this demand. In the event of supply constraints, import volumes from outside of Europe are likely to increase. Prices for all users of such fuels, including road users, are also likely to be affected.

- **Option Two: Retrofit of a scrubbing system to ships.** The consensus from the shipping operators that have been consulted as part of the study is that the currently available abatement technology is not sufficiently proven for ship owners to switch with confidence and demonstrate compliance *within the time period required by the legislation (i.e. by January 2015).* This section collates operators experience with the technology to date and reviews publicly available information on the current status of the technology.

- **Option Three: Use of Liquefied Natural Gas (LNG) as an alternative fuel**. Alternative fuels may be applicable in some circumstances and the potential use of LNG has been assessed. Its use poses particular problems where existing ships would need to be retrofitted (which is understood to be unsuitable for much of the UK fleet) and is more appropriate for new build ships. This is an immature market and a lack of appropriate infrastructure or supply chain as well as uncertainty over prices means that this option therefore remains a concern for the industry.

A fourth option of switching to Methanol as a fuel and a fifth the use of exemptions are also briefly discussed.

2.2 Option 1: Fuel switching from 1% to 0.1% Sulphur fuel

Under Option 1, ship operators meet the MARPOL Annex VI sulphur emissions requirements by switching from current fuels (with 1% sulphur in SECAs since 2010) to low sulphur fuels (0.1% sulphur in SECAs from 2015).

Broadly, this means switching from fuels that are primarily constituted of residual oil to fuels that are primarily constituted of distillate oil. The specifications of the most common marine fuels are given in

Table 2.1.

This illustrates that, in general, reducing marine fuel content involves a shift away from residual to distillate oils. Currently, the only fuels that meet the 0.1%S requirements are particular grades of marine gas oil (MGO), all of which consist of 100% distillate.

This is expected to have a range of impacts on the shipping industry, especially for those operators sailing in SECAs, as well as on refineries and refined oil product markets more generally:

- **Impacts on shipping operators**: The main impacts on shipping operators are:
  - A requirement to change the designation and use of some fuel tanks from HFO to LSF involving tank cleaning of tanks that have been used for HFO storage over a number of years, so as to avoid blockage of filters and guard against the likelihood of machinery failures;
  - increase in fuel costs while sailing in SECAs, illustrated in see Section 4.2.3;
  - potential downstream market impacts linked to the ability of shipping operators to pass on these increased cost to their customers, via increased ticket prices;
  - potential impacts on vessel and route viability linked to these market impacts; and
  - potential losses of seafarer, shipping and ports jobs.
- **Impacts on refineries:** The main impacts on refineries are linked to the increase in demand on distillate oils, combined with a decrease in demand for fuel oils. The European distillate production capacity is currently unable to meet domestic demand for diesel and gasoil, and Europe as a whole is a net importer of these products. Under Option 1, the main choice facing refineries would be:
  - Substantial investment to convert residual oils into distillate oils; or
  - No change, which would necessitate an increase in diesel/gasoil imports, along with a corresponding increase in fuel oil exports.
- **Impacts on wider refined oil product markets**: The increase in demand for distillates is likely to lead to an increase in the price of diesel, which would have potentially important consequences for road users and the economy as a whole. (see Box 1).

Table 2.1 Specifications of the most common marine fuels

Industrial name	ISO name	Composition	ISO Specification sulphur weight %	Actual sulphur weight %	Price, $/tonne (**)
Intermediate Fuel Oil 380 (IFO 380)	RMG380, RMH380	98% residual oil 2% distillate oil (*)	Statutory requirements (3.5% outside SECAs)	2.67% world average (*)	644.50
Intermediate Fuel Oil 180 (IFO 180)	RME180, RMF180	88% residual oil 12% distillate oil (*)	Statutory requirements (3.5% SECAs)	2.67% world average (*)	668.00
Low sulphur intermediate fuel oil (LS 380)	n/a	Not given	Not given	On market meeting 1% specification	693.50
Low sulphur intermediate fuel oil (LS 180)	n/a	Not given	Not given	On market meeting 1% specification	717.00
Marine Diesel Oil (MDO)	DMB	Distillate oil with trace of residual oil	2%	0.65% world average (*)	-
Marine Gas Oil (MGO)	DMA	100% distillate oil	1.5%	0.38% world average (*) On market meeting 0.1% specification	1,005 (0.1%S)
Marine Gas Oil (MGO)	DMX	100% distillate oil	1%	On market meeting 0.1% specification	1,005 (0.1%S)
Low Sulphur Marine Gas Oil (LSMGO)	n/a	100% distillate oil	Not given	On market meeting 0.1% specification	1,005

(*) Information published in 2007. Current values are probably different, reflecting regulatory changes since then.

(**) Prices from bunkerworld.com for 11 February 2013 at Rotterdam.

Source: ICCT (2007), based on Vis 2003, BP 2004, Exxon Mobil Marine 2006, CARB 2005. Updated in line with information on bunkerworld.com and ISO 8217 standards as published by Chevron.

This study focuses primarily on the impacts on shipping operators, according to a methodology and structure that is presented in Section 3. Impacts on refinery investment choices are briefly considered in Section 3.2.2 in order to assess how their reactions and investment decisions might affect shipping fuel prices. The predicted impacts on the European balance of trade in refined oil products are summarised in Section 3.3.

The wider market impacts on downstream users of refined oil products (e.g. on diesel prices for road transport users) are not assessed in detail in this report. However, the analysis of this impact in Sweden by Sweco (2012) is summarised in Box 1 which illustrates the potential scale of impact in the UK.

Box 1 Increased demand from shipping has the potential to increase prices for all users of diesel

The expected increase in demand for middle distillate oils, combined with supply side constraints at the European level, has the potential to increase fuel prices for all users.

This is particularly relevant for users of diesel road vehicles, since marine gas oil is very similar to road transport diesel. However, any price increase in road diesel would ultimately affect consumer travel choices, and would therefore have indirect impacts for all fuel users.

Sweco (2012) attempt to quantify the impacts of a potential switch to 0.1%S shipping fuel on road diesel prices in Sweden. Starting from their calculation that the expected price premium for low sulphur fuels in SECAs should be above $350 per tonne in 2015, they equate this to a 4% pre-tax increase in the price of road diesel relative to the baseline price. They then calculate this to be equivalent to an increase of 0.8 SEK per litre of post-tax road diesel in 2015, or roughly €0.072.

Applying a similar analysis, assuming a 4% increase in the price of pre-tax diesel and using 2011 average UK diesel prices and tax rates yields an expected increase in road diesel post-tax pump prices of 2.8 pence per litre. The actual 2015 values are likely be higher than this, due to inflation.

Road diesel	2011 average	Data source
Pre-rise pump price (pence/litre)	138.81	DECC
Duty rate (pence per litre)	58.18	DECC
VAT rate (%)	19.95*%	DECC
Implied pre-tax price (pence per litre)	57.54	Calculation
Post-rise pre-tax price (pence per litre)	59.84	Calculation
Post-rise post-tax price (pence per litre)	141.57	Calculation
Pump price difference (pence per litre)	2.76	Calculation

According to HMRC[7], around 26,000 million litres of diesel were consumed in the UK in 2011, meaning that such an increase in the diesel pump price would be equivalent to an overall additional cost to road diesel consumers in the region of **£720 million**.

* VAT rate changed to 20% from 17.5% during the period

2.3 Option 2: Feasibility of adopting abatement technology

2.3.1 Technical options (Scrubbers)

MARPOL Annex VI allows the after-treatment of exhaust gases as an alternative to low sulphur fuel on the basis that an equivalent reduction in emissions is achieved. There are three principle types of suitable sulphur scrubber. It is important to note that the evidence reviewed suggests that this approach does offer a potentially feasible option for some operators to comply with the SO_X limit for some of their fleet; and that systems can remove 90-95 % of SO_2.[8] This evidence should be compared with the experience of operators who have both installed test bed prototype and full scale scrubber systems and those in negotiations with potential suppliers of the technology. In those instances where scrubbers have been installed, the evidence suggests that important design and operational

[7] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65772/5953-dukes-2012-chapter-3-energy.pdf

[8] Entec, 2010. Study to review assessment undertaken of the revised MARPOL Annex VI regulations. Study prepared for the ship-owner associations of Belgium, Finland, Germany, Holland, Sweden and UK and endorsed by the wider membership of ECSA and ICS.

lessons are still being learnt. Clearly the technology is continuing to develop and remains a likely long term solution. Given the lead in time required for the development, installation and testing of the systems, investment decisions for 2015 compliance would need to be made imminently. On that basis, this section provides an overview of the options, the implications of their use and draws on recent operator experience in using or procuring the technology.

Wet scrubbers

Wet scrubbers are typically located near to the funnel and mix water with the exhaust gas, reducing its sulphur content. They require a scrubber chamber, washwater treatment and sludge tanks, emissions monitoring systems, various pipes, pump and cooling equipment. Reheaters, used to increase exhaust gas temperatures, may also be necessary on certain ships.

Wet scrubbers are available as 'open loop' or 'closed loop' systems. The former pump seawater into the ship, which is then mixed with the exhaust fumes inside the scrubber system to reduce sulphur emissions. The seawater is then treated inside the ship and pumped out to sea. A SO_X removal rate of 98% would be required to ensure emissions from 3.5% sulphur content fuel would be equivalent to the use of 0.1% fuel, after scrubbing. Open loop systems typically weigh between 30 to 55 tonnes (excluding washwater and treatment systems) and consume between 1% and 2% of engine power[9]. Depending on the type of ship and how many scrubbers are fitted the water within the scrubber system could be as much as 250 tonnes, which can cause some vessels stability issues

Similarly, wet scrubber 'closed loop' systems scrub the exhaust gasses using use fresh water, treated with sodium hydroxide (NaOH), which removes SO_X as sodium sulphate. The used water then passes into a process tank, is cleaned and recirculated inside the system. Closed loop systems typically weight between 30 to 55 tonnes (excluding washwater and treatment systems and the required holding tanks) and consume between 0.5% and 1% of engine power. However, it is understood that not many 'closed loop' systems have been taken to market due to the extra cost involved over and above 'open loop' scrubbers. 'Hybrid' models (with both open and closed loop capability) are also available, and could typically be used as 'closed loop' in the Baltic Sea or in ports of high environmental sensitivity such as Gothenburg and as 'open loop' scrubbers in the North Sea. It is understood a hybrid system normally only has sufficient capacity to maintain the wash water on board for 2 -3 days.

Dry scrubbers.

Dry scrubbers use chemicals (typically calcium hydroxide granules that absorb exhaust gas particles) rather than water to scrub the exhaust fumes. These granules require storage on board, (both before and after use as they are not dissolved in the process) as well as appropriate delivery and storage infrastructure at port. The reaction is exothermic (heat releasing) so dry scrubbers are located before (i.e. beneath) waste heat recovery or selective catalytic reduction systems. These units typically weigh some 250 – 300 tonnes (including circa 150 – 200 tonnes of granules stored on board) and consume between 0.15% and 0.2% of engine power. The granules will need to be exchanged for fresh supplies every 10 – 14 days which presents a logistics challenge during port turnarounds. Additionally, these dry scrubbers will typically reduce the vessel's deadweight once retro-fitted and will likely use valuable cargo space so that up to 5 cargo units are required to be excluded. A cargo ship has recently had a dry

[9] Lloyds Register, June 2012. Understanding exhaust gas treatment systems. Guidance for ship-owners and operators.

scrubber system retro-fitted to it and has added 3 – 4 large containers in front of the vessel's accommodation as storage space for the granules. This may be possible on cargo freight ships, but this retro fit would not be possible on large RoRo passenger vessels nor would complement the vessel's design. As such this operator told us they do not believe dry scrubbers are feasible for passenger vessels or passenger ferries.

2.3.2 Consultation Responses

As of January 2013, two of five operators consulted as part of the study, have installed scrubber technology; a full scale wet scrubber followed by test bed platform installation in one case and a full scale wet scrubber in the other. The remaining three operators highlighted commercial (cost and contractual), technical and practical concerns.. These are briefly summarised below Table 2.2.

Table 2.2 Scrubber status and experiences (January 2013)

Current Position/Operator	Operator 1	Operator 2	Operator 3	Operator 4	Operator 5
Summary of status	No installations to date. Extensive discussion with potential suppliers. Offers for installation received.	No installations to date. Extensive discussion with potential suppliers. Offers for installation received.	Installation of full scale wet scrubber system installed 2003 which was unsuccessful and decommissioned in 2005. Full scale system covered 4 main engines and 4 generators. Installation of a test bed prototype wet scrubber fitted to one generator in December 2005 and removed in March 2012.	No data available	Installation of one full scale wet scrubber system (2009 - ongoing). Fire in scrubber whilst in dry dock (2009). First live test; discovered corrosion to pipe work requiring replacement (2010). Second fire in scrubber whilst in dry dock (2011). Melting of metal filing from exhaust damper failure; melting of plastic covering (2012). A System was operational only 73% of the time(January 2013).

Source: Consultations between the consultants and operators'.

Installation Experience

Feedback from operators that have installed scrubbers to date, have highlighted some operational issues, summarised below.

- Loss of revenue associated with installation: scrubber installations were not possible within standard maintenance windows. These take place every other year and take between two and three weeks, during which time the ship is out of service. These installations took between four and eight weeks, resulting in an additional time out of service of between two to six weeks out of service, resulting in some £300,000- £5,000,000 lost revenue depending on vessel type and trade.

- Length of time from installation to full commissioning. An open loop system was commissioned six months to one year after installation; a closed loop system some two and half years after installation[10].

- Ongoing modification requirements, post installation. One of the five operators consulted noted, one full scale scrubber had been installed, "...its utilisation has been 73%, or some 8,300 running hours, during which time two fires have occurred whilst the ship was in dock.." These fires were caused by the use of plastic covering and coated steel piping on parts of the scrubber system. The operator is confident that these lessons have been learnt and these problems will not re-occur. Other more basic scrubber maintenance has been possible within standard maintenance windows, and has related mainly to pumps, valves, and a plate heat exchanger.

- The other operator consulted confirmed the installation of a full scale wet scrubbers in a system installed 2003 which was unsuccessful and decommissioned in 2005. This system was actually installed whilst the vessel was undergoing a 3 month major conversion but the operator estimates it would have taken six to eight weeks off service to fit. The four main engine scrubbers did not operate successfully and although the operator persevered with the scrubbers of the generator system, the scrubbing efficiency did not come close to design specification or the 0.1% sulphur requirement. As such the operator de-commissioned the system in 2005.

- The same operator then installed a test bed prototype wet scrubber on a generator in December 2005 which was finally removed from the vessel in March 2012. During this period the prototype scrubber had operated for a total of 35,000 hours and when operational met the 0.1% sulphur requirement. However, there were issues about the reliability of the system, lack of continuous running, and its maintenance requiring intervention by the crew and/or the manufacturer.

- A number of developments had been demonstrated by this second operator, notably the use of continuous monitoring of emissions at the funnel (IMO Scheme B) and the standards for sludge handling and washwater criteria which had later been agreed at IMO. It was acknowledged that the lessons learnt had been incorporated into the latest generation of scrubbers and this operator welcomed the development of multi-engine scrubbers, as an option which may be of benefit for multi-engine vessels.

Barriers to investment

Given confidentiality concerns, it is inappropriate to examine the issues each operator has encountered separately. There are, however, a number of common themes, as follows. It is important to note that these are the operators' opinions, which are based on their dealings with potential suppliers to date.

- Uncertainty over technical performance: In principle, the operators consider that both wet and/or dry scrubber technologies are potentially viable, but the risk of non compliance is, in their view, currently still too high. Insufficient technical detail has been received from the scrubber suppliers. In particular further technical details are needed on the:

    - Performance of the scrubber systems under different engine loads, at different exhaust temperatures and at various periods between maintenance schedules?

[10] If take up of scrubbers increases then the commissioning period can be expected to reduce due to learning effects as the installers and operators become more familiar with the new technology.

- Performance effects of using fuels containing differing sulphur content?
- Frequency of nozzle plugging and effects of this on scrubber performance?
- Reaction speed of the scrubber in response to sudden change in engine load?
- Weight and dimensions of the scrubber system and auxiliary systems (and differences in weight between in use and idle)?
- Implications for existing sea water systems (for example flow speed variation, cavitations, erosion, connection on sea water crossover or on sea chests)?
- Impacts on exhaust gas boilers, for example do they cause backpressure, diminution of gaps flow, temperature increases, turbocharger speed or surging?
- Maximum or optimal durations of operation for closed loop and details of system reaction to extended periods in closed loop running?
- Effects of technology combinations, for example can the scrubber system be used alongside selective catalytic reduction (SCR) technology, and the effects of this on future SCR maintenance?
- Implications of future NO_X regulations and assessments as to whether further retrofit or upgrades are required?

• Operators have concerns about financial liabilities associated with their use and have been unable to accurately forecast the capital, operational and maintenance costs (including installation time) associated with the scrubber systems. Problematical areas include:

  - Space requirements of the systems and whether this may result in a loss of revenue generating space?
  - Forecasting additional power needs and costs. Operator assessments have indicated that the electrical power needs may require almost exclusive use of one of the auxiliary engines?
  - If dry scrubbing systems are used, the port facilities that will be required to dispose of chemical products. Operators have estimated the chemical consumption and costs, and estimate that around 40 tonnes may be required per week, pumped aboard using special equipment.
  - If wet scrubbing systems are used, fresh water consumption, storage and disposal needs are unclear.
  - Maintenance costs and expected operational lifetimes of equipment.

• Caveats and exclusions in suppliers' contractual offers, or scope of works. In a number of specific areas, operators perceive that these have either required them to take a disproportionate level of commercial risk, or prevented them from sufficiently understanding their commercial risk.

  - Installation of the scrubber systems have been the ship owner's responsibility. Limited technical guidance or specifications have been provided, which could be passed on to the shipyard, to aid the installation process.

- Insufficient clarity has been provided on, for example, delivery time and duration of installation; the requested contractual time allowances for supplier repairs and performance failure have been, in the operator’s view, substantial and are likely to have operational implications. Insufficient guarantees of functionality have been received, and these have predominantly been for test systems only.

- Contractual stipulations for performance guarantees have not, in the operator’s view, been satisfactory.

- Further technical detail has been contingent on performing an initial test study.

- Inability to install the system within the standard maintenance windows or during major refit period (typically the latter are of two to three week duration, every two years). Operators have estimated that installation will occupy all of this time and a further 4-5 weeks (alongside other work) to allow the shipyard to complete installation, with approximately three further days testing at sea.

- Operators who have approached shipyards to discuss installation have received what they consider to be insufficiently firm offers, due to their inexperience with the technology.

- Deadweight and age of vessel. On ships that are older than 20 years, operators do not consider that the revenue generating potential of the ship justifies expenditure that would be required to install a scrubber. It is likely that such ships would therefore be sold. In addition, the weight of the scrubber system, may affect the deadweight of the vessel and hence the volume of freight/passengers carried.

- The Europe wide recession is further limiting operators’ ability to raise suitable finance.

A proposal to reduce the current pH 6.5 limit for wash-water discharges when ships operate in the open sea was recently discussed at the 17th meeting of the IMO's Sub-Committee on Bulk Liquids and Gases (BLG 17) (4 to 8 February 2013). Denmark presented a paper to BLG 17 suggesting achieving the pH 6.5 limit set in the 2009 guidelines is not possible for seawater scrubbers operating in open loop mode, and said research showed that pH 3 in washwater at sea presented no environmental threat. There are diverging views over whether the pH values of the discharge water from open loop scrubbers operating at full power in open sea comply with the wash water criteria. Therefore the BLG Chairman concluded that it is important to find out if current scrubbers exist which can meet the pH 6.5 discharge limit when operating in open loop mode before a change in regulation can be considered by the Marine Environment Protection Committee (MEPC). This uncertainty over the performance of open loop scrubbers and the likelihood of future changes to wash water criteria regulations is a further cause for hesitation in operators’ investment decisions. Furthermore, if a failure to adjust the pH limit does rule out several currently available systems from the market this would further restrict short term supply of suitable scrubber technologies.

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2.3.3 Technical Assessment of Scrubber Technology

Entec 2010. Study to Review Assessments Undertaken of the Revised MARPOL Annex V1 Regulations.

Entec (now AMEC) prepared a review of six studies[11] which examined the effect of revisions to IMO's MARPOL Annex VI regulation, in June 2010. This included an assessment of scrubber technology and usage at the time, which is summarised below. These studies have been prepared for a number of EU member state governments and are hereafter referred to by the nationality of that government.

As noted above, the most common type of scrubbing options for marine applications is sea water scrubbing (SWS) or open loop wet scrubbing systems. The Sweden (2009) and Finland (2009) reports acknowledge the limitations of using sea water scrubbing (SWS) in the Baltic Sea, for example, where alkalinity is lower than normal because of the minimal exchange of water through the Danish straits (it is usually constant and high). At low alkalinity SWS can still operate, but it can lead to lower cleaning efficiency (requiring greater volumes of sea water and/or additional reagent) and low effluent pH figures. Sweden (2009) notes that closed fresh water scrubbers may be more appropriate/acceptable, but are more expensive than open systems, can create work environment safety problems and require facilities in ports for handling sludge. The UK (2009) report notes that this technology is less well developed than the use of sea water (open loop) alone. To date, ships sailing in the Baltic Sea have not made use of scrubbers. ECa (2010) and ECb (2010) recommend that further studies are undertaken for brackish and river water.

Both UK and Finland (2009) remark that there are currently few manufacturers in the scrubber market, likely to be linked to limited demand (UK 2009) and production capacity. The UK report concludes that as demand increases, so too will production capacity, however manufacturers are unlikely to invest in sufficient capacity to meet all demand before 2020. It is not expected that demand will substantially increase in the near future and may only increase from 2015 onwards. The UK report states that industry does not consider likely a high percentage uptake

[11] The six studies reviewed and the references assigned dot these are as follows:

- Entec (2009): Impact Assessment for the revised Annex VI of MARPOL (prepared for the Maritime & Coastguard Agency, UK). [hereafter referred to as "**UK (2009)**"]
- University of Turku Centre for Maritime Studies (2009): Sulphur content in ships bunker fuel in 2015 – A study on the impacts of the new IMO regulations on transportation costs (prepared for the Ministry of Transport and Communications Finland). [hereafter referred to as "**Finland (2009)**"]
- Swedish Maritime Administration (2009): Consequences of the IMO's new marine sulphur fuel regulations. [hereafter referred to as "**Sweden (2009)**"]
- ITMMA University of Antwerp & TM Leuven (2010): Analysis of the Consequences of Low Sulphur Fuel Requirements (prepared for the European Community Shipowners' Associations). [hereafter referred to as "**ECSA (2010)**"]
- AEA Technology, TNO, IVL & EMRC (2010): Cost benefit analysis to support the impact assessment accompanying the revision of Directive 1999/32/EC on the sulphur content of certain liquid fuels (prepared for the European Commission). [hereafter referred to as "**ECa (2010)**"]
- SKEMA (draft April 2010): Impact study of the future requirements of Annex VI of the MARPOL Convention on Short Sea Shipping (prepared for the European Commission). [hereafter referred to as "**ECb (2010)**"]

of SWS. In addition, ECSA (2010) considers scrubbing to be an immature technology and does not expect it to play an important role in 2015.

The reports concur that for the commercial implementation of marine scrubbers to become viable, there are a number of challenges to be faced:

- Ecological concerns of sludge disposal – there is concern that sending seawater back into the ocean with S-containing wastewater is harmful to the marine ecosystem. There are IMO regulations on wash water criteria approved under Method B of IMO Annex VI Regulation 14. Criteria include pH, PAH, turbidity, nitrates, additives;

- Environmental concerns of sludge disposal - there are already some regulations stipulating performance, verification, and certification issues for SO_x scrubbers. IMO Resolution MEPC.130 (53) requires a SECA Compliance Plan (SCP) describing methodology for compliance by each ship using scrubbers rather than low-sulphur fuel;

- Availability of space on vessels – reports concur that retrofitting SWS in existing ships would be difficult and costly as the sludge cleaning equipment occupies a significant amount of space onboard which is not readily available (although this needs to be considered against the costs of low S fuel) and clearly depends on ship design/size;

- Design of new ships – the Finnish report argues that installation would be easier in new ships where necessary space could be designed at the planning stage;

- Interaction with other abatement measures such as selective catalytic reduction (SCR). SCR can be used along with SWS. If the SWS system is connected after the SCR system[12] however, issues of high back pressure on the engine could arise. Note that this would only be an issue for new vessels covered by the tightest NOx controls;

- Fuel consumption penalty associated with the operation of the unit; and

- New Technology – uncertainty over costs and technology.

The UK (2009) report finds that industry experts note that the amount of sludge produced is overstated and that the amount of sludge from in-vessel fuel treatment systems is higher than that from SWS. They also find that experts do not consider that the disposal of sludge should be an environmental concern. ECa (2010) assumes that compliance with sulphur limits can be achieved with the use of scrubbers with high sulphur fuel (2.94%).

None of the reports examines issues of reliability of scrubbing systems in detail, primarily as it is a relatively new technology with limited applications and hence empirical data. In instances where scrubber systems fail whilst the ship is at sea, the vessel would be forced to change over to an alternative fuel with appropriate sulphur content for the area in which the vessel is operating. Alternatively, the vessel would be off service until the scrubber fault was rectified. It should be noted that not all vessels have sufficient tank segregation to carry fuels of up to three

[12] Such a configuration is unlikely as the catalyst in the SCR will be poisoned if the exhaust gas has a high sulphur content, therefore SWS is more likely to be fitted before SCR to mitigate this. The exhaust may need to be reheated after the SWS to meet the operating criteria of the SCR unit.

different levels of sulphur content. ECa (2010) state that there is limited data on the performance of marine scrubbers and it is important to conduct more trials.

2.3.4 Cost estimates

The 2011 study reviewed costs associated with the installation of and use of scrubbers. The findings have been summarised here. There is high uncertainty regarding scrubber costs due to the small number of scrubbers currently in operation and the application of available cost data (in terms of € per installed kW) to different engine sizes. The reports concur that scrubber costs will be considerably higher for retrofit systems than for new systems and that closed systems are more costly than open ones. UK (2009), ECa (2010) and ECb (2010) include information on scrubber costs in their analyses, supplemented with more recent costs estimates, taken from consultation with several operators in January 2013 (Table 2.3 and Table 2.4).

Table 2.3 Comparison of scrubber costs and assumptions (from Entec 2011 review)

Study	Key Assumptions	New Build Capex (€/kW)	Retrofit Capex (€/kW) (Note 1)	Abatement Efficiencies	O+M Costs
UK (2009)	• Focuses on SWS (2009 prices) • Assumed capital costs of installing scrubbers to main engine only (separate costs given for combined installation to main and auxiliary engine) • Expected lifetime: 25 years • Fuel consumption penalty: 1.5% • Sensitivity scenario has been considered whereby scrubber costs reduce by 50% due to increased commercialisation.	122	156	SO_x up to 95% reduction. PM up to 80%	Per year: small: 3%; medium: 2%; large: 1%
ECa (2010)	• Separately considers prices for open/ closed scrubber systems (2005 prices) • For closed systems, purchase of NaOH and fresh water are taken into consideration. NaOH cost: €0.5/litre 50% NaOH • For SWS maintenance costs and fuel penalty are taken into account. • Expected lifetime: 15 years for new, 12.5 for retrofit • Fuel consumption penalty: 2%	100-200	200-400	Assumes abatement up to 97%	k€/vessel (15MW): 28 (incl sludge disposal costs of €0.12/ litre)
ECb (2010)	• Focuses on SWS (2009 prices) • Cost data based on Entec (2005) report for the European Commission with 10% reduction applied to account for new manufacturers of scrubbers entering the market. • Expected lifetime: 15 years	118	168	Range based on scrubbers from different manufacturers: SO_2 93-100%; PM 50-85%	€/MWh: small 0.8; medium 0.5; large: 0.3

Note 1: Based on discussions with industry, the retrofitting of a scrubber will require an off service period of up to 28 days which is considerably longer than routine dry-docking and refits of the same vessels. Operators therefore have to factor in the additional loss of revenue due to the time off service. These additional costs do not appear to have been taken into account in the figures quoted above.

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Table 2.4 Costs estimates from industry consultation (January 2013)

Current Position/Operator	Operator 1	Operator 2	Operator 3	Operator 4	Operator 5	UK Chamber of Shipping/Average
Capital Cost Estimates (per unit)	£6 million	£6 million*	Confidential	No data received	£9 million	£7 million
Operational Cost Estimates (per installed unit, per year)	£500,000	£700,000*	Confidential	No data received.	£3 million**	£1 million

Source: Confidential consultations between the consultants and operators'. *Based on an average, operational costs are estimates from the operator. **Broad estimates based on lost revenue incurred from ship being out of service during installation and power requirements. Note: where data has been provided in Euros, these have been converted to pound sterling using exchange rate at December 2011.

2.3.5 Conclusions

Exhaust gas scrubbers are an emerging technology for shipping. A number of barriers to investment are still to be over-come before take up is likely to become widespread. The consensus from the shipping operators that have been consulted as part of the study is that the currently available abatement technology is not sufficiently proven for ship owners to switch with confidence and demonstrate compliance *within the time period required by the legislation.* As such this would appear to be an unrealistic option for achieving compliance by 2015.

2.4 Option 3: Alternative Fuel (LNG)

The use of liquefied natural gas (LNG) is a third potential option for MARPOL Annex VI compliance. LNG is naturally sufficiently low in sulphur that it is understood that its use would meet the requirements. Use of LNG would require some engine modification and upgrading of fuel tanks on board ship. In addition port operators would need to provide storage facilities and fuelling facilities at port.

2.4.1 Consultation Responses

As with scrubbers, consultation with the operators has highlighted a number of viability concerns, summarised below;

- Uncertainty over future LNG fuel prices. There is concern that as LNG becomes established as a shipping fuel, prices will be pegged to the price of LSF and therefore increase quickly and hence any cost saving brought about by using LNG rather than purchasing scrubbing equipment or using LSF may be temporary.
- Costs of retrofitting existing ships are considered prohibitively expensive. Estimates have been provided of between €12- €16 million (£10-£13 million) for retrofit of ship with one main engine and four auxiliary engines, meaning that LNG has not been seriously considered for existing ships. Costs for dual fuel use are also considered to be prohibitively high. The associated costs of transportation and storage are also unclear.

- Concerns about supply capability and resilience. The operators' view is that LNG suppliers have not/will not establish the infrastructure required to support its widespread use, until demand increases. There are three basic options for transportation and bunkering of LNG:

    1. Transportation by road and direct filling at port from a LNG tanker. This is relatively easy to establish, but it is not practicable or cost effective for quantities required greater than 20 tonnes.

    2. Transfer LNG from a terminal to ship, via a pipeline and loading arm. The infrastructure required is complicated and expensive and cannot be carried out in all harbours (reflecting the requirements of the Seveso[13] regulation). This is more suitable for larger volumes (up to 1,300 m^3 or more).

    3. Ship to ship (i.e. via a seaborne LNG tanker/barge, residing at port). This is considered the most practicable long term option. However, this requires a sufficient volume of LNG traffic, more than currently exists. Operators expressed concern about the upfront costs of commissioning barges and setting up the infrastructure and were concerned that these costs would fall largely on them. For operators sailing into ports with higher volumes and more users, costs may be more widely spread.

- The product is cryogenic and flammable, for ports that are in close proximity to urban areas; challenges are expected regarding permitting for the transportation and storage of LNG.

- One operator is designing the technical scope of a new vessel that will be able to run on LNG, alongside an MGO/LSF. The capital costs of the ship is likely to be substantially greater than both the cost of conventional (HFO/MO(LSF)) and scrubber fitted equivalents. The ship will not be delivered until after 2015 and is at research and development stage only.

2.4.2 Technical Assessments

Entec 2010. Study to Review Assessments Undertaken of the Revised MARPOL Annex V1 Regulations.

Of the six MARPOL impact studies reviewed, one (UK 2009) reviewed Liquefied Natural Gas (LNG) as a potential option for MARPOL Annex VI compliance. The report concludes switching to LNG is not considered a compliance option because of the small scale of potential uptake of LNG and the short/medium term barriers to implementation.

2.4.3 Conclusions

LNG is a more expensive option compared to scrubber technology or switching to LSF, but better from an environmental standpoint and would result in co-benefits from reduced greenhouse gas emissions. The greatest short term technical challenge is the delivery and provision of LNG in suitable quantities rather than the technical feasibility (although costs are high and depend on the configuration of the affected ship).

LNG may become competitive, in the mid to long term, if suitable infrastructure is in place (LNG terminal or ship to ship). LNG could become the most appropriate choice beyond 2020, where sulphur limits will be 0.5% outside

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[13] *Council Directive 96/82/EC on the control of major-accident hazards* –(Seveso II Directive) http://ec.europa.eu/environment/seveso/index.htm

ECA, although this depends on the price and availability of HFO. The European Commission is proposing that LNG refuelling stations be installed in all maritime and inland parts of the trans-European (TEN-T) core network by 2020 (2025 for inland ports), a total of 139 ports which account for about 10% of all EU ports. However, consensus is that it is not viable for existing vessels to be retrofitted to use LNG. Therefore, this LNG strategy supported by the Commissions will not lead to significant numbers of LNG vessels until ship-owners commence building new ships as part of a fleet renewal plan. As such it is not considered a viable option for existing vessels to comply with the 2015 0.1% Sulphur requirements in the Baltic/North Sea/Channel SECA

2.5 Option 4: Methanol

The use of Methanol as a fuel is currently being explored by some operators although retrofitting / conversion from HFO would be required with a high associated cost. The potential benefits of methanol as a fuel are said to include lower emissions of particulates and NOx. In addition, the increasing interest in methanol as a road transport fuel may soon lead to an opportunity for the shipping industry. However, Methanol is not currently widely available and it is perhaps too early in the R&D cycle to be considered suitable as a significant option for the industry at present. Given the short timescales between now and January 2015 methanol is unlikely to represent a significant means of meeting the new regulations right away but may of course develop as an alternative to switching to low sulphur fuels in the future. Methanol is beyond the scope of this report and has not been explored further.

2.6 Option 5: Use of Exemptions

The UK Chamber of Shipping favours the "implementation of tightly controlled route and time specific exemptions" once the 0.1% Sulphur requirement in SECAs comes into force in January 2015. The UK Chamber believe such exemptions offer the most realistic option to protect important UK trade routes, UK jobs, UK companies and the environment whilst preventing a predictable modal back shift from sea to land.

2.7 2.7 Conclusion

Given the technical and practical unavailability of LNG and scrubbers in the immediate future the only viable means of meeting the requirements of MARPOL Annex VI will be through switching to lower sulphur fuel.

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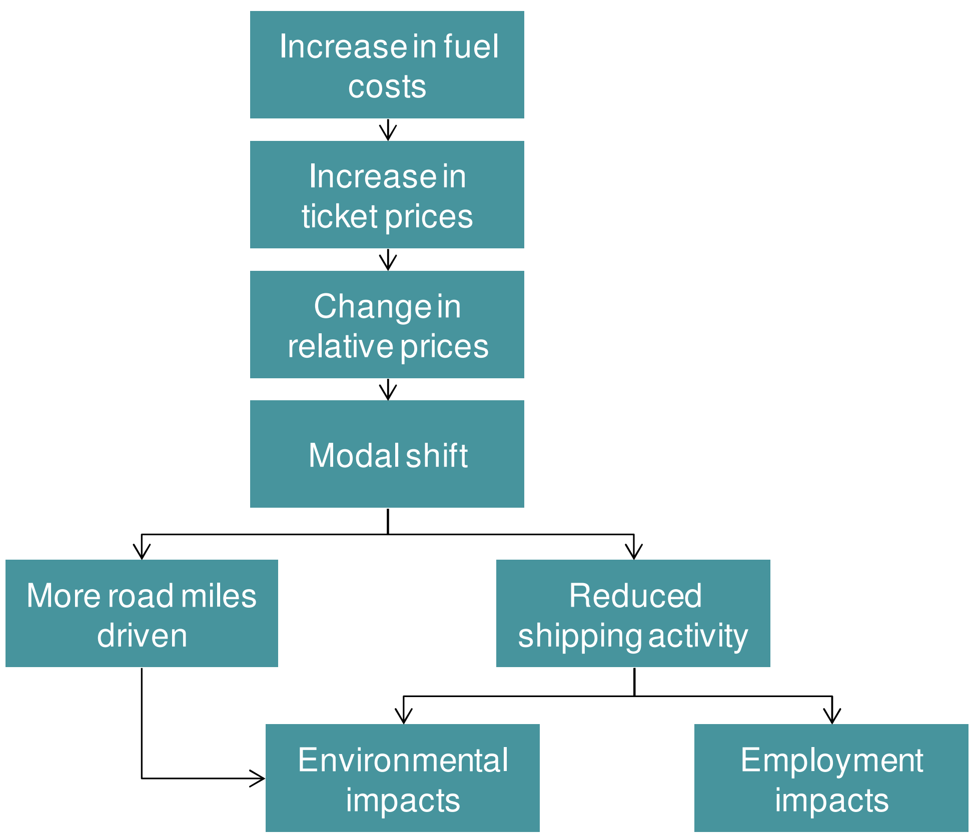
3. Analysis of the economic impact of switching to 0.1% Sulphur fuel

3.1 Overview

This section explores the economic and environmental impacts of the fuel switching option set out in the previous chapter. First, the anticipated costs associated with fuel switching are established. This is based on a review of available information on the costs associated with different types of fuel. Second, the effect of increased demand for middle distillate fuels on European refineries and fuel imports is considered, which has the potential to increase the cost of such fuels. Third, we consider the effect on fuel costs borne by operators on particular shipping routes and how this is expected to manifest in increased ticket prices for freight and passengers. Fourth, we consider how these ticket price increases can be expected to affect haulier (and to a lesser extent passenger) route choice and the extent to which modal shift may occur between longer sea routes to shorter seas routes, with the associated increase in road miles travelled in both the UK and on the continent from this traffic. Fifth, economic and environmental externalities associated with these road miles are considered.

Figure 3.1 Analytical approach



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3.2 Costs associated with fuel switching

3.2.1 Previous studies on price impacts

There have been a number of studies attempting to forecast the marine fuel price impacts of the MARPOL Annex VI Regulations. A comprehensive review of these is provided by Entec (2010), which summarises the following:

- Entec (2009): Impact Assessment for the revised Annex VI of MARPOL (prepared for the Maritime & Coastguard Agency, UK). [hereafter referred to as "**UK (2009)**"];
- University of Turku Centre for Maritime Studies (2009): Sulphur content in ships bunker fuel in 2015 – A study on the impacts of the new IMO regulations on transportation costs (prepared for the Ministry of Transport and Communications Finland). [hereafter referred to as "**Finland (2009)**"];
- Swedish Maritime Administration (2009): Consequences of the IMO's new marine sulphur fuel regulations. [hereafter referred to as "**Sweden (2009)**"];
- ITMMA University of Antwerp & TM Leuven (2010): Analysis of the Consequences of Low Sulphur Fuel Requirements (prepared for the European Community Ship owners' Associations). [hereafter referred to as "**ECSA (2010)**"];
- AEA Technology, TNO, IVL & EMRC (2010): Cost benefit analysis to support the impact assessment accompanying the revision of Directive 1999/32/EC on the sulphur content of certain liquid fuels (prepared for the European Commission). [hereafter referred to as "**ECa (2010)**"]; and
- SKEMA (draft April 2010): Impact study of the future requirements of Annex VI of the MARPOL Convention on Short Sea Shipping (prepared for the European Commission). [hereafter referred to as "**ECb (2010)**"].

These can also be supplemented by more recent studies, published since the Entec (2010) review. These include:

- Bartholomew & Panagiotopoulos (2011): Options for lower-sulphur marine fuels (prepared for digitalrefining.com);
- Purvin & Gertz (2011): Supply and pricing of low sulphur fuels (prepared for the Interferry 36th Annual Conference, Barcelona, 3-6 October 2011); and
- Sweco (2012): Consequences of the Sulphur Directive (October 2012).

All the studies above recognise the difficulty in forecasting such price changes. This goes beyond the difficulty inherent in price forecasting in general, as it depends critically on the behaviours and investment decisions of both shipping operators and refineries.

The key considerations for these actors are briefly described below, in order to present a context in which the price forecasts found in the literature can be presented and interpreted. These are then used to select working figures for this study.

3.2.2 Uncertainties and assumptions

Shipping Operators

For shipping operators, the key uncertainty is as to whether to install scrubbers or not. The advantages of scrubbers are that SECA sulphur emissions requirements could be met by using cheaper high sulphur marine fuel oil such as IFO 180 or IFO 380 (HFO). However, this would require significant capital investment the cost of installation and taking the ship out of service is of the order of 6M Euro) and scrubbing remains a technology with limited track record and reliability issues to overcome in practice.

So far, all the studies reviewed assume that shipping operators will not install scrubbers in the near-term. For example, Sweco (2012) assume that most shipping lines will delay installing scrubber technology until there are more certainty over the performance of scrubbers and clearer indicators of the cost difference between the use of low sulphur fuel and the installation of scrubbers to achieve the same reduction of SO_2 emissions.

Therefore, a near-universal expectation is that marine sulphur emissions limits in SECAs from 2015 will be met via a switch to 0.1%S fuels.

Despite this, it remains recognised that, should the price differential between 1% S MFOs and 0.1%S distillates be large enough, and as scrubbing technology becomes more technically and economically viable, an increasing proportion of ship operators may eventually install scrubbers. This is particularly the case given that installing scrubbers on new ships is a lot cheaper than retrofitting them onto existing ones (Bartholomew & Panagiotopoulos, 2011). As such, the proportion of ships with scrubbers installed would be expected to naturally increase in time as older ships are retired and replaced by newer ones.

Refiners

For refineries, the key uncertainty is as to how they might meet the increased demand for 0.1%S marine fuel. Broadly, there are two ways in which this can be achieved;

- The first option, used traditionally, involves refineries reducing the sulphur content of MFO by blending it with increasing proportions of low sulphur distillates
- Bartholomew & Panagiotopoulos (2011) relate the rule of thumb that current intermediate fuel oil (IFO) is a blend of 75% MFO with 25% distillate. They expect that meeting new 0.1%S requirements will lead to these proportions being reversed, i.e. that distillates will replace the great majority of MFO in marine fuel. This rule of thumb is in line with other assessments, such as that by ICCT (2007), presented in
- The second option involves converting heavier residual oil (resid) into 0.1%S fuel useable in ships. This can be achieved by desulphurisation of resid to produce low sulphur MFO; or by converting resid into lighter distillate grades using techniques such as coking or hydrocracking. This has two main advantages over blending in that it (i) does not reduce the overall supply of distillate, for which there is a relative shortage that stands to be further exacerbated by ships switching to 0.1%S fuels; and (ii) utilises the heavier residual oil, for which there is an over-supply that also stands to be increased by such a switch. However, both desulphurisation and coking/hydrocracking would require many

refineries to undertake significant capital investments. These have been estimated by Purvin & Gertz (in Sweco, 2012) to be in the range of $0.5-1 billion per refinery, with a lead-time of 3-4 years. Similarly, Deloitte (2010) have estimated these costs to be in the range £440-770 million per refinery. It is worth noting that some analysts do not consider cokers to be a fully commercially mature technology (Sweco, 2012).

In this context, the preferred option for refineries would be for ships to install scrubbers and keep using high sulphur MFO. This would allow them to avoid the significant capital investment costs while maintaining their customer base for heavier residual oils. For this reason, it might be expected that refineries will be reluctant to invest in desulphurisation or coking/hydrocracking technologies until the regulatory and market conditions have stabilised and that shipping operators' responses are known, especially regarding the uptake of on-board scrubbers (Sweco, 2012, Purvin & Gertz, 2009).

Working assumptions

In line with the ship operator and refinery considerations presented above, our main working assumption is that both shipping operators and refineries will delay any substantial investments (in scrubbers and hydrocracking respectively) until there is greater certainty regarding the relative fuel prices between 1% S marine fuel and 0.1% S marine fuel (as well as confidence that scrubbers are reliable enough to achieve compliance). More specifically, our assumptions for 2015 are:

- Shipping volumes remain at 2011 levels;
- All shipping operators in the EU SECAs meet MARPOL Annex VI regulations by switching to distillate-grade fuel (low sulphur MGO), i.e. there is no immediate uptake of scrubbers or LNG;
- EU refineries do not undertake any immediate investments in resid desulphurisation, coking or hydrocracking; and
- Any increase in distillate demand for shipping that cannot be met by EU refineries is imported (see Section 3.3.2 below).

3.2.3 Price difference forecasts

All of the studies presented above provide some forecasts for the difference in price between low and high sulphur marine fuel, although the exact definitions sometimes differ, according to the exact sulphur content. Entec (2010) uses the price data and forecasts in the studies it summarises to produce a graph of fuel prices as a function of sulphur content, as presented in Figure 3.2. This graph presents an expected differential between 0.1%S fuel and 1%S marine fuel for 2015 in a broad range of €150-300 per tonne.

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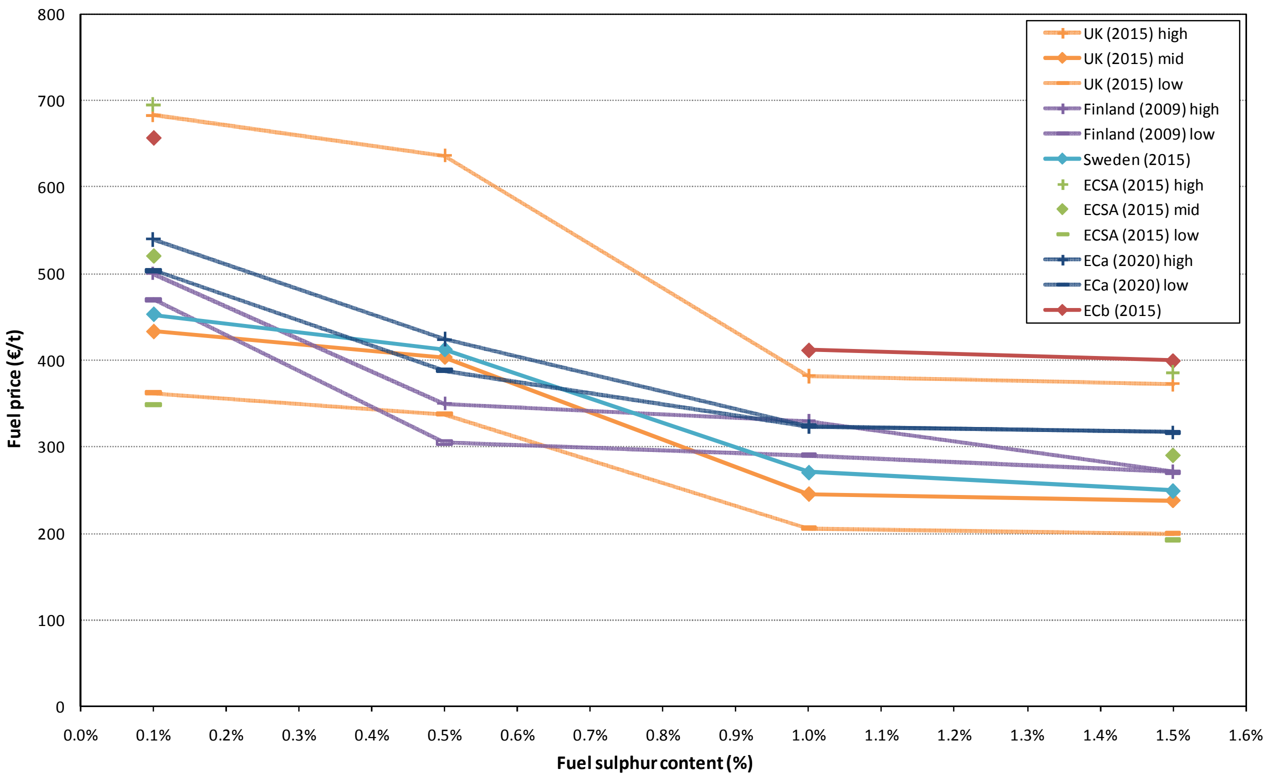
Figure 3.2 Assumed fuel prices (€/tonne) as a function of fuel sulphur content (%)



Source: Entec (2010)

Note: the assumed fuel prices in the above figure relate to different years, as included in the legend. Also, not all studies have data available to plot, such that for example the 0.1% S fuel price assumptions of ECSA (2010) and ECb (2010) are single points unconnected by lines, which gives them at first sight comparatively less emphasis.

The more recent studies also present some predicted values for such price differentials:

- Sweco (2012) estimate that the price premium for low sulphur fuels (mainly diesel) in the SECAs (i.e. the difference between 0.1%S and 1%S fuel) will rise from a "current" value of $290 per tonne to "more than" $350 per tonne in 2015;
- Bartholomew & Panagiotopoulos (2011) predict a price spread between 0.1%S distillate marine fuel and 1%S fuel oil of $24 per barrel. This is roughly equivalent to $320 per tonne[14]; and
- Purvin & Gertz (2011) predict a price differential between North West Europe gasoil and 1%S fuel oil of about $275 per tonne in 2015.

[14] This assumes 0.1%S distillate density of 890 kg/m3, 1%S MFO density of 920 kg/m3 (both from ISO 8217 fuel standards for 2010), and a1%S MFO price of $660 per tonne (from consultation).

3.2.4 Conclusions

The range of values in the three most recent studies is therefore **$275-350 per tonne**, with an average of **$315 per tonne**, which is consistent with the literature and consistent with current price differentials experienced by operators. It is therefore the range and expected value adopted in this study.

3.3 Effect of increased demand for middle distillate fuels on European refineries and fuel imports

3.3.1 Current trends

The oil extraction and refining market is a global one, with traded products making up around 20% for gasoline products and 50% of heavy fuel oil. The trade in refined oil products is important in balancing regional/national refinery supply with demand. Countries where refining capacity is small or otherwise unable to match local demand rely upon trade flows to meet these[15].

In recent years, Europe has been a net importer of kerosene and diesel/gasoil and a net exporter of gasoline and heavy fuel oil. This reflects European demand for gasoil/diesel increasing strongly between 1996 and 2006, with demand for gasoline declining[16]. Sweco (2012) report that the diesel deficit in Europe amounted to 30-40 million tonnes per year in early 2012 (equivalent to 300-400 TWh). This has resulted in increased imported gasoil products (particularly from Russia and the former Soviet Republics) whilst surplus gasoline has been exported to the US, where demand has grown strongly. Similarly, gasoline demand is expected to grow strongly in Africa and the Middle East, some of which will be met by European refineries. However, these exports are likely to face increasing competition from other exporters, reflecting increases to Middle Eastern and Indian refining capacity. In terms of gasoil/diesel, European imports are expected to continue to increase.

For heavy fuel oil, Europe has recently been a net exporter, reflecting a surplus in production relative to domestic demand. This has been primarily driven by a move away from heavy fuel oil in the power generation sector, especially following on from the introduction of the Large Combustion Plants Directive[17] (LCPD). Similarly, industrial users of heavy fuel oil have been switching to alternatives such as natural gas. It is thought the majority of European heavy fuel oil surplus has been exported to Asia (Purvin & Gertz, 2009).

These patterns and expected trends are presented in Figure 3.3, from Purvin & Gertz (2009). Overall, the recent pattern is expected to continue up to 2020, with the exception of heavy fuel oil, for which Europe is expected to shift from being a slight net exporter, to a slight net importer, reflecting announced refinery investments to reduce

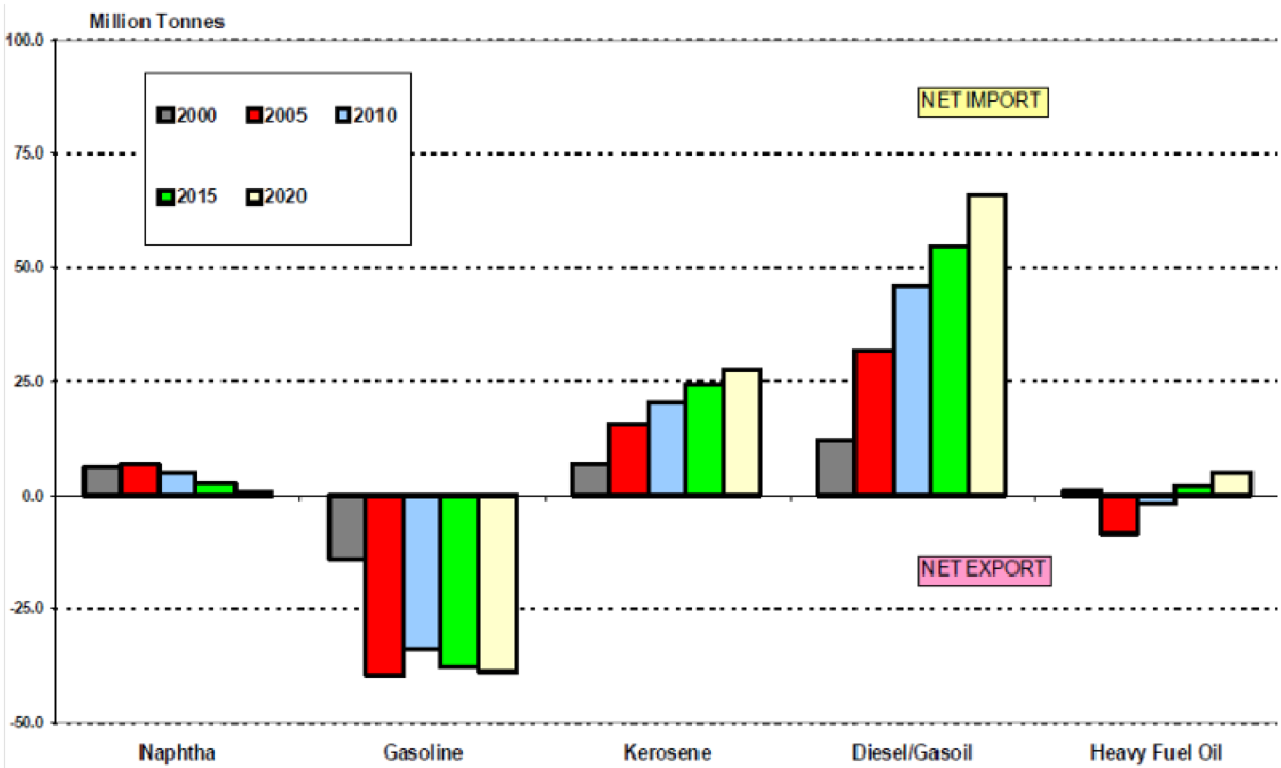
[15] Study on oil and oil refining, Purvin and Gertz Inc. 2008. http://ec.europa.eu/energy/observatory/oil/doc/refining/2008_01_study_oil_refining_oil_markets.pdf

[16] Figure A-1-1. Study on oil and oil refining, Purvin and Gertz Inc. 2008. http://ec.europa.eu/energy/observatory/oil/doc/refining/2008_01_study_oil_refining_oil_markets.pdf

[17] Directive 2001/80/EC on the limitation of emissions of certain pollutants into the air from large combustion plants.

heavy fuel oil production with a view to balancing European supply and demand. Most importantly, the gap between European demand and production of diesel and gasoil is expected to widen, thus driving greater net imports of middle distillate grades of fuels. It is important to note that these are baseline expected trends, i.e. *before* any shift in shipping fuel use.

Figure 3.3 Net European Trade Flows of Oil Products, 2009 estimate



Reproduced from: (Purvin & Gertz, 2009:42).

In the longer term, major investments in refining capacity are expected in China, the Middle East and India, which is expected to have substantial implications for European refiners as the quantum of exported products will increase, putting downward pressure on prices (albeit from a currently very high level). This may disincentives investment in plant and capacity; increasing the likelihood that products will be imported from elsewhere.

3.3.2 Impacts on refineries of increased distillate demand from shipping

As presented in Section 3.2.2, it is expected that refineries will be reluctant to invest in desulphurisation or coking/hydrocracking technologies until the regulatory and market conditions have stabilised and that shipping operators' responses are known, especially regarding the uptake of on-board scrubbers (Sweco, 2012, Purvin & Gertz, 2009).

3.3.3 Conclusion

It is expected that the entirety of increased demand for distillates will be met from imports, thus exacerbating the current trend in that direction. Similarly, the reduced demand for MFO this implies is expected to result in more exports of heavy fuel oil from Europe. This alone may be sufficient to bring Europe from being an expected net importer of heavy fuel oil in 2015-2020 (Figure 3.3), back to being a net exporter.

3.4 Impact on ticket prices

3.4.1 Introduction

This section explores the impact of the increase in fuel prices on the ticket prices charged to RoRo freight traffic, unaccompanied trailers (UT), container shipping and passengers. The approach has assumed that 100% of any fuel price increase would be passed on to customers. This is based on discussions with the operators. In addition, a data proforma was agreed with five operators, who subsequently provided a range of information on western channel and North Sea routes. This included information on categories of freight and passengers carried, fuel use, fuel prices, revenues, operating margins, number of trips and distances travelled and current ticket prices. This information has formed the basis of the analysis presented here.

All data is based on 2011[18] as at the time of data collection, this was the last full year for which data was available. It is presented in pound sterling, using exchange rates prevailing at December 2011, where applicable. All but three of these routes relate to trips taking place entirely within the SECA. The analysis assumes that where journeys take place beyond the SECA boundary, operators will switch from using LSF to HFO, and therefore not incur additional fuel costs. The information has been made available on the basis that commercially confidential data would not be presented in the final report; hence the results are anonymised and in summary form. Moreover, whilst operators have provided standard information, it has been derived in slightly different ways. These differences are explained in footnotes to the text.

The selected routes comprise a total of nineteen RoRo, RoPAX and container services operating from thirteen ports in England and Scotland and to France, Spain, Sweden, Denmark, Germany, Holland, Belgium and Poland. The routes analysed relate to some 4.6 million kilometres travelled at sea, from a total of 38 ships making some 1,200 journeys and using 1.6 million tonnes of HFO, alongside some 10,300 tonnes of MGO (LSF). In total, some 3.3 million passengers, 500,000 lorries, 100,000 unaccompanied trailers (UT) and 110,000 containers[19] were carried on the routes analysed.

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[18] In a small number of instances, data was provided for financial rather than calendar years. For the purposes of the assessment, data for '2011-2012' has been treated the same as data for '2011' as the data has been used to estimate typical costs and volumes carried in a twelve month period.

[19] All information was based on 2011 data.

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3.4.2 Overview of Approach and Key Assumptions

The data which was received from the operators has been collated and analysed in a series of steps, which are explained below.

Information on existing operations and costs

- Fuel costs: data was provided on the total fuel use (tonnes), per ship, per route for 2011 broken down by usage of both Heavy Fuel Oil (HFO) and Marine Gas Oil (Low Sulphur Fuel (LSF)). In addition, information on the prices paid for these fuels, again in 2011, were given (typically annual average fuel prices, per tonne). These figures were multiplied to provide a total annual fuel cost, per ship, per route. Details of existing total revenues, annual numbers of sailings were also provided, per ship and route.

- Freight volumes and passengers carried: operators provided details of the total number of passengers, lorries, unaccompanied trailers and containers carried by route, ship and year.

- Ticket prices: 2011 ticket price data was provided, for passengers, lorries, UTs and containers.[20]

Estimating future costs associated with MARPOL Annex VI compliance

- Estimating future fuel costs: the additional cost per tonne that operators are expected to pay for LSF under the three price scenarios (that the price will increase by $275, $315 or $375 described above has been added to the price that operators paid for HFO, per tonne in 2011. No allowance has been made for substantial differences in fuel efficiency or calorific value. This revised fuel price is then multiplied by the total quantum of HFO fuel used, per ship and route to provide an estimated annual fuel bill, assuming the MARPOL Annex VI restrictions are in place. This is then subtracted from the 2011 fuel bill to indicate the total 'revenue gap' that would need to be recouped from ticket sales, if existing operating margins are to be maintained. The total HFO fuel bill for 2011 was £160 million; the total future fuel bill, assuming the current configuration of ships and distances remain unchanged, would be some £230 million; resulting in a revenue gap of some £70 million[21].

- Apportioning increased fuel costs to freight and passengers carried (details of the approach used and a hypothetical example are provided below and in Table 3.1):

[20] This information has been provided in slightly different ways, depending on the data collections methods of the respective operators. For one operator, 2011 average passenger ticket prices were derived by total revenue generated from passengers, divided by the number carried. Another operator provided revenue generated from Lorries, per 'Lane-metre' (i.e. per metre of used garage space). In this instance, ticket prices were estimated by applying a revenue per lane metre, multiplied by an estimated average lorry length. The average used was 16.5 metres (i.e. the average maximum length of an articulated lorry, which was considered appropriate, given the routes under consideration. Other categories considered, but not used, were rigid vehicles and 'road trains' (i.e. a lorry and trailer). Source: 'UK regulation: Road Vehicles (Construction and Use) Regulations 1986 (SI 1986/1078)' available from http://www.worcestershire.gov.uk/cms/pdf/2009-Oversize-&-Weight-limits.pdf'.

[21] Note, numbers rounded.

- Total ticket revenues generated from passengers, lorry, UTs and containers were identified by multiplying average prices by the number carried, in each category[22] (For example, route 1 may generate £400,000 from 10,000 passengers each paying £40 per trip).

- The proportion of total revenue accounted for by each of these categories (for example on route 1, 20% of total revenue is accounted for by passengers, the remainder by lorries) was then applied to the total additional fuel cost, to identify the annual revenue gap that would need to be recouped, from each category of customer (for example the fuel price increase is estimated to result in an additional cost per year of £290,000, hence 20% of this amount, £58,000, would need to be recouped from the 10,000 passengers on that route, through ticket sales).

- This provides an amount that would need to be recouped, per passenger, which is then added to the 2011 ticket price to provide a future ticket price. The two figures are compared; the percentage increase, per category and route are set out in Table 3.2 and Table 3.3[23].

Table 3.1 Approach to estimating ticket price increase

*Relevant ticket revenue = average prices * units carried (e.g. number of passengers).*
Proportion of total to be recouped by unit type (e.g. passenger) = Relevant ticket revenue / total ticket revenue
*Revenue to be recouped from unit type (e.g. passengers) = total costs associated with fuel switching (Note 1) * proportion of total revenue to be recouped by unit type*
Cost to recoup per unit type = Revenue to be recouped from unit type / units carried
'Future' ticket price = Cost to recoup per unit type + 2011 ticket price
Percentage increase in ticket price = new price - the old cost per ticket / old ticket price.

Note 1 see' fuel costs' paragraph above.

Three scenarios have been presented, based on a 'low', 'central' and 'high' estimate of future LSF price increases, set out in the previous chapter. The approach assumes that current use volumes of HFO will switch entirely to LSF and that this LSF will cost between $275 or £176 (low scenario); $315 or £202 (central scenario); and $350 or £225 (high scenario) more per tonne than current prices paid for HFO. The price increases have only been applied to the volumes of HFO used; current usage of LSF (used in port for manoeuvring or powering on board systems whilst in dock) has not been included in the estimates of additional fuel costs.

Effects of fuel switching on ticket prices – Western Channel Routes

The results of the analysis for Western Channel Routes are shown below. It suggests that ticket prices, per passenger, would increase between an average of 9% and 12%, with small differences between routes in the price increase expected. Ticket prices for lorries and unaccompanied trailers are expected to increase between 12% and 16%, with larger differences between routes. Containers are not carried on the Western Channel routes analysed.

[22] Note, in terms of passenger prices, the data presented below shows the percentage increase in the price paid per passenger (not per car) the percentage increase paid per car/family would be greater than set out here.

[23] Note that where a number of different ships were used on particular routes in 2011, an average has been taken.

Table 3.2 Estimated Ticket Price increases - Western Channel Routes

Route	Passenger (PAX)			Lorry			Unaccompanied Trailer (UT)		
	Low	Central	High	Low	Central	High	Low	Central	High
WC 1	10%	12%	13%	10%	12%	13%	10%	12%	13%
WC 2	n/a	n/a	n/a	21%	25%	29%	21%	25%	29%
WC 3	8%	10%	12%	8%	10%	12%	8%	10%	12%
WC 4	9%	10%	12%	9%	10%	12%	9%	10%	12%
Western Channel Average	***9%***	***11%***	***12%***	***12%***	***14%***	***16%***	***12%***	***14%***	***16%***

Source: AMEC, based on operator data. *Note n/a denotes data unavailable or missing.

Effects of fuel switching on ticket prices – North Sea and Container Routes

The same approach has been taken to estimating ticket price increases on North Sea and container routes. The shaded cells denote routes where the relevant unit type is not carried, or data was not provided[24]. In this sector there is greater variance between distances, volumes and ship types, which is reflected in wider percentage increases between routes. Overall, passenger prices are expected to increase by between 10% and 13%. For lorries ticket prices are expected to rise by between 11% and 14%; for unaccompanied trailers by between 9% and 13% and containers between 7% and 10%.

Table 3.3 Estimated Ticket Price increases – North Sea and Container Routes

Route	Passenger (PAX)			Lorry			Unaccompanied Trailer (UT)			Containers		
Scenario	***Low***	***Central***	***High***	***Low***	***Central***	***High***	***Low***	***Central***	***High***	***Low***	***Central***	***High***
NS 1				9%	11%	12%						
NS 2	13%	15%	17%	13%	15%	17%						
NS 3				15%	17%	19%						
NS 4				14%	17%	18%						
NS 5				9%	10%	12%						

[24] As above, one operator provided revenue and price information for Lorries in terms of Lane-metres (i.e. the amount of revenue generated by one lanemetre). This figure has been used to estimate total revenue on that route, and average ticket prices per lorry, based on an assumed average lorry length. The operator provided passenger ticket prices directly. The two figures have been added to provide total ticket revenue. The subsequent approach to estimating ticket price increases on the routes operated by this company is the same as set out above, i.e. identify proportions of ticket revenue generated by each category of passenger, apply this proportion to total fuel costs that would need to be recouped; identify the cost per passenger or lorry, then add this to existing 2011 ticket price and establish a percentage difference.

Route	Passenger (PAX)			Lorry			Unaccompanied Trailer (UT)			Containers		
NS 6				17%	19%	21%						
NS 7	16%	18%	20%	16%	18%	20%						
NS 8										5%	6%	7%
NS 9										7%	8%	9%
NS 10										6%	7%	8%
NS 11	7%	8%	10%	7%	8%	10%	12%	15%	17%	12%	15%	17%
NS 12	5%	7%	8%	5%	7%	8%	5%	7%	8%	5%	7%	8%
NS 13	8%	10%	11%	9%	10%	11%						
NS 14				10%	11%	12%						
NS 15				9%	11%	12%				9%	11%	12%
North Sea Average	***10%***	***12%***	***13%***	***11%***	***13%***	***14%***	***9%***	***11%***	***13%***	***7%***	***9%***	***10%***

Source: AMEC, based on operator data.

3.5 Impact on customer behaviour and modal shift

3.5.1 Introduction

This section explores the extent to which the ticket price increases set out in the previous chapter are likely to affect the route decisions of freight and passengers and lead to a modal shift from longer sea routes, to shorter sea routes with the associated additional road miles travelled. Passengers in particular may also have the option not to travel. This chapter explores the extent to which this modal shift is likely to occur and the economic and environmental impact of this.

Such modal shifts are only expected to occur where the costs of travelling to the relevant port are less than the expected ticket price increase. We assume that hauliers (i.e. freight traffic) are more price sensitive, given the commercial pressures, and are more likely to reallocate their traffic. This, in turn, supposes that the current distribution of traffic volumes on the Western Channel and North Sea routes are financially and operationally optimal. Hauliers' decisions are therefore represented by a comparison of the ticket price increase with the cost of driving additional road miles to access short sea ferry services.

Changes in the distribution of traffic are likely to result in a number of potential knock on impacts. These include adverse impacts for viability of ferry services and their frequency, with associated impacts to port revenues and employment. Reductions in traffic may also have further effects on ticket prices and on competition between operators on routes, which are clearly dynamic. Freight hauliers who do not switch routes will however still have to bear the additional costs of travel, which may affect the viability or configuration of haulage operations or the prices charged. Passengers are expected to be less price sensitive and we understand many, particularly those

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travelling on the western channel routes, own property in France or Spain, however price increases may well affect frequency of travel, travel in peak seasons and short breaks.

3.5.2 Approach

From an economic perspective, the increase in ferry company fuel costs can be characterised as a shock to a market in equilibrium. This shock to supply costs leads to price changes which then affect demand. Eventually a new equilibrium develops reflecting two impacts, firstly an overall rise in prices leading to a change in overall level of the market - the total goods or passengers carried - and secondly, a change in demand for different routes according to movements in relative prices between them.

For analysis, these two effects can be treated independently. The overall market effect is often seen as the most important in this and similar cases as it affects the total size of the sector, whereas the movement in relative prices affects only the balance between different parts of it. In principle, such a shock may exhibit these two effects in different proportions with the possibility of either no change in the overall market or no change in the movement between routes. The likelihood of these outcomes depends on the alternatives available and price sensitivity of the different customer groups.

At the level of the overall market, the main issue is whether current users have alternatives which mean that they no longer make use of ferry services. A good example of this is in the leisure market where a more expensive cross-channel break by car may be replaced by a visit by air to a European city. For freight, the effect at the level of the overall market is less important as freight costs are a relatively small proportion of the final price paid by the consumer for all goods except certain bulk commodities. However, hauliers are likely to be very sensitive to the relative costs of different routes as their choices are constrained by few factors other than price. For example, final consumers typically will not care which route was taken and only some goods, such as hazardous cargoes need specific handling and shipping facilities only available on some routes. In simple terms, the freight market is therefore very sensitive to the structure of prices but less to the overall level while the leisure market is less sensitive to price structures but more to the overall price levels.

The freight market consisting predominantly of trucks and trailers and leisure market were understood as different market sectors and could be analysed independently. Freight is the primary market by volume and value to ferry operators, and the analysis focuses on this market first.

The analysis focuses on the relative attractiveness of key routes in the Northern and Western sections of the market when tariffs increase. These routes are Harwich-Holland and Portsmouth-Caen respectively. Changes to these routes provide the evidence that can be related to routes with lower traffic densities (such as the routes through Poole and Tilbury).

The availability of specific data was substantially greater for the North Sea than for the Western Channel and this conditioned our approach. A detailed route by route haulage analysis was undertaken for the North Sea crossing and this was used as an example to estimate the impacts on the Western channel.

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3.5.3 Tariff increases

Fuel costs are a cost that is relatively simple to apportion across a shipping fleet as, following basic economic and accounting theory, all the fuel costs of a ship on a route should be paid for by customers using that route because all these costs would be avoidable if customers did not travel. Any rise in fuel costs will therefore result in a corresponding rise in tariffs for each customer class based on their current tariff as already described. In summary, the result is that the increase is of a similar proportion in percentage terms for all customer classes and both freight and passengers will see the same percentage increase in the headline price of a ticket.

In assessing their response to high prices, leisure customers may compare this new price of a ticket with their alternatives, for example the costs of alternative ferry routes and costs of alternative holidays. Freight customers will simply look at the impact on the relative costs of different routes between the endpoints of their haulage contract.

For a haulier, alternative freight routes will differ according to a number of factors that affect their final choice including security and reliability of service, both of which come ahead of price in a recent report (Malmqvist 2013). Differences in security levels between ports has not been highlighted in the evidence collected for this analysis while reliability of service in terms of its frequency is understood as having a potential impact, though short sea crossings which may substitute from the longer crossing may also have better service frequency from the perspective of a haulier.

Non-price factors are likely to be of different levels of importance to individual hauliers depending on their cargos and customers and so may not always lead to a financial benefit. The impact of tariff increases will however directly affect all hauliers financially. Choosing a different route is a simple method of mitigating such increases and there are no additional costs in changing route which makes it relatively easy for hauliers to switch. We understand even long term contracts for bulk purchases of crossings are not longer than a year and frequently less.

Hence, in the freight market for UK-continent crossings, price is the dominant decision variable. The access to a more frequent service may add a small additional impact. This frequency effect would be enhanced if switching is sufficient to reduce demand and so the number of ferry sailings on the route being switched away from and further if it increases the number of sailings on routes that hauliers switch to. Both these might happen if ferry operators were to move a ship operating on the Hoek van Holland-Harwich crossing to Dover-Calais in response to hauliers also moving to the short sea crossing.

For hauliers, no new route is expected to have a smaller road distance and moving away from an existing route is assumed to require additional road miles. From a purely financial perspective, the decision to drive an additional distance will depend on the saving in ferry tariffs that could be achieved. Equally, the level of tariff increase determines the distance they would be prepared to drive which in turn depends on the haulier's cost per kilometre.

The table below shows the tariff increases calculated for each of the routes of interest to this study and in the right hand columns the equivalent driving distances. For example, the tariff increase for a haulier using the Portsmouth-Caen route in the low fuel price scenario would be £33. The equivalent distance they would be prepared to drive is 38km if each km is costed at the total costs of running a truck and 86km if each km is costed to include just the fuel and other operating costs. Even leaving aside the non-price factors, this example shows the wide range in the propensity to switch resulting from the cost models that hauliers are actually using. The economic analysis of this issue would best be related to the use of the truck over the long term. Hauliers using the truck extensively for cross-channel work would find that they would need to recognise some of the non-fuel costs in their decisions, or they might find that the saving in tariffs was insufficient to account for wear and tear (depreciation) and other non-mileage related costs. However a truck that is used only intermittently for cross-channel work might find that the few additional kilometres will not affect noticeably affect wear and tear , the cost of which are largely covered by other work. Older trucks which for example have been fully depreciated will have costs somewhere in between these upper and lower limits.

This leads to possibly counter-intuitive result. Trucks which are used regularly, even if old, may not find the additional distances worthwhile when costed at the cost of fuel only as the regularity of use does have other appreciable costs such as wear and tear which may reduce truck life. These trucks will therefore not drive the maximum distances shown in the table below to avoid the tariff increase. However, trucks used less regularly have a greater incentive to profit from what for them is an infrequent event. As the first group are the more regular users, they make up the bulk of the traffic and so qualitatively there may be an overall reduction in the switching that might otherwise be expected.

Table 3.4 Tarff Increases (freight)

	Volumes	**Sea Distances**	**Tariff increases as equivalent road km(all road costs)**		**Tariff increases as equivalent road km(operating costs only)**	
			(1) Low fuel price	(2) High fuel price	(1) Low fuel price	(2) High fuel price
	units	Km	km	Km	Km	km
Dover - Calais	113038	43	-	-	-	-
Portsmouth – Caen	22242	181	38	49	86	110
Poole – Cherbourg	7153	122	38	52	86	117
Plymouth – Roscoff	5889	187	19	38	43	85
Portsmouth – Bilbao	95935	1,000	193	247	433	555
Gothenburg-Immingham	15764	922	158	201	355	452
Esbjerg-Harwich	68730	633	111	141	249	316
Esbjerg-Immingham	22366	609	100	127	224	285
Cuxhaven-Immingham	104121	624	105	134	237	302

	Volumes	Sea Distances	Tariff increases as equivalent road km(all road costs)		Tariff increases as equivalent road km(operating costs only)	
Vlaadingen-Immingham	7904	369	52	66	117	149
Zeebrugge-Rosyth	23151	733	122	155	275	350
Amsterdam-Newcastle	43480	500	176	224	396	504
Hull-Zebrugge	95417	372	22	32	50	73
Hull-Europort (Rotterdam)	142000	368	22	32	50	71
Hoek van Holland-Harwich	79000	204	36	46	81	104
Hoek van Holland-Killingholme	60300	367	48	61	108	137
Rotterdam/Europoort-Harwich	18700	204	27	34	60	77
Tilbury – Zebrugge	113038		36	46	81	104

Source: Road distance summaries from IRN; Tilbury-Zeebrugge tariffs explicitly set to match Hoek van Holland - Harwich

This table is important to the analysis of routes as it provides a method of identifying the maximum additional driving distances that might apply for different routes and hence defines a limiting case for possible switching away from a particular route. If the total additional driving distance using a new route through a different port is greater than this maximum, it is not in a haulier's interests to switch away from the current route. As a further simplification, if the additional distance required is greater than the maximum driving distance in the table (555km), then no further consideration is required to confirm that a switch will not occur.

Using this approach, some switching scenarios can be investigated immediately.

The increase for the routes using Hull is less than the increase for Harwich and Killingholme routes and, based on this alone, traffic through Hull traffic will not switch to either Harwich or Killingholme. Traffic using Hull will also not switch to the Short Sea crossings as the distance from Hull to Dover is greater than the 555km maximum distance. This simplified analysis is supported by the fact that the price increase for the Hull routes over the short sea routes is equivalent to a maximum of 73km, insufficient to reach Killingholme or Dover.

On the Harwich routes the greatest additional cost a haulier would be exposed to is £40. The Tilbury-Zeebrugge route is a probable alternative for some hauliers but a switch from Harwich routes to Tilbury routes is not expected as they have the same sea distances and shipping tariffs are expected to rise almost identically, though tariff rises have not been calculated explicitly for the Tilbury route.

The only plausible main switching dynamic for North Sea routes is away from Harwich or Tilbury to routes using short sea crossings, and the maximum saving available to a haulier is £40.

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When expressed in terms of road distance this would be equivalent to the costs of driving 104km for a haulier seeking to cover only mileage costs (principally fuel). It would fall to 46km for a haulier with a cost model where all vehicle costs were covered. In the scenario with lower shipping fuel costs and correspondingly lower tariff increases, the equivalent road distances are correspondingly reduced, but are of a similar order of magnitude - 36km and 81km.

Therefore, on the North Sea under all scenarios of shipping fuel costs and haulier cost models, the range of possible distances that a haulier would consider driving are between 36km at the low end and 104km at the high. In particular, no haulier would switch if they had to drive further than an additional 104km.

Dover-Calais prices also increase as a result of the shipping fuel increases, this increase has been calculated to be approximately £6/trip although we did not have the same level of detail behind that calculation as was available for the other routes should the real price effect be greater the relative advantage of Dover-Calais would correspondingly reduce and in these circumstances the upper limit for road distances is reduced which marginally reduces the impacts.

3.5.4 Market Structure

Geographically, the cross-channel market divides fundamentally into two; the section to the west of the Dover straits and the section to the North of the straits. In each of these sections, the reference price has been taken to be the Dover-Calais price. This provides the benchmark route with the shortest sea crossing and, by implication, often the longest distance travelled on land. The volumes of traffic in the freight market on reference routes[25] are shown in Table 3.5

As a result of the geography, when shipping ticket prices increase, there is an incentive for road traffic to divert to the Dover straits where costs are lower due to the shorter sea crossing. Traffic increases on the short sea routes (Dover-Calais, Dover- Dunkerque, Folkestone-Coquelles (via Eurotunnel)) and away from the main western routes (predominantly Portsmouth-Caen) and the North Sea routes (Harwich-Holland, Tilbury-Zeebrugge, and the more Northern ports to the Netherlands).

[25] These reference routes are used to correspond to the haulage endpoint data analysis.

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Table 3.5 UK- Continent Freight Market Volumes on Reference routes

	Market Western Channel and North Sea				
	Total Freight Units	(Cab and Trailer)	Trailer	Sub total	%
Dover/Calais (P&O)	1,067,597	1,031,459	36,158		
Dover-Calais (Sea France)	533,367	530,911	2,456		
Dover/Dunkerque (DFDS)	468,267	462,247	6,020		
				2,069,231	49%
Eurotunnel	1,263,322	1,263,322			
				1,263,322	30%
Newhaven/Dieppe(Transmanche Ferries)	37,364	34,764	2,600		
Portsmouth Le Havre (LD Lines)	24,867	24,014	853		
Portsmouth-Caen (Brittany)	110,311	89,637	20,674		
Portsmouth-Cherbourg (Brittany)	2,368	2,060	308		
Portsmouth-St. Malo (Brittany)	13,423	11,584	1,839		
Portsmouth-Bilbao (P&O/BF)	8,986	6,449	2,537		
Portsmouth-Santander (Brittany)	8,196	5,651	2,343		
Poole-Cherbourg (Brittany)	22,263	19,901	2,313		
Poole-St Malo (Brittany)	-	-	-		
Poole-Santander (Brittany)	11,956	9,741	2,215		
Plymouth-Roscoff (Brittany)	7,016	6,060	956		
Plymouth-Santander (Brittany)	1,160	1,108	52		
Plymouth-St Malo (Brittany)	143	136	7		
				248,053	6%
Teesport/Rotterdam (P&O Ferries)	47,431	1,392	46,039		
Teesport/Zeebrugge (P&O Ferries)	102,729	2,007	100,722		
Hull/Rotterdam (P&O Ferries)	128,489	46,063	82,426		
Hull/Zeebrugge (P&O Ferries)	72,938	10,384	62,554		
Killingholme/Hook of Holland (Stena Line)	78,773	42,045	36,728		
Harwich/Hook of Holland (Stena Line)	142,346	91,610	50,736		
Harwich/Rotterdam (Stena Line)	67,267	6,846	60,421		
				639,973	15%
		Total market		4,220,579	100%

Source: summaries from IRN; operator submissions to this project

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3.5.5 North Sea freight routes

Haulage data was provided which covered current patterns of traffic from a major logistics operator. It comprises data for specific haulage routes and includes:

- The UK endpoint (UK town);
- Continental endpoint (country);
- Crossing used;
- Tonnage shipped;
- Number of journeys; and
- UK and continental road distances.

The information relates to 2012 and relates to freight journeys across the North Sea, rather than through Western Channel routes; data is provided for both westbound (i.e. Continent – UK) and eastbound (i.e. UK-Continent) directions. The data can be understood as a sample of the North Sea market and makes up approximately 10% of the traffic on the Harwich, Hull, Immingham-Netherlands and Tilbury routes. It is for unaccompanied trailers only and excludes traffic from one operator.

The total traffic tonnages eastbound reported by this operator are 28% less than westbound though this may result from hauliers' different choice of operator for westbound and eastbound trips. However the structure of traffic within the respective totals is also different. Eastbound traffic shows a greater tonnage on a fewer number of haulage routes. Westbound traffic has a greater number of haulage routes and a more diverse set of UK endpoints. This would correspond with inbound goods being more widely distributed, while outbound goods are predominantly shipped from places where they are already concentrated (such as a production facility).

The number of end-to-end individual movements of consignments ('jobs') by this operator makes up approximately 10% of total traffic on the North Sea. As a check on its suitability as a sample of the market the relative use by this operator of the different ferry routes closely matches the relative traffic volumes by route for the corresponding routes in the North Sea market and so is a good representation of the structure of this section of the market.

Within the dataset the routes with the top 30% by tonnage of west-bound (Continent-UK) traffic routes and the top 66% by tonnage of east-bound (UK- Continent) traffic were selected for analysis and to exclude the numerous routes which carried little tonnage and to concentrate on the switching dynamic for the major end-to-end routes.

For these routes the analysis of the propensity to switch was done based on the relative difference between the route currently taken and the alternative route using the short sea crossing. Two scenarios are run to cover the range from 36km to 104km. Each is run independently and only those routes are selected where the additional distance is less than that set in that particular scenario.

The estimation of haulage route distance was based on the AA routeplanner. The approach to the calculation of distance on the UK side and the continental side was different. On the UK side, the two alternative distances were firstly from the particular town to the short sea crossing point (assumed to be Dover) and secondly from the particular town to the currently used port. On the continental side, there was assumed to be no change in distance. The rationale for this assumption was checked but in essence the logic is as follows. The relative distance to Hoek van Holland and Calais reduces with the total length of journey on the continental side and the continental leg of journeys is relatively long. The route data specified continental endpoints only in terms of their country (e.g. 'Germany') and knowledge of the particular part of each country is required to specify an assumption that is better than the assumption of 'no change in continental distance'.

Certain routes are excluded. Routes which already use the Short Sea are not considered switchable. Routes which had 'Europoort' as the port and 'The Netherlands' as the continental endpoint were assumed to be mainly transhipments. For this reason (i.e. onward shipping rather than delivery to the continent) and, as the distance between Calais and Europoort is 331km, switching to a short sea crossing would imply a distance for the continental leg which was not 'no change' but approximately 331km longer, these routes were also excluded, even though the difference in UK distances fell within the 104km limit.

Figure 3.4 illustrates the volume in terms of tonnage on westbound routes that would be affected compared with the distance between the chosen port actually used and an alternative route via Dover.

The haulage routes divide into two main groups, those with additional distances to Dover that are less than 100km and those with additional distances greater than 250km. There is no implicit reason for this, but would reflect the fact that companies expecting to ship large volumes regularly to or from the continent are located within range of a port. Those in the lower group use Harwich and have an option to use Dover. Those in the higher distance band are those which are located to use the Northern ports. Based on the analysis of tariffs, these Northern routes have no financial incentive to switch.

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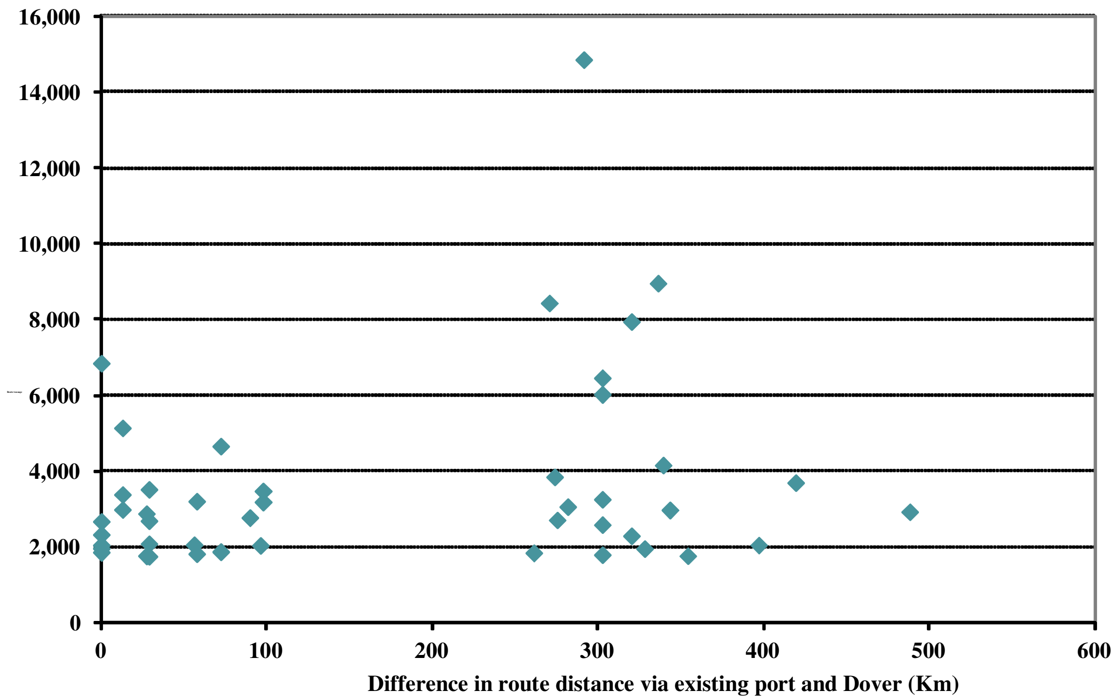
Figure 3.4 Distances and Tonnage Westbound (freight)



This structure of traffic indicates the potential proportion of traffic that could switch. All routes with distances less than 104km might switch. From the figure, the total tonnage that is in this category is of the order of 30% of the total (the sum of the all the tonnage to the left of the 100km point on the horizontal axis). This 30% is an upper limit of the tonnage that might switch. For a greater tonnage to switch the hauliers would need to be prepared to drive over 250km to avoid the £40 (corresponding to the 104km) tariff increase and there is no financial incentive to do this.

Route selection was undertaken separately for the Westbound and Eastbound traffic. Switching in the low scenario was 8% Westbound and 3% Eastbound, giving (when weighted by tonnage) an overall 6%. For the high scenario, both Westbound and Eastbound switching was close to 16%. These figures are percentages of the overall sample from the logistics operator. Switching percentages at individual ports, as a percentage of traffic through those ports are higher.

Switching behaviour by port

Table 3.6 shows the switching that occurs on the routes in the sample through the different ports. The differences are notable, but reflect structural patterns in the traffic. The high westbound switching propensity at Harwich reflects a more geographically distributed set of UK endpoints, and the lower propensity eastbound a greater number of UK locations which have fewer route choices.

The short distance between Tilbury and Dover giving almost all hauliers using that route a choice and when Tilbury becomes more expensive almost all would switch based on the relative prices.

Table 3.6 Switching on North Sea routes by Port

	Harwich		Tilbury	
	Low	High	Low	High
Westbound	42%	57%	0%	100%
Eastbound	14%	25%	4%	89%
West and East combine	27%	40%	3%	92%

3.5.6 Key Assumptions in the estimates

Use of the North Sea Analysis

The North Sea analysis has the advantage that it includes the endpoint data critical to assessing switching. As well as the intrinsic aspects of the dataset (such as including only unaccompanied traffic) its use in developing the estimates below will necessarily reflect the following additional aspects:

- Switching only occurs on two routes, through Harwich and Tilbury;
- Harwich and Tilbury have 53% of the unaccompanied traffic whereas for the routes in the sample overall there is 69% unaccompanied traffic. When Harwich and Tilbury are taken as proxies for either other ports of for overall markets these differences indicate a potential range to be considered;
- The influence of Europoort is important as routes there are assumed not to switch under any of the levels of tariff increases included in this study;
- There is a quite a different eastbound and westbound structure of routes and tonnages;
- There are major volumes shipped to specific locations (e.g. steel or car plant) and their switching behaviour is implicitly included in the switching estimates; in general major volumes do not switch reflecting the fact that they are already located to use a particular port; and
- The relevant market is wider than just the routes that switch, because major importers/exporters have locational choices.

Relevance of endpoint data for assessing switching

Knowledge of the endpoints of the haulage routes is critical to the assessment of switching behaviour.

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The specific case of the Immingham-Cuxhaven route provides a good illustration of the general issues. The estimated tariff increase of £116 equates to a possible 302km (in the high case with high shipping fuel costs case and with lowest road haulage costs). The alternatives to the Immingham-Cuxhaven crossing are via short sea routes or Harwich-Hoek van Holland.

Cuxhaven is 481km from Hoek van Holland by road so any haulier within 179km (i.e. 481-302km) of Cuxhaven would have no financial incentive to switch crossings to the Harwich with the additional working assumption that road distances on the UK side were the same.

It is not impossible that a number of haulage routes using the Immingham-Cuxhaven crossing have their continental endpoints within 179km of Cuxhaven as a local concentration of suppliers and a market in England would be a reason to establish the route in the first place. These would not switch.

Hauliers using this crossing but having an endpoint further into the continent would have a greater incentive to switch. In abstract terms, an approximate circle of diameter of 302km can be imagined to be placed somewhere in Europe and all hauliers using this crossing and having journeys with endpoints in this circle are potential switching candidates, as for them the additional 302km of driving is a cheaper crossing option.

Without knowledge of which endpoints are using the Cuxhaven crossing, the difficulty is in knowing where to place this circle. If it is centred at Cuxhaven, then, following the argument above, no hauliers would switch. If it is instead half way between Cuxhaven and Hoek van Holland (i.e. all trips have an endpoint South of Cuxhaven) then all would switch. If it is in Poland then some would switch, the exact amount depending on the location of the endpoints.

The existence of a single circle is furthermore a simplification as there would be a circle for each UK potential endpoint and for each length of trip. That is a 500km trip from Sheffield to a specific location on the continent via Cuxhaven might be equivalent in cost with a 802km (500+302km) trip via Harwich. An 800km trip from Port Talbot would have different circle of potential switchers. Furthermore the circle is only an approximation of the shape which will depend on the geography of the road network.

In many respects, this pattern is as good as other approximations that might be made as all others will require other major assumptions. High level aggregate statistics, such as the volume of goods shipped from the UK to Europe do not help in distinguishing between specific routes at the level of detail implied by the additional road distance. Other assumptions such as an even geographic distribution of haulage endpoints could simply be arbitrary with even less ultimate justification.

Cases where endpoint data does not matter

For a very long haulage trip from e.g. Italy to Nottingham, the difference in road distance may make it worth switching as in general longer routes encourage switching as endpoints are further from a preferred port. However, despite their length, it may be clear that other long routes do not have a switching option as the geography precludes it.

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Clear examples are the Portsmouth-Bilbao and Gothenburg-Immingham routes. In simple terms, the road alternative would involve driving along the coast road until meeting a possible port. In this case the distance along the coast road can be compared directly with the tariff increase and it is, for example, not worth driving from Gothenburg to Esbjerg.

3.5.7 Estimates of modal shift impacts on market and on routes

North Sea freight routes

The North Sea routes covered in the detailed analysis are the basis for the estimates. They are first scaled to represent the overall market.

The scaling methodology follows the following steps.

The detailed route analysis for the North Sea can be seen scaled up to provide an indication of the market in the North Sea (See Table 3.7). It should be noted that the percentages switching are calculated with respect to total tonnages in the logistics operator sample which are based on tonnages across the North Sea excluding DFDS. As discussed above, the percentage switching on the Harwich and Tilbury routes is shown as greater as the same tonnage switched is divided by the traffic for each of these ports alone.

Table 3.7 North Sea - Modal Shift estimates (freight)

		Shipping tariff increase	Haulier cost	Equivalent driving distance	Tonnage switched	% North Sea (non DFDS) market switching	Additional road km
		£/one way trip	£/km	Km	tonnes	%	km
Low	(low shipping fuel price, high haulage cost)	£31	£0.86	36	959,658	6%	1,130,667
High	(high shipping fuel price, low haulage cost)	£40	£0.43	104	2,663,874	16%	7,792,795

The two cases in the table reflect differences in terms of the shipping fuel price scenarios and haulier cost model.

The differences can be seen to multiply from what appears a small range of £31 to £40 to a much large difference in tonnage and in road kilometres. In general, this is due to the fact when switching occurs it diverts all tonnage on routes which may have substantial flows. These flows are further multiplied by differences in distances. Small tariff changes can therefore lead to substantial impacts on operators. However it is the impact of the hauliers' cost model that makes the most difference. Although the difference in haulage cost per km is only of a factor of 2 (from £0.43/km to £0.86/km) and this equates to a factor of 2 in distance terms, the catchment area is in principle related to the square of this difference (2*2) and so to a factor of 4. While these simple interpretations do not lead directly to the results here which are calculated on the more specific route basis, they nevertheless underlie the structure of the results, particularly the additional road km.

Western Channel freight routes

Data on haulage end-points is not available in the same detail for these routes. Summary data includes only that the typical length of journey was 260km on the UK side and 890km on the continental side. The calculated tariff increases are very similar to the increases on the Harwich routes.

The key assumption is that the freight market will illustrate the same dynamics and structure as seen on the North Sea routes. Although not perfect, the market can be seen as a mini North sea, each having Dover-Calais as the main competitor to the longer routes through Harwich and Tilbury on the North Sea and through Portsmouth and Poole in the Western Channel. In addition, a similar maximum distance of 110km (rather than 104km on the North Sea) determines the catchment size of haulage routes that may switch. Without detailed endpoint information this is taken as the best assumption to make though subject to issues raised above. An alternative more detailed approach would require further assumptions that would otherwise compromise the overall analysis.

The aggregate market statistics indicate that traffic on all Western channel routes is 39% of that on the North Sea routes (see table 3.5 for market volumes) and this factor is used to scale the impacts on the North Sea and shown in Table 3.8.

Table 3.8 Western Channel - Modal Shift estimates (freight)

		shipping tariff increase	haulier cost	equivalent driving distance	tonnage switched	% Western Channel switching	additional road km
		£/one way trip	£/km	km	tonnes	%	km
Low	(low shipping fuel price, high haulage cost)	£33	£0.86	38	371,963	6%	438,245
High	(high shipping fuel price, low haulage cost)	£43	£0.43	110	1,032,515	16%	3,020,481

Other freight routes

No change is expected on the longer routes north of Harwich on the North Sea and west of Portsmouth in the Channel primarily as a result of the relatively short equivalent distances for the expected tariff increases compared with the existing length of sea route and of its road alternative. These longer routes are also those which implicitly have road alternatives which are parallel to coast for a large part of their distance (such as those to Bilbao and Scandinavia) and hence less likely to have customers who can switch.

The important caveat to the assessment of 'no change' relates to specific bulk commodities and a good example is forest products which are believed to make up an important proportion of the inbound cargoes on the Gothenburg-Immingham route. If this route is used to supply UK power stations near Immingham with biomass fuel it may be subject to a 'tipping point' where the increase in shipping cost is sufficient to cause the power station to switch to

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an alternative supply such as biomass sources that UK power generators own in South America. A detailed analysis of margins on the two alternatives would be required to assess whether shipping cost increases would cause such a switch. In this instance, shipping tariff increases are only one factor in the uncertain future for UK biomass generation and hence the traffic on this route may be at risk for other reasons. The risk itself may not be substantially increased as a result of shipping tariff increases alone.

In this study, the detailed evidence of other prices and cargo volumes required for a tipping point analysis is not available and the assumption made is that the tariff increases would not themselves cause a change in traffic levels or a modal shift using a different port.

All UK-Continent freight markets

The changes calculated for the Western Channel and North Sea freight markets were summed and are reported below.

Table 3.9 North Sea and Western Channel - Modal Shift estimates (freight)

		shipping tariff increase	haulier cost	equivalent driving distance	tonnage switched	% market switching	additional road km
		£/one way trip	£/km	km	tonnes	%	km
Low	(low shipping fuel price, high haulage cost)	£31-33	£0.83	~35	1,331,620	6%	1,568,912
High	(high shipping fuel price, low haulage cost)	£40-43	£0.48	~110	3,696,389	16%	10,813,275

Leisure markets

A one to one relationship between price increase and loss in quantity is theoretically predicted and an observed characteristic of markets which are in balance between supply and demand and priced optimally. It is known as having an “elasticity” of -1 which means that an increase in price of 1% leads to a fall in quantity of -1%. Over time, suppliers tend to price such that optimal pricing prevails and in the absence of other information this can be used to estimate market impacts.

Evidence for the reaction of the leisure market is not available as regards route switching. Anecdotally, the leisure market falls into regular travellers with, for example, property in France and those with more discretion over their travel choices taking short breaks. The first group is unlikely to change behaviour in response to the level of tariff increases predicted in this study. The second group is expected to be more likely to take an alternative holiday than to use a different route.

Using these simple theories in the absence of other information about holiday choices, the leisure market is expected to lose market in line with optimal pricing. This would suggest that a 10% increase in price would lead to a reduction of 10% in market volumes. This is the figure that has been used in the viability assessments.

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Analysis of upper impact of modal shifts for freight movements on specific routes.

The route by route analysis shown in Table 3.10 uses the preceding analysis above to assess the greatest potential impact on the main routes. To the right of Table 3.10 are results showing a 'high high' case for modal shift at particular ports, though these need to be set in context as collating and using the North Sea analysis in whole and in part introduces complexities of relative scaling particularly between market and route definitions. The aggregate analysis reported above is on a market basis whereas this analysis is on a route basis.

In order to clarify this process, the analysis for individual routes has been developed in stages. The first column ("base volume") shows accompanied and unaccompanied volumes. The low and high distances that are equivalent to the tariff increase are shown in the next columns. The percentages shown in the middle of the table are the switching percentages calculated for Harwich based on the detailed North Sea analysis. This is uplifted by a further factor of 1.3[26] to give the column labelled volume reduction based on Harwich (adjusted). These figures in the high scenario are then further scaled up by a further 10% in the high case to reflect a 'sailing frequency' effect as these relatively high shifts would probably reduce the number of sailings and reduce traffic still further. In the low scenario the figures are equally scaled down by 25% in the low case to reflect a measure of inertia when the tariff changes are relatively small. The result is a 'high high' case for shift away from a particular route.

For the Portsmouth-Caen route the level of modal shift varies from 27% in the low case to 57%[27] in the high case, though these estimates are further commented on in the section below. However, the broad impacts are clear, relatively large movements on relatively few routes. Whether the inertia and frequency effects should be considered is an assumption used here but reflects a judgement.

This analysis focuses on the major routes as if there are shifts the major routes are those that will see the greatest absolute reductions.

The high-high case figures sum to a total number of trips (210,424) that is similar to that calculated for the aggregate market and Table 3.8 can therefore be seen as a breakdown of the aggregate figures by route. It is however simplified in that all impacts are allocated to Portsmouth-Caen and Poole-Cherbourg. The minor Channel routes are not considered. In summary, the aggregate estimates above should be used when considering the impact on the Western Channel and North Sea markets. The route by route impacts may use the raw Harwich figures of 27% and 40% where those routes are considered in a similar relationship to Dover-Calais as Harwich is to Dover-Calais.

[26] The adjustment factor reflects the difference between the 53% of unaccompanied traffic through Harwich and the 69% that unaccompanied traffic makes up as a proportion of the North Sea traffic. Without this factor the shift would be under-represented as a proportion of the market.

[27] Note that the reported percentages here are based on trips whereas for the aggregate statistics they are based on tonnage.

Table 3.10 Upper estimates for model shift for routes (freight)

	Base Volume	Tariff increases as equivalent road km		% Volume reduction based on Harwich		Volume reduction based on Harwich (adjusted)		Volume reduction for Viability assessment inputs			
		Low	High	Low	High	Low	High	Low	High-High	Low	High-High
	units	km	km	%	%	units	units	units	units	%	%
Portsmouth - Caen	113,038	38	110	27%	40%	40,071	58,362	29,293	64,199	26%	57%
Poole - Cherbourg	22,242	38	117	27%	40%	7,885	11,484	5,764	12,632	26%	57%
Hoek van Holland-Harwich	142,000	36	104	27%	40%	50,338	73,316	36,799	80,647	26%	57%
Rotterdam/Europoort-Harwich	60,300	27	77	27%	40%	21,376	31,133	15,626	34,247	26%	57%
Tilbury-Zeebrugge	18,700	36	104	0%	100%	-	18,700	-	18,700	0%	100%
Total						*119,670*	*192,995*	*87,482*	*210,424*		

All the haulage routes using Tilbury-Zeebrugge route switch and so an estimate is included in the table above.

3.5.8 Comments on results

Overall, it is suggested that less traffic may switch than implied by the combination of necessarily coarse assumptions.

The main assumption is the sensitivity of hauliers to tariff increases. The assumption in this study is that all who could benefit from switching do in fact switch. For some, the benefits may be very small. For example in the high case any haulier with a difference in distance between routes of less than 104km is assumed to switch. If the difference is in fact only 5km, they would only save 5km worth of haulage costs and may decide not to switch.

Price may not be the main factor affecting hauliers' decisions. A particular reference (Malmqvist 2013) quotes evidence showing that security and frequency are more important than price to hauliers. The tariff increases calculated here may be relatively small compared to the value of a typical haulage contract. The high volumes of accompanied traffic on the Western Channel indicates relatively high value and possibly time-sensitive cargoes. If a change in route comprises the quality of deliverables hauliers may not wish to change route despite the increase.

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Prices rises will affect all hauliers equally and this will increase the ability of the haulage sector to pass these costs through to final customers. If customers are made aware of the impact of route choice (e.g. in terms of time to market) they may prefer to pay the additional charge.

A large proportion of foreign registered traffic already goes through Dover-Calais. The implication is that long-distance continental hauliers may already have 'switched' if they were going to prefer the short sea routes. The traffic using other routes may therefore already be dominated by hauliers undertaking shorter routes which are inherently less flexible over their route choice.

This study calculates switching relative to an increase in the Dover-Calais price of zero. If the relative tariff increases on the other routes are smaller, this will also reduce switching (as noted above).

Although the use of the North Sea analysis as a proxy for the Western Channel is seen as the best method, some qualitative differences may mean a reduction in switching on the Western Channel routes. For example, the additional distance to Dover for the catchment area currently served by Portsmouth-Caen is relatively large compared to the additional distances for North Sea routes.

Lastly, the freight market is assumed not to change in size. It is possible that fewer goods will be shipped, but anecdotal evidence of the ability to absorb transport costs (such as the 5% fuel increase in recent years) is the basis of this assumption. In contrast the leisure market, as discussed above may reduce in size. If the market reduced in overall size, the volume reduction on individual routes would correspondingly reduce.

3.6 Impact of Identified Modal Shift

3.6.1 Externalities

The predicted modal shift from maritime to road transport will have a range of social, economic and environmental consequences. Where these are not included in the actual prices, these consequences are known as externalities, which can be qualified, quantified and monetised according to standard methodologies.

In public policy appraisal in the UK and Europe, the main methodologies to assess the external costs of transport are, respectively:

- The Department for Transport's (DfT) Transport Analysis Guidance (TAG), especially Units 3.9.5 (DfT, 2012a) and 3.13.2 (DfT, 2012b); and
- The European Commission's (DG TREN) Handbook on estimation of external costs in the transport sector, (CE Delft, 2008).

This analysis is mainly based on DfT methodology and guidance, as it is both more recent and more directly applicable to the UK than the European Commission's guidance.

The DfT guidance (DfT, 2012a) identifies the main external costs of transport as being:

- **Congestion**. This is defined as "as time lost relative to free flow conditions" and is quantified and monetised using the National Transport Model (NTM). The marginal cost of congestion is in essence the "cost of delay of an additional vehicle kilometre". It is first worked out for a passenger car, but can then be scaled up to other road vehicles using a standard Passenger Car Unit (PCU) factor for various vehicle types;

- **Infrastructure.** The DfT methodology for estimating the marginal external costs to infrastructure is based on Sansom et al (2001) and includes marginal infrastructure operating, maintenance and depreciation costs. The Sansom et al (2001) marginal costs have been updated in DfT (2012b) to reflect subsequent guidance;

- **Accidents**. The marginal accident costs are also based on Sansom et al (2001), updated in DfT (2012b) to reflect subsequent guidance. They are linked to the impact of additional traffic on accident risk rates, and include the full value of the estimated additional accidents;

- **Local air quality**. These costs are also based on Sansom et al (2001), updated in DfT (2012b) to reflect subsequent guidance. The Sansom et al (2001) methodology included the marginal costs associated with emissions of carbon monoxide, SO2, NOx, PM10, hydrocarbons, benzene and 1,3-butadiene. Additionally emissions of benzo-[a]-pyrene were used as an indicator of potential impacts from PAHs;

- **Noise**. These costs are also based on Sansom et al (2001), updated in DfT (2012b) to reflect subsequent guidance. The marginal costs of noise are generally taken to include both an annoyance cost and a health cost; and

- **Greenhouse gas emissions.** These costs are also based on Sansom et al (2001), updated in DfT (2012b) to reflect subsequent guidance.

The DfT produces a spreadsheet[28] of marginal external costs for all these categories. These are on a per passenger car kilometre basis, in 2010 prices, assessed at five-yearly intervals from 2010 to 2035. Values are provided for different types of road, as well as weighted averages for Great Britain overall. The weighted average values for 2015 are provided in Table 3.11.

[28] http://www.dft.gov.uk/webtag/documents/expert/unit3.9.5.php

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Table 3.11 2015 marginal external costs for passenger cars, Great Britain weighted average across road types

Cost type	Marginal external costs(2010 pence per passenger car km)
Congestion	13.1
Infrastructure	0.1
Accident	1.7
Local Air Quality	0.1
Noise	0.1
Greenhouse Gases	0.8

Source: DfT (2012a, 2012b)

Note: These figures are all taken forward for further quantification and monetisation of impacts, except the figure for greenhouse gases.

The marginal external cost values provided in Table 3.11 provide the starting point for this analysis of the external costs linked with the predicted modal shift (except for greenhouse gases, see below).

However, since these figures are for passenger cars only, scaling factors need to be used to quantify the marginal external costs linked with additional lorry kilometres travelled. In order to do this, vehicle marginal external costs can be expressed in terms of passenger car units (PCUs), which vary according to the specific external cost. For congestion, these are given in DfT (2012a:11), for other external costs, they can be approximated from the marginal external cost values given in Sansom et al (2001:56). The PCU factors used in this analysis are presented in Table 3.12.

Table 3.12 Passenger Car Unit (PCU) factors

Vehicle type	Congestion	Infrastructure	Accidents	Air pollution	Noise
Car	1.0	1.0	1.0	1.0	1.0
Light Goods Vehicle	1.0	1.2	0.7	3.8	1.9
Rigid Goods Vehicle	1.9	72.6	1.5	9.3	5.6
Articulated Goods Vehicle	2.9	144.8	1.1	8.5	8.4
Public Service Vehicle	2.5	100.3	4.8	17.5	7.9

Source: DfT (2012a), Sansom et al (2001:56)

This methodology is not used for the marginal external costs of greenhouse gas emissions, as these can be readily worked out directly from vehicle fuel consumption data from the Road Haulage Association (RHA, 2011), combined with monetised values of emissions from DECC (2011), as presented in Table 3.13.

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Table 3.13 2015 Marginal greenhouse gas costs associated with lorries

Lorry	Average mpg	Average l/km	Average kg CO2/km	Marginal cost (2010 pence/km)
3.5t gross vehicle (diesel)	27	0.11	0.26	1.51
7.5t gross vehicle	16	0.18	0.44	2.55
13t gross vehicle	14	0.20	0.50	2.91
18t gross vehicle (2 axles)	12	0.24	0.59	3.39
26t gross rigid vehicle	9.5	0.30	0.74	4.29
32t gross rigid vehicle (tipper)	8	0.36	0.88	5.09
32/33t gross (4x2+tandem) combination	9	0.32	0.78	4.53
38t gross (4x2+tri-axle) combination	8	0.36	0.88	5.09
40t gross (4x2+tri-axle) combination	7.8	0.36	0.90	5.22
44t gross (4x2+tri-axle) combination	7.2	0.39	0.98	5.66
32.5t gross drawbar combination (2 axle tractor, 2 axle trailer)	9	0.32	0.78	4.53

Source: RHA (2011), DECC (2011)

Notes: mpg data from RHA (2011), mpg to l/km conversion factor is 0.352 from RHA (2011), 2.484 kg CO2/l diesel is 2015 value from DECC (2011), 5.772 pence per kg CO2 is central 2015 non-traded value from DECC (2011).

Combining the marginal external cost values (and conversion factors) presented in Table 3.11, Table 3.12 and Table 3.13 with the expected number of additional lorry road kilometres travelled from 2015 following the expected modal shift (6.2 million km mid-point estimate) yields the overall external costs presented in Table 3.14. It should be noted that, as no information was found on the shares of different lorry types potentially affected, it has been assumed that all lorries are articulated good vehicles (for externalities other than greenhouse gas emissions) or 32/33t gross (4x2+tandem) combination vehicles (for greenhouse gas emissions).

Table 3.14 2015 marginal and total external costs following modal shift (2010 prices)

Cost type	Vehicle assumption	Marginal external costs (2010 pence per vehicle km)	Total additional external costs following modal shift (2010 £)
Congestion	Articulated Goods Vehicle	37.99	2,350,000
Infrastructure	Articulated Goods Vehicle	14.48	896,000
Accident	Articulated Goods Vehicle	1.87	116,000
Local Air Quality	Articulated Goods Vehicle	0.85	53,000
Noise	Articulated Goods Vehicle	0.84	52,000
Greenhouse Gases	32/33t gross (4x2+tandem) combination	4.53	281,000
Total	**32/33t gross (4x2+tandem) combination**	**60.55**	**3,749,000**

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3.6.2 Other impacts

There are a number of potential implications which could arise from the shift of a quantum of traffic on the various routes. First, the loss of traffic could affect route frequency or viability, affecting the number of employees required by the operators in board and in port. There would be a corresponding reduction in fees paid to port operators and the services provided, hence further job losses at the affected ports. Second, depending on the results of the viability analysis, some wider economic affects may arise, from increased costs borne by those hauliers whose behaviour does not change as a result of higher ticket prices. These would, presumably, be passed on down their respective supply chains. It is not clear if the overall effect would be a reduction in trade, however some loss of flexibility in the service that hauliers can offer their clients would be expected.

3.6.3 Conclusion

The direct impacts of increased costs on the shipping industry in the UK could be considerable leading to increases in fuel costs faced by operators in the Western Channel and North Sea of more than £300 million. The effect on ticket prices charged (simply to recover these additional costs) on North Sea routes would require price increases of between 5 and 21% (Table3.3) and on Western Channel routes of between 8 and 29% (Table 3.2) (section 3.4).

4. Wider Economic Effects and Route Viability

4.1 Introduction

This section explores the potential implications for overall route viability. Route viability is assessed against two options; first the cost of installation and operation of scrubbers and second; the increased fuel costs expected from fuel switching; resulting in modal shift. The first option is shown for illustrative purposes as it is not expected that this option will be chosen in the immediate term; for the reasons set out in section 3.

For the fuel switching option, we assess the viability of routes with reduced traffic volumes. Economic impacts, in terms of lost jobs and port fees paid, are also assessed.

4.2 Route viability - effects of fuel switching

The analysis in this section focuses on the implications for the viability of certain routes with the reduced traffic volumes, estimated above; i.e. the effect on route viability if the modal shift estimated in the previous section transpires. First, the expected modal shift was estimated on each route, this draws on the earlier analysis set out in chapter 3. In terms of estimating reductions in passenger numbers, an elasticity of -1 was assumed; i.e. a 1% increase in ticket prices leads to a 1% reduction in passenger numbers. The overall reduction numbers are driven by the estimated average ticket price increase per route, which has been described above.

Overall, the analysis suggests that the following *reductions* in the numbers of passengers and freight would occur on each route (Table 4.1 and Table 4.2). These numbers were subtracted from the existing quantum of traffic on each route carried in 2011.

Route viability has been assessed based on the implications of the losses in traffic on revenue and hence the profitability of the route. First, the operating margin on each route was set out . This information indicates that some routes were not profitable in 2011, before any fuel switching has taken place. Second this information has been used to define the cost base on each route, and by extension, the implied profit and loss. Third, the reduced traffic volumes were applied to existing passenger, lorry, UT and container ticket prices to estimate overall ticket revenue, which was then compared to the baseline traffic volumes, ticket prices and ticket revenue, to derive losses in ticket revenue, per route. The figures were compared to illustrate if the route remained profitable or not. The implied profit or loss was then compared to baseline costs, to estimate the likely margin, on each route. As previously, where a number of ships were used on any one route, an average margin was taken for each ship used. On a number of routes, information on revenues was incomplete or not provided, so conclusions on these have not been made.

Table 4.1 Economic implications of lower traffic volumes – Western Channel

Route	Reduction in annual passenger number	Reduction in annual Freight (Lorry, UT and Container)	Implication with modal shift (lower traffic volumes) from costs associated with switching to low sulphur fuel	
			Loss making?	Viability
WC 1	90,775	46,746	Yes	**Unlikely to be viable with estimated modal shift, 2011 ship configuration and number of sailings**
WC 2	n/a	9,198	Yes	**Unlikely to be viable with estimated modal shift, 2011 ship configuration and number of sailings**
WC 3	38,357	0	Yes	**Threatened with estimated modal shift, 2011 ship configuration and number of sailings**
WC 4	5,149	0	Yes	**Threatened with estimated modal shift, 2011 ship configuration and number of sailings**

Source: AMEC analysis, based on operator data

Table 4.2 Economic implications of lower traffic volumes – North Sea and Container Routes

Route	Reduction in annual passenger number	Reduction in annual Freight (Lorry, UT and Container)	Implication with modal shift (lower traffic volumes) from costs associated with switching to low sulphur fuel	
			Loss making?	Viability
NS 1	0	0	No change	**Likely to remain viable, with estimated modal shift, 2011 ship configuration and number of sailings**
NS 2	13,485.60	0	Unknown	n/a
NS 3	0	0	Unknown	n/a
NS 4	0	0	No change	**Likely to remain viable, with estimated modal shift, 2011 ship configuration and number of sailings**
NS 5	0	0	No change	**Likely to remain viable, with estimated modal shift, 2011 ship configuration and number of sailings**
NS 6	0	0	No change	**Likely to remain viable, with estimated modal shift, 2011 ship configuration and number of sailings**
NS 7	101,288.70	0	Unknown	**n/a**
NS 8	n/a	n/a	Unknown	**n/a**
NS 9	n/a	n/a	Unknown	**n/a**
NS 10	n/a	n/a	Unknown	**n/a**
NS 11	28,733.76	0	Yes	**Threatened, with estimated modal shift, 2011 ship configuration and number of sailings**
NS 12	38,351.67	0	Yes	**Threatened, with estimated modal shift, 2011 ship configuration and number of sailings**

Route	Reduction in annual passenger number	Reduction in annual Freight (Lorry, UT and Container)	Implication with modal shift (lower traffic volumes) from costs associated with switching to low sulphur fuel	
			Loss making?	Viability
NS 13	50,900.00	58,722.93	Yes	**Unlikely to be viable with estimated modal shift and 2011 ship configuration and number of sailings**
NS 14	0	0	No change	**Likely to remain viable, with estimated modal shift, 2011 ship configuration and number of sailings**
NS 15	0	24,936.57	Yes	**Threatened, with estimated modal shift, 2011 ship configuration and number of sailings**

Source: AMEC analysis, based on operator data *Note, the UT and Container price increase are affected by the use of one ship on the route during 2011 which carried relatively low volumes of both UT's and containers.

The assessment of whether the routes are 'threatened' or judged 'unlikely to be viable' has been made with reference to a) whether the margin is negative and b) the change in the margin between the two scenarios. Where the routes have been judged as unlikely to be viable, the analysis suggests that costs are likely to exceed ticket revenue by over 20%. Routes are judged as threatened, where the *change* between costs and ticket revenues under the baseline 2011 traffic volumes and the reduced traffic volumes after modal shift is less than 5%. A number of assumptions have been made as part of the analysis, which should be noted:

- The analysis has been undertaken with reference to 2011 traffic volumes, ship configurations, fuel costs and sailing numbers; clearly these change from year to year. Potentially operational cost savings can be made by changing the ship configurations and number of sailings, although these may incur other, potentially substantial, costs;

- The analysis assumes a fixed costs base, if traffic volumes decrease significantly, certain costs are likely to decrease (i.e. staffing), potentially affecting the margins;

- We have analysed the information based on the implication on profitability on each route, in isolation, without reference to margins on other routes by the same operator. It may be possible for operators to maintain routes by cross subsidies. Whilst we have had access to information on the operating margin on each route, which suggests that some routes are not currently profitable, we are not privy to more detailed information. If cross subsidies were to be used to maintain loss making routes, the ability of operators to continue to do this would be adversely affected if traffic decreased on several routes, which, in some cases, appears to be the case; and

- Where in sufficient information has been provided, on overall revenues, margins and profitability, the assessment has not been made and marked with a 'n/a'.

4.3 Wider economic effects

There are a number of potential implications which could arise from the shift of a quantum of traffic on the various routes. First, changes to frequency or route closures would affect the number of employees required by the operators on board and in port. There would be a corresponding reduction in fees paid to port operators for the services provided, hence further job losses at the affected ports may well occur, depending on the number of shipping routes operating from them. The next section explores potential impacts arising from the viability assessment above.

4.3.1 Employment

Operators

Overall job numbers have been provided by the operators. Some represent full time equivalent jobs, others total numbers of staff including full time, part time, contract and agency staff. Some operators have provided UK and continental port based employees, others have provided jobs in UK ports only. Overall, from those that provided data some 3,290 people are employed by the operators who took part in the study (Table 4.1) some of whom may be affected by service closures or less forewent service operations.

The table below estimates, in very broad terms, the UK and continental employees likely to be at risk, if the modal shift estimates above materialise and changing ship configurations are not practicable. 'At risk' has been defined as all those employees supported by routes considered to be threatened, or potentially unviable in their current form, where these numbers can be estimated. Amongst certain operators, some of the shore based jobs are likely to be supported by revenue from routes that have not been assessed as part of this study and although these too may well be affected, they do not form part of the assessment below.

Table 4.1 Job numbers

Operator	Ship Based	Shore Based	Jobs 'at risk'
1	Not provided	257*	A proportion of the shore based jobs, and further employees on board.
2	1,381**		Unknown
3	Not provided	Not provided	n/s
4	530**	422**	530 (and a proportion of shore based employment)
5	480**	220**	406
Total			940***

Source: Operator data. *FTE jobs. ** Total jobs, including full time part time and contract staff, UK and continent based. ***Numbers rounded.

Overall we can identify some 940 full time, part time and contract positions that are likely to be at risk in the UK from just two operators, given the employment of the five main operators included in this study the number of jobs at risk is likely to be in excess of 2,000. In addition jobs on the continent, in maritime engineering, navigation, catering, customer service, cleaning and administrative occupations from those routes that are potentially unviable or would be threatened from the traffic reductions identified could also be at risk

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Port

Data on total port fees has also been provided from operators and is summarised below. The numbers represent total annual port fees paid to all ports called at on the relevant routes for 2011, unless otherwise stated. Overall the operators paid just over £50 million in fees on all of the routes assed as part of the study. The size of the fee is based on services provided and is affected by number of sailings/dockings, but also freight volumes handled. As noted above, the reduced quantum of traffic on certain routes may affect the configuration, or number of ships used on routes, frequency of sailings or perhaps the viability of the routes as a whole. The table therefore also shows the total port fees that would be 'at risk' (i.e. associated with routes that are unlikely to be viable or threatened, if the estimated modal shift occurs, with 2011 ship configurations, sailings and costs). These fees represent an annual spend of around £38 million, supporting a range of direct jobs in freight handling/operatives, terminal services, towing, engineering, fuel handling and administration and supporting indirect jobs in logistics, fuel supply and marine engineering occupations.

Source: Operator data. *Note – fees paid for both routes, to UK ports only. Remaining data represents payments to both UK and overseas ports. Note: The information for WC routes are fees paid in 2012.

4.3.2 Effects on hauliers and on trade

Largely irrespective of modal shift decisions, it is likely that the costs for haulage firms are likely to increase, either through higher ticket prices, or (marginally lower) cost increases from increased road miles. These costs would either be at least partly passed on down their respective supply chains, or haulage firms would seek to reduce costs further, or both. One method of doing this would be to reduce wages paid to staff, potentially by using a greater number of drivers based outside the UK, or delaying investment in new rolling stock. It is not clear if the overall net effect would be a reduction in trade (i.e. some exporters and importers withdraw from the market or cease trading), however some loss of flexibility in the service that hauliers can offer their clients would be expected.

4.4 Externalities

This section summarises the identified potential impacts of shipping operators in SECAs switching from 1%S to 0.1%S fuel in 2015:

- Price increase for low sulphur fuel of $275-350 per tonne, with a mid-point value of $315 per tonne. For the 38 ships in the study this would add over £300M to the annual fuel costs;
- Assuming the related rise in fuel costs is entirely passed on, this is predicted to lead to ticket price increases:
  - On Western Channel routes, ticket price increases of 9-12% for passengers (11% mid-point), 12-16% for lorries (14% mid-point), and 12-16% for unaccompanied trailers (14% mid-point);
  - On North Sea and container routes, ticket price increases of 10-13% for passengers (12% mid-point), 11-14% for lorries (13% mid-point), 9-13% for unaccompanied trailers (11% mid-point), and 7-10% for containers (9% mid-point),
- This is expected to result in a degree of modal shift, estimated at 6-16% in the freight market;

- In the leisure market, there is expected to be an impact of the order of 10% reduction;
- Overall, between 1.6 and 10.8 million additional road kilometres are expected to be travelled by lorries (6.2 million km mid-point estimate);
- These (mid-point estimate) additional road kilometres will be associated with overall external costs in the UK of the order of £3.7 million, consisting of:
  - £2.4 million associated with additional road congestion;
  - £0.9 million associated with additional infrastructure maintenance and operational costs;
  - £0.1 million associated with additional road accidents;
  - £50,000 associated with reduced local air quality;
  - £50,000 associated with additional noise; and
  - £0.3 million associated with greenhouse gas emissions.

4.4.1 Conclusions

Increased ticket prices on longer sea routes will result in haulage operators switching from longer sea routes to shorter sea routes which require longer road journeys. This "modal shift" away from ferries to road journeys will lead to reduced viability of some routes threatening thousands of jobs as well as an increase in congestion and other detrimental affects.

Our analysis suggests that modal shift will threaten the viability of routes in the North Sea Western Channel. The loss of viability of routes and port operations has the potential to displace thousands of (good quality) jobs. Overall, as many as 2,000 full time, part time and contract positions are likely to be at risk in the UK and on the continent, in maritime engineering, navigation, catering, customer service, cleaning and administrative occupations from those routes that are potentially unviable or would be threatened from the traffic reductions identified.

5. Summary and Conclusions

5.1 Purpose of this Report

This report has been prepared for the UK Chamber of Shipping, on behalf of several North Sea and Western Channel shipping operators, to establish the economic effect of compliance with the requirements of MARPOL Annex VI regulations, which sets sulphur limits for fuels in SOx Emission Control Area (SECA) currently 1%, since 1 July 2010; being further reduced to 0.1%, effective from 1st January 2015.

5.2 Report Structure

The report is structured as follows:

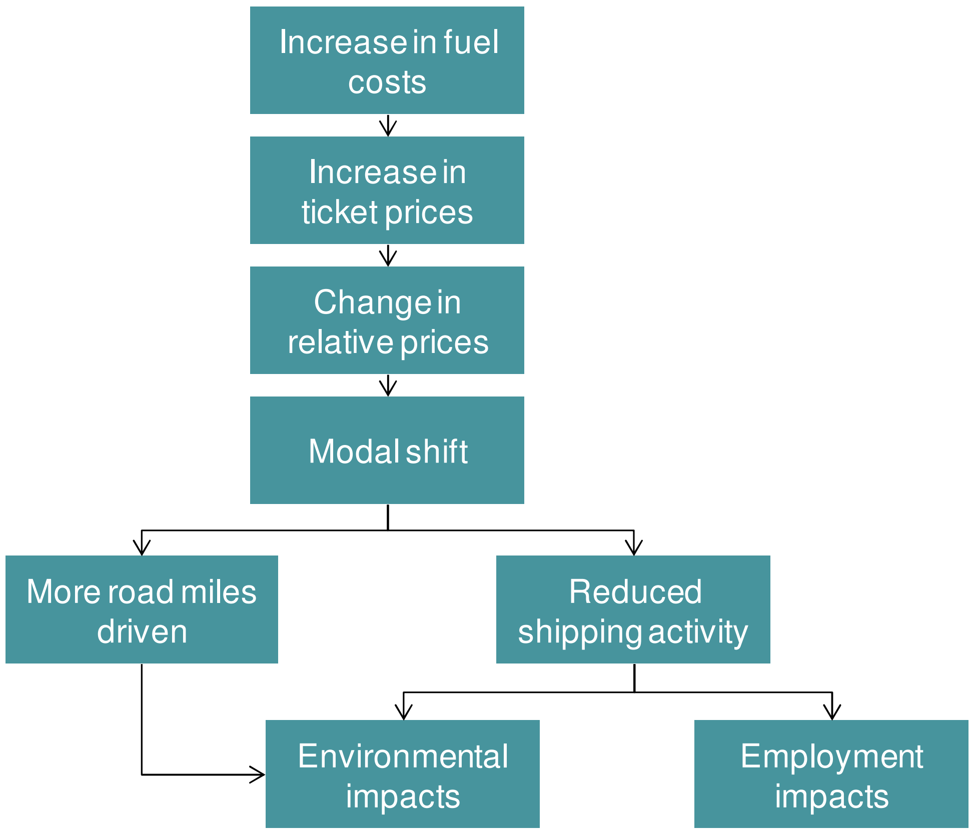
- Section 2 reviews the three potential options in greater detail and establishes the costs and practical issues associated with their implementation in order to comply with the requirements of the regulation;
- Section 3 examines the impacts expected to arise from fuel switching from HFO to LSF. The analysis is undertaken in a series of steps. First the costs of switching fuel are estimated and subsequently the effect this will have on ticket prices. Potential impacts on route switching and modal shift are then considered;
- Section 4 investigates the wider economic and route viability impacts of meeting the requirements identifying the scale of risk to the industry and to the wider economy; and
- Conclusions are set out in Section 5.

5.3 Options for meeting the requirements

- **Option One: Fuel switching from 'Heavy Fuel Oil (HFO), to Low Sulphur Fuel (LSF**). This option is technically feasible, with limited up-front investment costs (except for change of designation and use of some fuel tanks from HFO to LSF involving tank cleaning of those tanks).
- **Option Two: Retrofit of a scrubbing system to ships.** The consensus from the shipping operators that have been consulted as part of the study is that the currently available abatement technology is not sufficiently proven for ship owners to switch with confidence and demonstrate compliance *within the time period required by the legislation.*
- **Option Three: Use of Liquefied Natural Gas (LNG) as an alternative fuel**. Alternative fuels may be applicable in some circumstances. Its use poses particular problems where existing ships would need to be retrofitted (w*hich is understood to be unsuitable for much of the UK fleet) and is more* a***ppropriate for new build.***

5.4 Approach take in the study

The analysis follows a stepwise approach as set out in this illustration.



5.5 Increases in fuel costs

- Analysis of the likely range of values for the increase in costs associated with switching from 1.0% to 0.1% Sulphur content fuel is $275-350 per tonne, with an average of $315 per tonne, which is the range and expected value adopted in this study. It is assumed that the full cost of fuel price increases will be passed on directly as increased ticket prices.

- Impacts on wider refined oil product markets: The increase in demand for distillates will be approximately the same as the current UK market for diesel fuel. Fuel oils are globally traded commodities and the impact of an increase in demand from across Europe is likely to lead to an increase in the price of diesel, A Swedish Study Sweco (2012) suggests an increase in fuel costs of around 2.8p per litre. Road users account for around 26,000 million litres of diesel in the UK in 2011. This means that such an increase in the diesel pump price would be equivalent to an overall additional cost to road diesel consumers in the region of £720 million. (See Box 1 in main report.).

5.6 Increases in ticket prices

In this analysis ticket prices increase in order to match the increase in operating costs associated with increases in fuel prices. The industry indicates that there is no capacity to absorb increases in costs and that margins are already tight.

5.6.1 Effects of fuel switching on ticket prices – Western Channel Routes

The results of the analysis for Western Channel Routes suggests that ticket prices, per passenger, would increase between an average of 8% and 13%, with small differences between routes in the price increase expected. Ticket prices for lorries and unaccompanied trailers are expected to increase between 8% and 29%, with larger differences between routes. Containers are not carried on the Western Channel routes analysed.

5.6.2 Effects of fuel switching on ticket prices – North Sea and Container Routes

The same approach has been taken to estimating ticket price increases on North Sea and container routes. Overall, passenger prices are expected to increase by between 5% and 20%. For lorries ticket prices are expected to rise by between 5% and 21%; for unaccompanied trailers by between 5% and 17% and containers between 5% and 17%.

5.7 Modal shift

A modal shift occurs when the relative prices of alternative modes of transport change the economic benefits of different route and transport choices. This study identifies modal shift associated with switching longer sea routes with shorter sea routes and driving more (in order to reach the new port of departure and the delivery destination at the other end. This comes about because longer sea routes imply more fuel use and increased fuel costs mean higher ticket prices which disproportionately impact longer routes.

5.7.1 Switching behaviour by area

Estimating "switching behaviour" begins with an analysis of relative price changes which are converted to an equivalent number of road miles illustrated in the following tables. The range of values presented are broad because they combine the three fuel price scenarios with two haulier cost per Km estimates.

5.7.2 North Sea

Depending upon the costs faced by hauliers for road Km travelled and the scale of increases in tariffs the expected modal shift is modelled to be between 6 and 16% of all freight traffic with the switching being most noticeable for routes near to Dover Calais which is the shortest available cross channel route.

Table 5.1 North Sea - Modal Shift estimates (freight)

		Shipping tariff increase	Haulier cost	Equivalent driving distance	Tonnage switched	% North Sea market switching	Additional road km
		£/one way trip	£/km	Km	Tonnes	%	Km
Low	(low shipping fuel price, high haulage cost)	£31	£0.86	36	959,658	6%	1,130,667
High	(high shipping fuel price, low haulage cost)	£40	£0.43	104	2,663,874	16%	7,792,795

Western Channel routes

Data on haulage end-points is not available in the same detail for these routes. Summary data includes only that the typical length of journey was 260km on the UK side and 890km on the continental side. The calculated tariff increases are very similar to the increases on the North Sea routes. As with North Sea routes the total tonnage of freight switching to shorter sea routes at the expense of increased road transport is modelled to be between 6% and 16%.

Table 5.2 Western Channel - Modal Shift estimates (freight)

		Shipping tariff increase	Haulier cost	Equivalent driving distance	Tonnage switched	% Western Channel switching	Additional road km
		£/one way trip	£/km	Km	Tonnes	%	km
Low	(low shipping fuel price, high haulage cost)	£33	£0.86	38	371,963	6%	438,245
High	(high shipping fuel price, low haulage cost)	£43	£0.43	110	1,032,515	16%	3,020,481

Leisure markets

A one to one relationship between price increase and loss in quantity demanded is predicted for the leisure market. This would suggest that a 10% increase in price would lead to a reduction of 10% in market volumes. Evidence for the reaction of the leisure market is not available as regards route switching. Anecdotally, the leisure market falls into regular travellers with, for example, property in France and those with more discretion over their travel choices taking short breaks.

The first group is unlikely to change behaviour much in the short term in response to the level of tariff increases predicted in this study, however a longer term impact might be felt in frequency of trips and second home owners, potentially seeing reductions in the value of their property. The second group is expected to be more likely to take an alternative holiday than to use a different route.

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5.8 Impact of Identified Modal Shift

The predicted modal shift from maritime to road transport will have a range of social, economic and environmental consequences. Where these are not included in the actual prices, these consequences are known as externalities, which can be qualified, quantified and monetised according to standard methodologies.

Our analysis suggests that modal shift will threaten the viability of routes in the North Sea Western Channel. (section 4) The loss of viability of routes and port operations has the potential to displace thousands of (good quality) jobs (Section 4).

The analysis further indicates that modal shift will affect between 1.3-3.6 Million tonnes of freight leading to between 1.5-10 million additional road kilometres. This is expected to lead to increased congestion on the roads and local environmental problems. The DfT guidance (DfT, 2012a) identifies the main external costs of transport as being; congestion, infrastructure, accidents, local air quality. noise. greenhouse gas emissions.

5.9 Route viability - effects of fuel switching

Route viability is assessed in relation to existing margins. The impact of increased ticket prices and reduced traffic feeds through into the ship by ship cost models used by the operators. Increased fuel prices represent an increased cost and increased ticket prices multiplied by the amount of traffic represents the income. Where as a result of our analysis the gross margin switches from positive to negative theses routes are identified as threatened, where the gross margin drops below -20% the route is classed as “unlikely to be viable”. Where there are several ships and multiple sailings the option to reduce capacity and maintain occupancy levels in spite of a falling volume may provide a means of securing part of the fleet and some of the routes.

5.9.1 North Sea routes

The results of modelling the costs of routes indicates one route that is unlikely to be viable post fuel switching (i.e. post implementation) and a further three are threatened. We were unable to model a number of routes in detail but of those we were able to model five were identified as likely to remain viable, and this is a reflection of the fact that for a number of these routes there are few practical alternatives.

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Table 5.3 Economic implications of lower traffic volumes – North Sea and Container Routes

Route	Reduction in annual passenger number	Reduction in annual Freight (Lorry, UT and Container)	Implication with modal shift (lower traffic volumes) from costs associated with switching to low sulphur fuel	
			Loss making?	Viability
NS 1	0	0	No change	Likely to remain viable, with estimated modal shift, 2011 ship configuration and number of sailings
NS 2	13,486	0	Unknown	n/a
NS 3	0	0	Unknown	n/a
NS 4	0	0	No change	Likely to remain viable, with estimated modal shift, 2011 ship configuration and number of sailings
NS 5	0	0	No change	Likely to remain viable, with estimated modal shift, 2011 ship configuration and number of sailings
NS 6	0	0	No change	Likely to remain viable, with estimated modal shift, 2011 ship configuration and number of sailings
NS 7	101,289	0	Unknown	**n/a**
NS 11	28,734	0	Yes	Threatened, with estimated modal shift, 2011 ship configuration and number of sailings
NS 12	38,3512	0	Yes	Threatened, with estimated modal shift, 2011 ship configuration and number of sailings
NS 13	50,900	58,723	Yes	Unlikely to be viable with estimated modal shift and 2011 ship configuration and number of sailings
NS 14	0	0	No change	Likely to remain viable, with estimated modal shift, 2011 ship configuration and number of sailings
NS 15	0	24,937	Yes	Threatened, with estimated modal shift, 2011 ship configuration and number of sailings

Source: AMEC analysis, based on operator data *Note, the UT and Container price increase are affected by the use of one ship on the route during 2011 which carried relatively low volumes of both UT's and containers.

5.9.2 Western Channel routes

Western Channel routes were found to be vulnerable to increased relative prices. Of the four routes studied two were found to be threatened and two unlikely to remain viable in the face of different relative prices.

Table 5.4 Economic implications of lower traffic volumes – Western Channel

Route	Reduction in annual passenger number	Reduction in annual Freight (Lorry, UT and Container)	Implication with modal shift (lower traffic volumes) from costs associated with switching to low sulphur fuel	
			Loss making?	Viability
WC 1	90,775	46,746	Yes	Unlikely to be viable with estimated modal shift, 2011 ship configuration and number of sailings
WC 2	n/a	9,198	Yes	Unlikely to be viable with estimated modal shift, 2011 ship configuration and number of sailings
WC 3	38,357	0	Yes	Threatened with estimated modal shift, 2011 ship configuration and number of sailings
WC 4	5,149	0	Yes	Threatened with estimated modal shift, 2011 ship configuration and number of sailings

Source: AMEC analysis, based on operator data

5.10 Wider economic effects

5.10.1 Shipping operator employment

Overall, as many as 2,000 full time, part time and contract positions are likely to be at risk in the UK and on the continent, in maritime engineering, navigation, catering, customer service, cleaning and administrative occupations from those routes that are potentially unviable or would be threatened from the traffic reductions identified.

5.10.2 Port based employment

Data on total port fees has also been provided from operators and is summarised below. The numbers represent total annual port fees paid to all ports called at on the relevant routes for 2011, unless otherwise stated. Overall the operators paid just over £50 million in fees on all of the routes assessed as part of the study.

5.10.3 Effects on hauliers and on trade

Largely irrespective of modal shift decisions, it is likely that the costs for haulage firms are likely to increase, either through higher ticket prices, or (marginally lower) cost increases from increased road miles. These costs would either be at least partly passed on down their respective supply chains, or haulage firms would seek to reduce costs further, or both.

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