Immingham Green Energy Terminal

9.29 Written Summaries of the Applicant's Oral Case at Issue Specific Hearing 1 with Appendices

March 2024
Version 1.0
Planning Inspectorate Scheme Ref: TR030008

TABLE OF CONTENTS

1 ABOUT THIS DOCUMENT

1.1 Introduction

1.1.1 This document summarises the case put by Associated British Ports (the Applicant), at the Issue Specific Hearing 1 on 20 February 2024 (PM) for the Immingham Green Energy Terminal project (referred to as the project).

1.1.2 The hearing opened at 14:00 on 20 February 2024 and closed at 17:44 on 20 February 2024. The agenda for the hearing [EV2-001] was published on the Planning Inspectorate's website on 9 February 2024.

1.1.3 In what follows, the Applicant's submissions on the points raised broadly follow the items set out in the Examining Authority's agenda.

1.2 Attendees on behalf of the Applicant

1.2.1 Hereward Phillpot KC, Counsel instructed jointly by Bryan Cave Leighton Paisner LLP (BCLP) and Charles Russell Speechlys (CRS), appeared on behalf of Associated British Ports, the Applicant.

2 APPLICANT'S SUMMARY OF CASE ON ITEM 3: OVERVIEW AND OPERATION OF THE PROPOSED DEVELOPMENT

2.1 Item 3 (Overview and Operation of the Proposed Development)

Table 3.1 – Item 3 (Overview and Operation of the Proposed Development)

<table>
<tr><th>Issue Discussed</th><th>Summary Of Oral Case</th></tr>
<tr><td colspan="2">The Applicant made submissions in relation to the below agenda items with reference to a PowerPoint presentation, the slides of which are provided at Appendix A of this document.</td></tr>
<tr><td>Reliable information and market data to demonstrate the need for the Proposed Development</td><td>The Applicant provides the speaking notes of Hereward Phillpot and Philip Rowell gave evidence in relation to this agenda item at appendices B and C respectively.

The Applicant also provides the opening statements of Simon Bird on behalf of Associated British Ports and Caroline Stancell on behalf Air Products at appendices D and E respectively.</td></tr>
<tr><td>Components of the Proposed Development that comprise the Nationally Significant Infrastructure Project (NSIP) and Associated Development (AD)</td><td>The Applicant provides the speaking notes of Adam Varley and Timon Robson gave evidence in relation to this agenda item at appendices F and G respectively.</td></tr>
<tr><td>Comparisons with other liquid bulk port developments within the UK</td><td>The Applicant provides the speaking note of Adam Varley who gave evidence in relation to this agenda item at appendix F of this document.</td></tr>
<tr><td>Step by step description of the operation of the Proposed Development (NSIP and Associated Development) during operations</td><td>The Applicant provides the speaking note of Timon Robson who gave evidence in relation to this agenda item at appendix G of this document.</td></tr>
<tr><td>Forecast of other users and jetty related activity that are expected to be accommodated to fully use the port capacity</td><td>The Applicant provides the speaking note of Philip Rowell who gave evidence in relation to this agenda item at appendix H of this document.</td></tr>
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ASSOCIATED BRITISH PORTS

AIR PRODUCTS

Immingham Green Energy Terminal

Issue Specific Hearing 1 (ISH1) Strategic Overview of the Proposed Development

Tuesday 20 February 2024 (pm)

Agenda Item 3: Applicant's Presentation as requested by the Examining Authority (ExA)

Structure of the Presentation

- Introductory comments
- Need for the Proposed Development
- Statement by Associated British Ports ("ABP")
- Statement by Air Products (BR) Ltd.
- Components of the NSIP and Associated Development
- Comparison with other liquid bulk port developments
- Operation of the NSIP
- Operation of the Hydrogen Production facility:
  - Hydrogen Production: Step-by-step description during operation
  - Low Carbon certification
- Forecast of other users and jetty related activity
- Construction programme and phasing, operation and decommissioning

Introductory comments

Need for the Proposed Development

Statement by ABP

Statement by Air Products

Components of the NSIP and Associated Development

Component of NSIP (Work No.1)	Component of Associated Development (Work Nos. 2 – 10)
New in-river berth adjacent to the main navigation channel of the River Humber, including:	Jetty access road (Work No. 2)
• A jetty, consisting of an approach trestle, approximately 1.1km in length, leading up to one berth, including loading platforms and berthing and mooring dolphins with link walkways	Ammonia storage tank and associated, buildings, plant and infrastructure (Work No. 3)
• Jetty access ramp making landfall above mean high water mark	Underground culvert beneath Laporte Road connecting Work Nos. 3 & 5 (Work No.4)
• Topside loading and unloading infrastructure, including ancillaries	Hydrogen production facility and associated buildings, lant and infrastructure (Work No.5)
• Pipes, pipelines and utilities and associated works	Underground pipelines, pipes, cables linking (Work Nos. 3 & 7)
• Local raising flood defence	Hydrogen production, storage and distribution facility (Work No. 7)
• A capital dredge of the berth pocket to -14.5m below Chart Datum	Temporary construction lay down areas adjacent to Queens Road (Work No. 8) and Work No. 2 (Work No.9)
	Temporary modification of overhead lines and removal of highway signage (Work No. 10)

Comparison with other liquid bulk port developments

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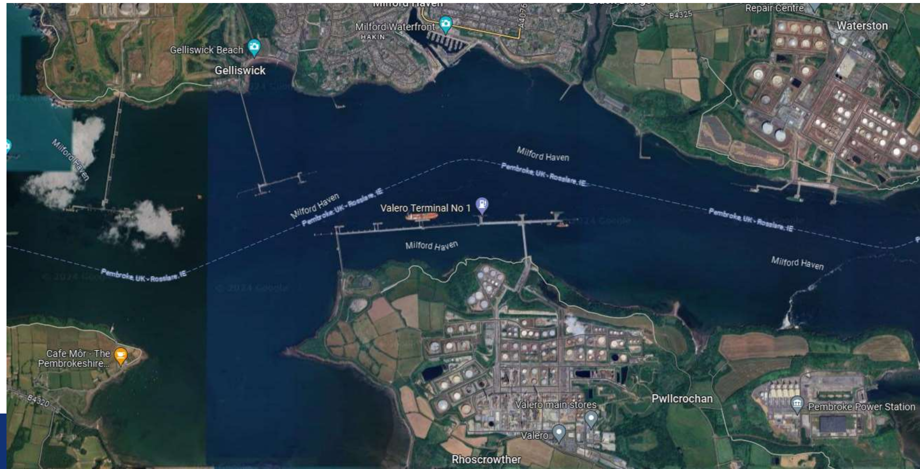
Immingham Oil Terminal

- 1 Liquid Bulk Jetty, approx. length 900m
- 7 Liquid Bulk Berths
- Max. Vessel Size, LOA 366.0m, Draft 13.1 (max)
- Landside storage facility (8ha)
- 8 km long pipeline connecting IOT with Prax Lindsey Oil Refinery and Phillips 66 Humber Refinery – combined 400ha (27% of UK refining capacity)

Milford Haven

- 4 Liquid Bulk Jetty's
- 14 Liquid Bulk Berths, largest in excess of 950m in length,
- Max Vessel Size (at Valero), LOA 365m, Draft 16.1m
- Storage capacity at Valero alone – 85,000,000 (bbl) in 52 tanks
- Largest jetty connects to South Hook LNG Terminal (One of Europe's largest handling 20% of UK gas demand)



Comparison with other liquid bulk port developments

Fawley Oil Terminal

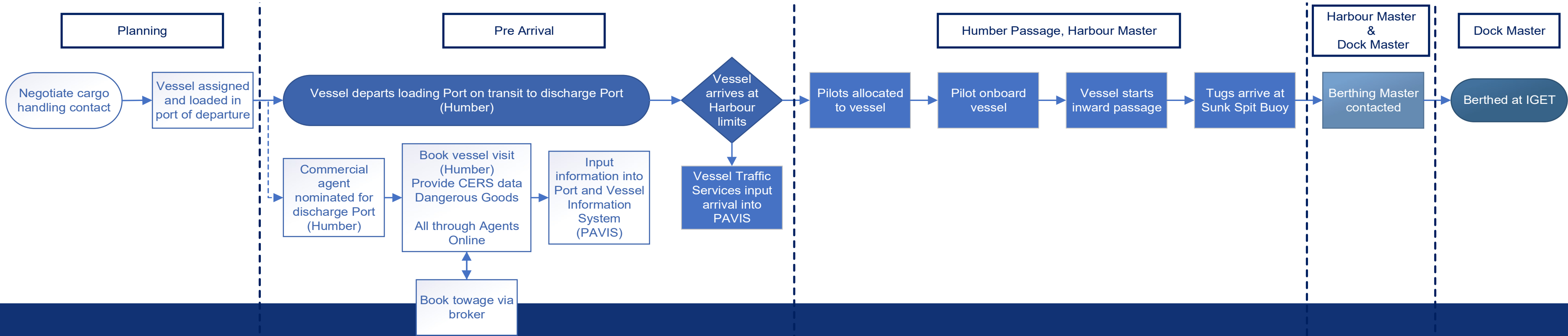
- 2 Liquid Bulk Jetty’s, length approx. 450m
- 9 Liquid Bulk Berths (Jetty Head in excess 1,500m long)
- Max Vessel Size, LOA 368m Draft 14.9m
- Serving 506 ha Fawley Refinery
- 20 % of UK Refinery Capacity

Operation of the NSIP

The below flow chart aims to outline the typical operations involved in of one of the 34,000+ vessel movements on the Humber each year.

Passage Operations

- The ships agent makes bookings for tugs, pilot and passage,
- The ship makes contact with Vessel Traffic Services (VTS) ahead of arrival – and will be ordered to anchor or be allowed to continue passage,
- On continuing as a passage plan vessel, the Pilot boards the ship via launch to guide the vessel to berth.



Operation of the NSIP (Cont.)

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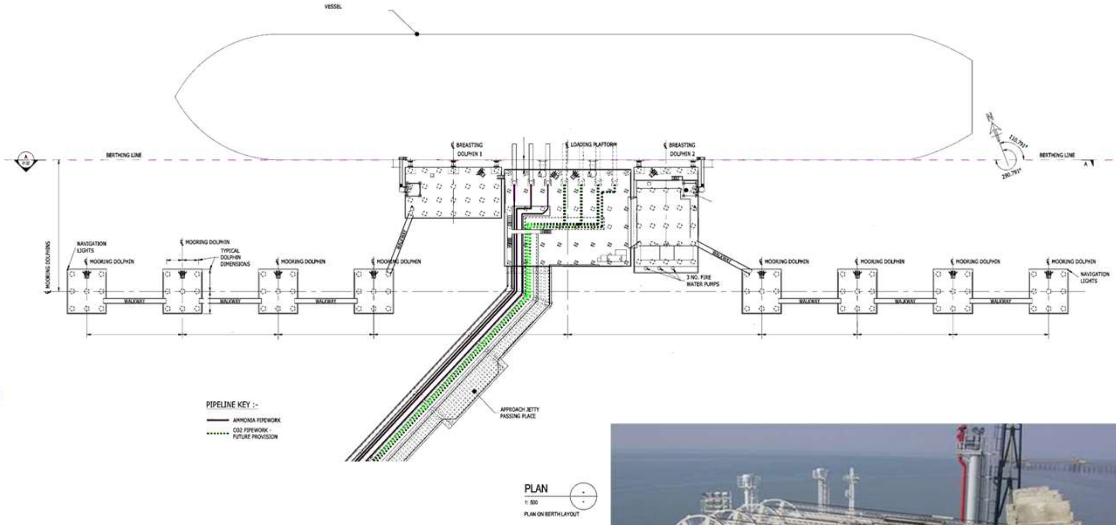
Berthing Operations

- The Berthing Master is contacted to oversee the final docking process, and the vessel continues its inward passage under the guidance of the Harbor Master & Dock Master.
- During the berthing process, tugs and pilots will assist the vessel to ensure it is safely and correctly positioned along the jetty. The crew on board and port personnel coordinate to secure the vessel.
- Once safely alongside, the Deck Officer and Air Products will manage the discharge of cargo. This will commence with the connection of the Marine Loading Arms at the jetty head.



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How is green hydrogen produced and transported?

1 Clean Energy Generation

Renewables such as solar and wind generate electricity.

2 Green Hydrogen Production

Renewable electricity splits desalinated water to produce green hydrogen.

3 Processing

Ammonia is produced from Green hydrogen and nitrogen

4 Shipping

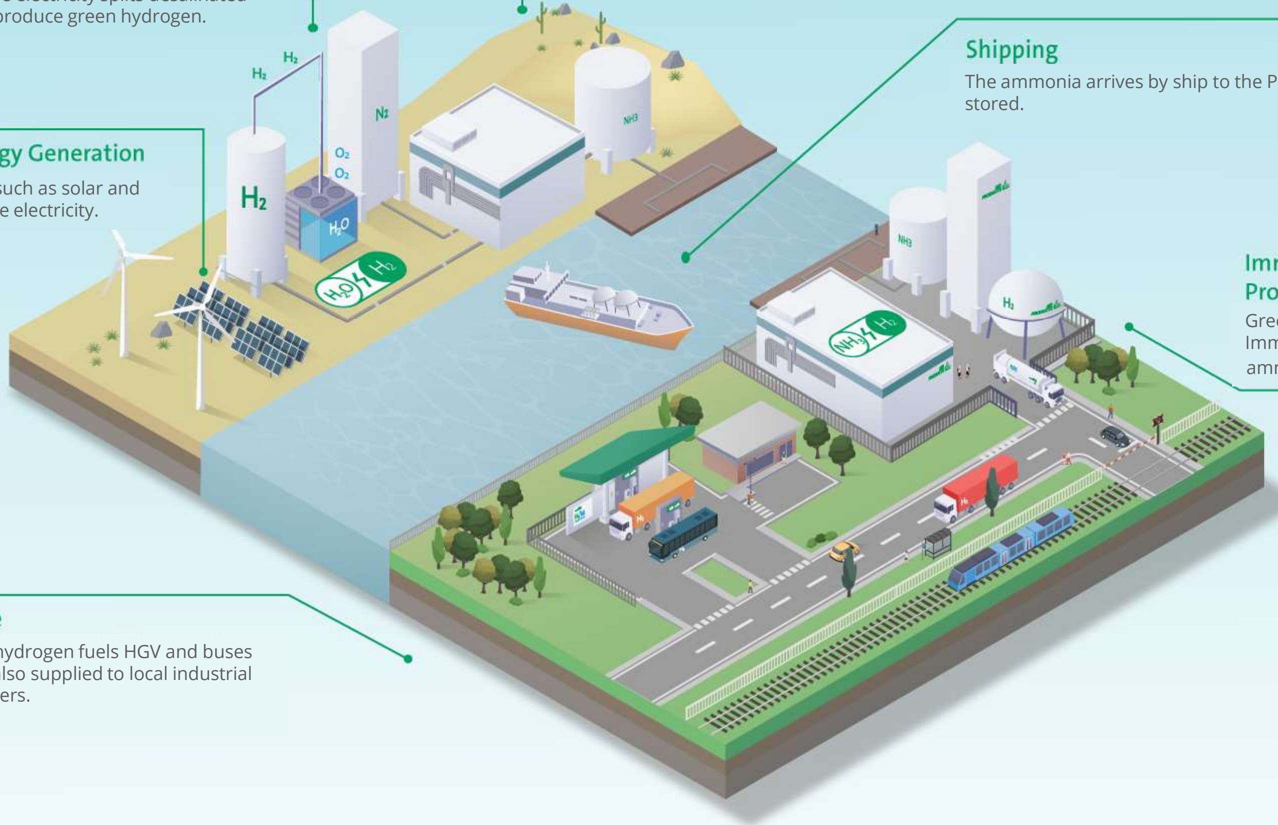
The ammonia arrives by ship to the Port of Immingham, where it is stored.

5 Immingham Green Hydrogen Production Facility

Green hydrogen is produced in Immingham, using the stored ammonia, and is then distributed to users.

6 Usage

Green hydrogen fuels HGV and buses and is also supplied to local industrial customers.



Immingham

H_2fM
Hydrogen for Mobility

Overall benefit of hydrogen produced by the project

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Diesel equivalent (94 gCO2e/MJ)	Gas equivalent (67 gCO2e/MJ)
At least 65 % reduction in CO2 emissions	At least 70 % reduction in CO2 emissions
Transport Hydrogen (32.9 gCO2e/MJ)	Industrial Hydrogen (20 gCO2e/MJ)

The green credentials of the process is expressed in terms of carbon intensity which refers to the life-cycle emissions of greenhouse gases from the fuel supply chain. It is expressed in units of carbon dioxide equivalents per megajoule of fuel (gCO2e/MJ).

Hydrogen Production: Step-by-step description

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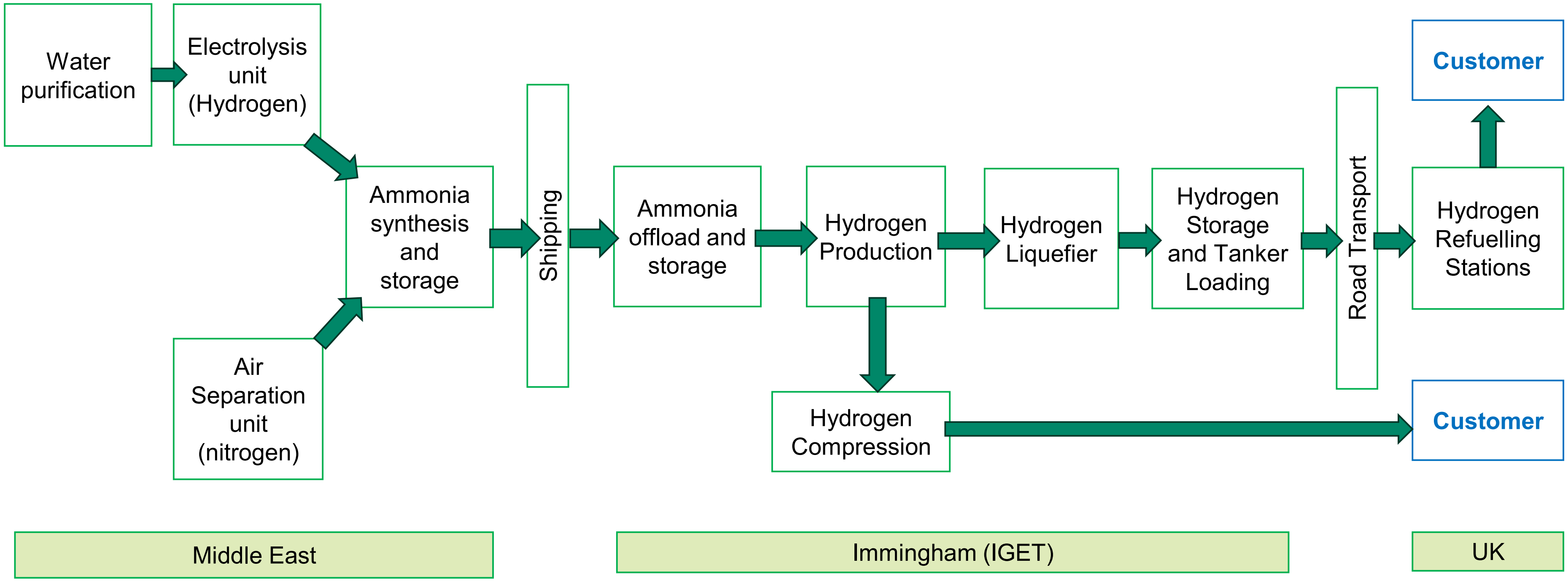

Creation of green ammonia in the Middle East

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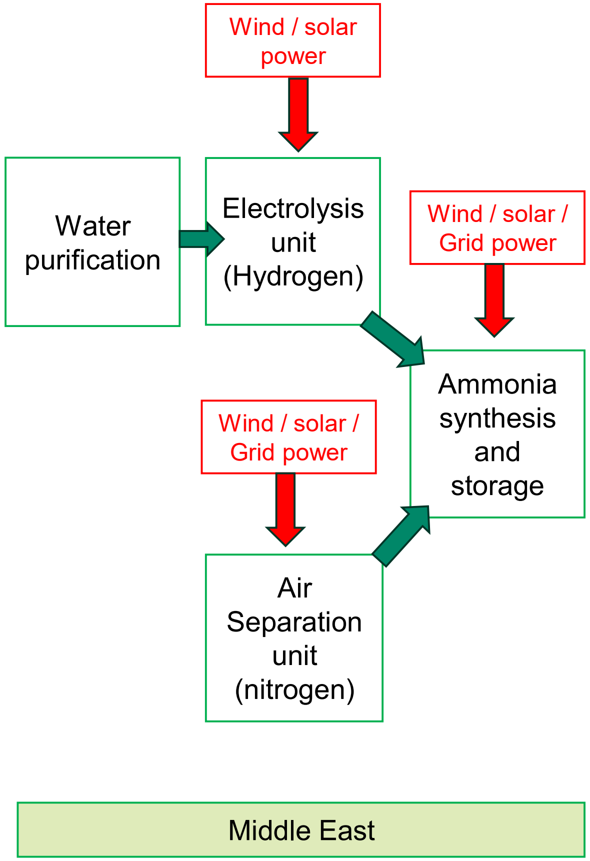


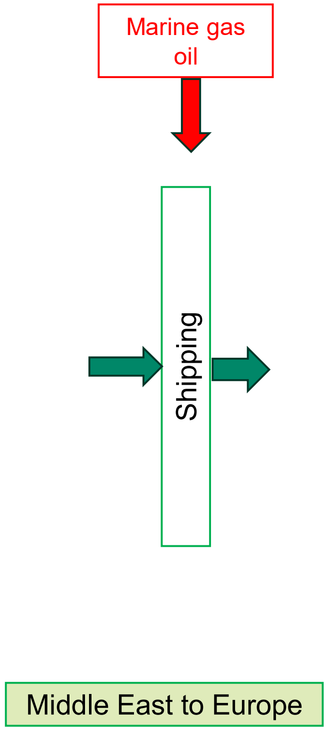
The generation of hydrogen molecules through electrolysis is entirely from renewable power.

- This process accounts for about 3% of the overall Carbon intensity of the final green H2
- There is CI contribution from areas such as catalysts, lubricating oils, water treatment etc

The generation of nitrogen and ammonia uses renewable power but also some electrical power from the local grid.

- This is due to critical equipment not being able to tolerate any fluctuations in electrical supply.
- This accounts for about 9% of the overall Carbon intensity of the final green H2 product

Shipping

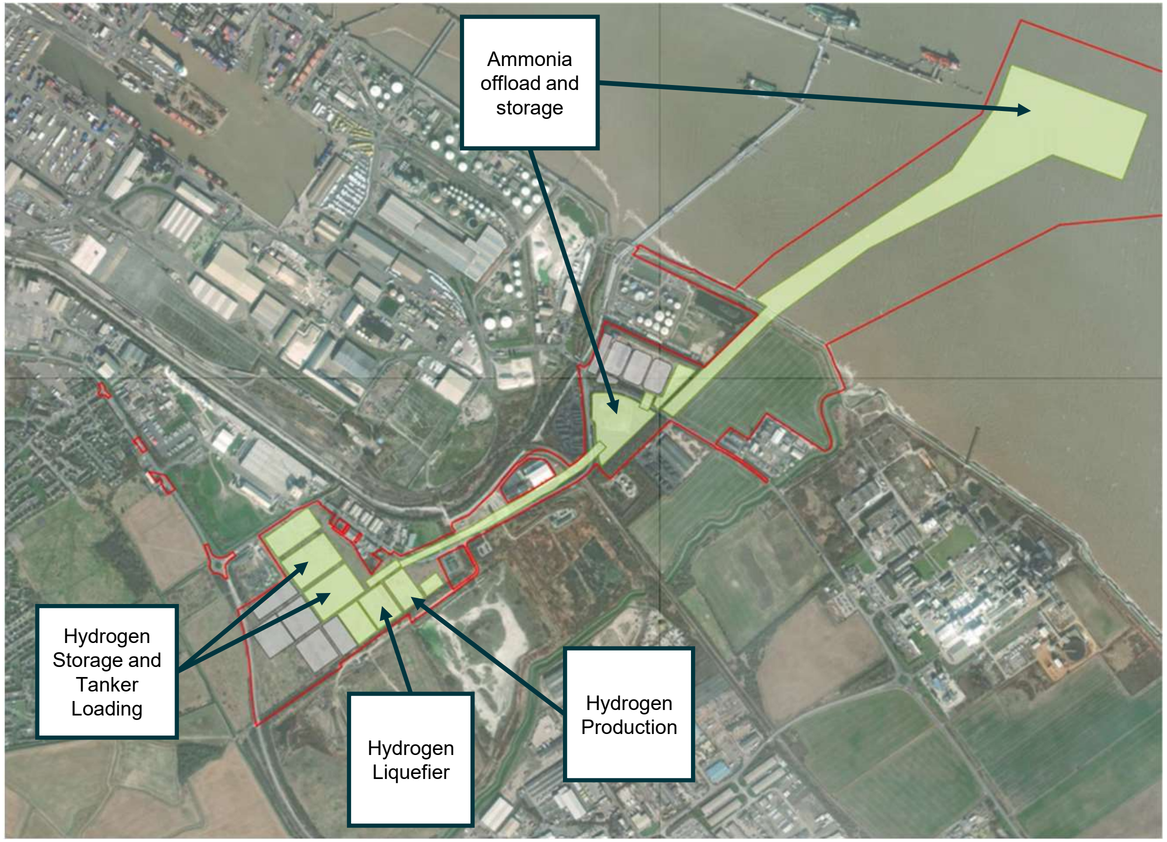


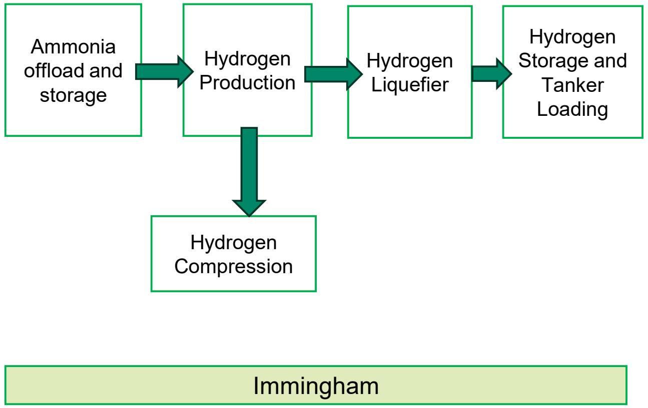
- VLGC vessels will be used to transport refrigerated liquid ammonia to Europe (Immingham, Rotterdam and Hamburg initially)
- These will be vessels (up to 230m long) or specific ammonia carrier ships of which some are now in construction

Green credentials

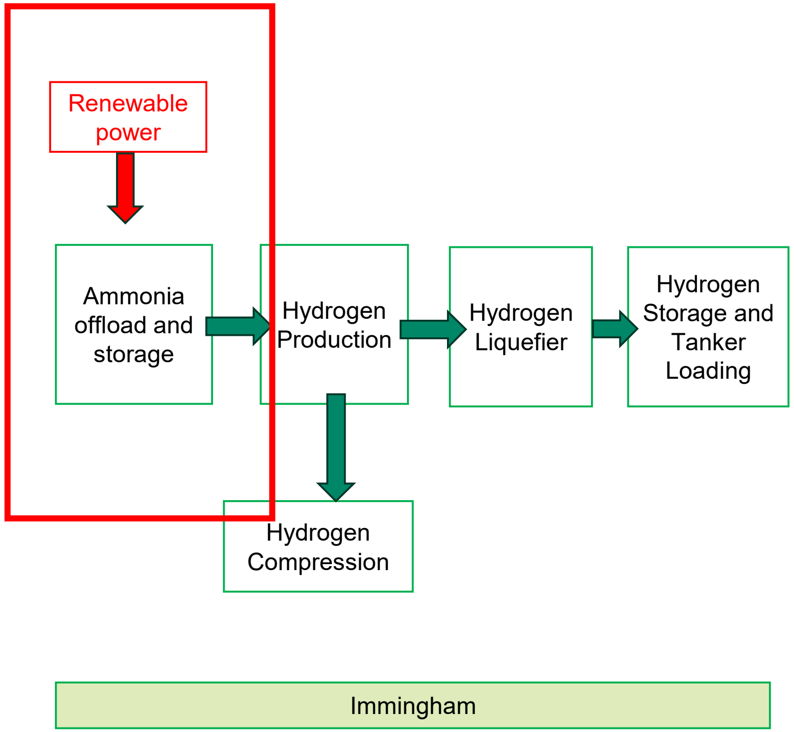
- Currently these ships are powered by marine gas oil.
- Shipping accounts for about 14% of the overall Carbon intensity of the final green H2 product
- Future technology improvements and regulations in the shipping industry means shipping emissions is expected to reduce
  - First Ammonia fuelled engines expected to be on market in 2024 (MAN) and new ammonia carriers are likely to be the first users of his technology. Expected that 1st ammonia-fuelled vessels to be operational in the second half of this decade
- UK Government has set legally binding Co2 emission reduction for shipping as part of its 6th Carbon Budget and net zero 2050 legislation

Immingham process layout





Ammonia storage

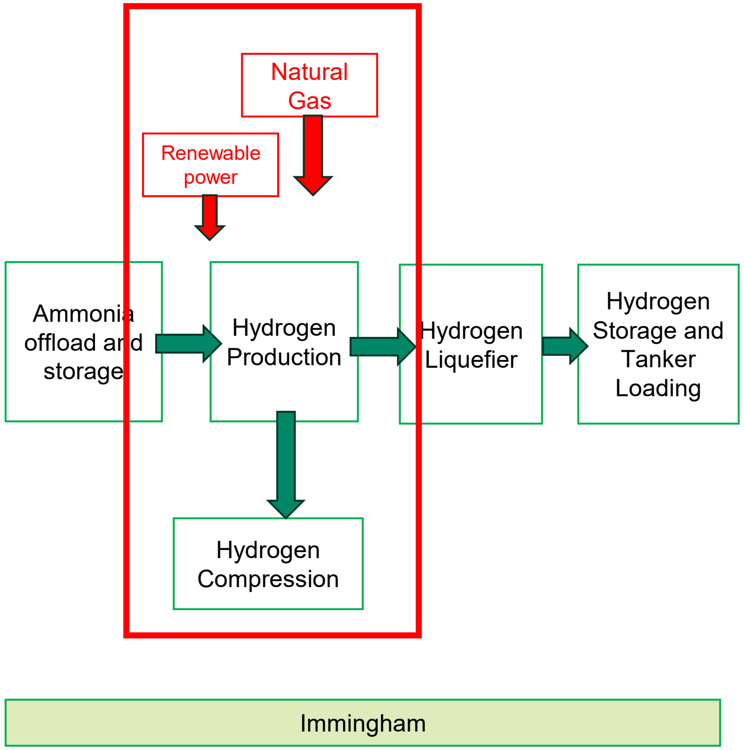


- Ships will dock at the IGET jetty in Immingham and offload liquid ammonia, using ships pumps, via above ground pipelines (Work No 1 and 2) into the large storage tank in Work No 3
- Prior to offloading, NH_3 will be circulated through the pipelines to cool them down. Offloading will take about 24 hours
- The ammonia will be kept in liquid form at -33C and a vapour recovery process unit will compress / liquify any vapour from the tank
- This area is supported by utility and safety systems (flare, instr air, fire water, emergency generator etc)
- Ammonia is pumped to the hydrogen production units (located in Work 7 for phase 1)

Green credentials

- Ammonia storage accounts for about 4% of the overall Carbon intensity of the final green H_2 product

Hydrogen production

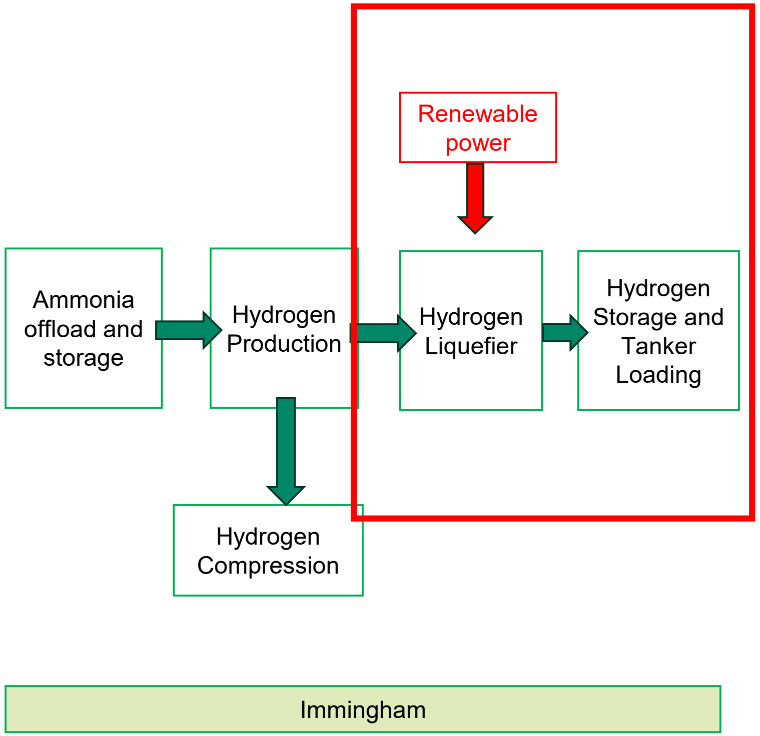


- Ammonia is split into H2 and N2 by heating the ammonia in a gas fired furnace with catalyst to assist the reaction.
- The produced H2 is then purified in a separate process unit. The nitrogen is released to atmosphere
- The design is optimised to minimise energy requirements (re-use of spare heat)

Green credentials

- Currently natural gas is used in the process
- Hydrogen production accounts for about 37% of the overall Carbon intensity of the final green H2 product (33% due to gas and 4% due to power)
- Future process improvements may allow use of hydrogen as a firing gas either wholly or partially

Hydrogen Liquefier

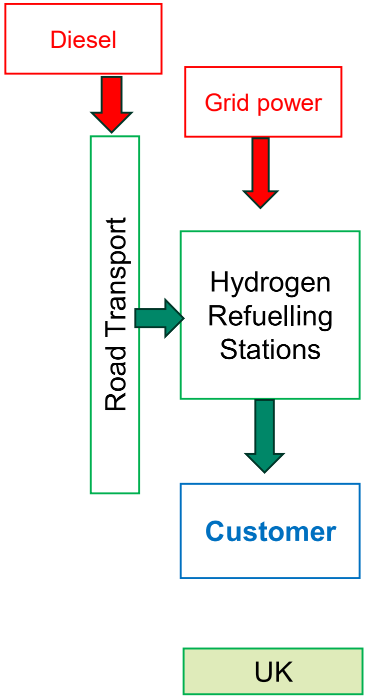


- Gaseous hydrogen is further purified and refrigerated to liquid form in the H2 liquefier process unit. This is done by a series of compression, cooling and expansion sequences.
- The liquid hydrogen is stored in long horizontal vessels from where liquid hydrogen is loaded into road tankers

<u>Green credentials</u>

- Hydrogen liquefying accounts for about 15% of the overall Carbon intensity of the final green H2 product.
- Power will be purchased from a renewable source through a renewable power purchase agreement

Hydrogen refueling stations



- Liquid hydrogen will be transported by road tanker to hydrogen refuelling stations (HRS) where the hydrogen will be stored and loaded into HGV as the end user.

Green credentials

- Current assessment is that transport is by diesel HGV but Air Products will convert its road tanker fleet to hydrogen power as soon as manufacturing and legislation enables this
- Road transport accounts for about 7% of the overall Carbon intensity of the final green H2 product.
- Hydrogen Refuelling stations accounts for about 11% of the overall Carbon intensity of the final green H2 product.

Carbon Intensity of each stage

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Process step	Carbon Intensity %
Hydrogen production	3%
N2 and NH3 production and storage	9%
Shipping	14%
Offload and storage	4%
Hydrogen Production Unit	37%
Liquefier	15%
Road Transport	7%
Hydrogen Refuelling Stations	11%
Overall *	100%

* 100% equates to 35% of equivalent Carbon Intensity for diesel use

Industrial Hydrogen

Transport Hydrogen

Low carbon certification

A separate written response will be provided (against Q1.3.3.4) explaining the current standards and obligations for certification of low carbon hydrogen, how they function and are secured.

The key standards related to green hydrogen are:

- **The Renewable Transport Fuel Obligation Order (RTFO)**
- **UK Low Carbon Hydrogen Standard**

Transport hydrogen (for HGV):

- Compliance with the **RTFO** requires a carbon intensity of less than **32.9 grCO2e/MJ** for its full supply chain from production to the fuelling point (Hydrogen Fuelling station).
- This is about 35% of the equivalent value for diesel
- The Air Products green hydrogen for road transport will meet this threshold

Industrial hydrogen (for pipeline customers):

- Compliance with the **UK Low Carbon Hydrogen Standard** requires a carbon intensity of less than **20 grCO2e/MJ** for its full supply chain from production to user.
- This is about 30% of the equivalent value for natural gas
- The Air Products green hydrogen for industrial use will meet this threshold

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Forecast of other users and jetty related activity

1. **<u>Introductory comments in relation to need</u>**

    a. In a moment I will invite Mr Rowell to explain the approach to need set by the NPSfP and how that applies to the proposed development here.

    b. He will explain how the NPS that has effect in this case establishes the need for substantial additional port capacity, including the type of capacity that would be created by the proposed development, such that it is not necessary for the Applicant itself to demonstrate need. That reflects the approach summarised in the **Planning Statement [APP-226] at p. 40 [5.1.2]** and set out in more detail in section 5 of that document.

    c. That is the intended role of NPS under the PA 2008.

    d. In that context, the Supreme Court has drawn attention to what was said in the 2007 White Paper: Planning for a Sustainable Future as to the mischiefs that the Planning Act was intended to address and how that translated into the Act itself (the Heathrow challenge (***R (Friends of the Earth) v. SST*** [2021] PTSR 190) at pp. 198-199). [We can supply a copy of that Judgment as an Appendix to the written summary of our oral submissions in due course.]

    e. As the White Paper explained, a key problem with the previous system was that national policy and in particular the national need for infrastructure, was not in all cases clearly set out. The need for the infrastructure therefore had to be established through the inquiry process for each individual application.

f. The advent of the Planning Act 2008 and the role that it gave to NPS was intended to address that mischief, and it has. The courts have also been rigorous in policing efforts by some to use the examination process to question the merits of policy or suggest that it is up to date in order to try and circumvent that central feature of the system established by the PA 2008.

g. Mr Rowell will therefore draw on what is said about need in the Ports NPS and so far as relevant the new overarching Energy NPS EN-1 and explain how it applies here.

h. He will also draw attention to the fact that the Applicant has nevertheless gone further and demonstrated a specific need for the proposed development here.

i. In the **NPSfP** the Government describes as a “fundamental policy” [3.3.2] that it seeks to “allow judgments about when and where new developments might be proposed to be made on the basis of commercial factors by the port industry or port developers operating within a free market environment” [3.3.1]. That is said by the Government to reflect the fact that “the ports industry has proved itself capable of responding to demand in that way”.

j. This is further developed at [3.4.12] where the NPS provides that "Port development must be responsive to changing commercial demands, and the Government considers that the market is the best mechanism for getting this right, with developers bringing forward applications for port developments where they consider them to be commercially viable".

k. In short, the NPS does not envisage the Government itself deciding which commercial demands should be responded to.

IMMINGHAM GREEN ENERGY TERMINAL

ISSUE SPECIFIC HEARING 1 (ISH1) – STRATEGIC OVERVIEW AND OPERATION OF THE PROPOSED DEVELOPMENT

Agenda item 3(i) – Applicant's explanation of the need for the Proposed Development.

i. Reliable information and market data to demonstrate the need for the Proposed Development, including the demand for additional liquid bulk port capacity, both generally and specifically for low carbon energy products, with reference to relevant policy positions in the National Policy Statement for Ports (NPSfP)

Speakers Notes – Philip Rowell (Adams Hendry Consulting Ltd)

1. I have the privilege of appearing before you today on behalf of the Applicant – Associated British Ports – to summarise the case on the need for the Proposed Development, particularly in the context of the National Policy Statement for Ports – the relevant National Policy Statement.

2. What I am going to set out is clearly only an outline of the detailed case on the need for the Proposed Development. Much greater detail is set out in the application documentation, for example the Planning Statement **[APP-226]** and accompanying appendices **[APP-227 to 233]** and Environmental Statement Chapter 3 Need and Alternatives **[APP-045].**

3. At the outset, I thought that it might be helpful to go back to some basic points and matters to help set the scene for understanding the need for the Proposed Development.

4. As we are all aware the Proposed Development is a Nationally Significant Infrastructure Project for which the National Policy Statement for Ports has effect. As such section 104(3) of the 2008 Act requires the Secretary of State for Transport to decide this application in accordance with that policy, except in a limited number of specified circumstances set out in the subsequent parts of section 104.

5. At this point I would just highlight that through its application documentation the Applicant has clearly demonstrated that the Proposed Development accords with the national ports policy and that none of the exceptions subsequently set out in section 104 of the 2008 Act apply.

6. In respect of the national ports policy, a final introductory contextual point to highlight is that no party is entitled to challenge what the policy says through the examination. Such a challenge to policy is only possible during the process of the policy being designated or reviewed. Whilst the Government has announced a review of the national ports policy, it remains at this time extant national policy against which harbour facility NSIPs are to be considered.

7. Before summarising the position on need that is contained within the ports policy, it is important to record at the outset an important principle in terms of that established policy. That principle is that under the ports policy itself there is actually no requirement for the Applicant to demonstrate a need for the proposed development (even though it has done so) because an urgent and compelling need is already established in the policy statement which has been approved by Parliament.

8. I will now explain that in some further detail by reference to Chapter 3 of the policy statement – the chapter that deals with need matters. Chapter 3 of the policy statement, as I will explain, demonstrates that there is a compelling need for substantial additional port capacity and in reaching this conclusion the Government in the policy statement has identified a number of matters which I will now summarise-

   a. It is identified that shipping will continue to provide the only effective way to move the vast majority of freight and bulk commodities in and out of the UK, and the provision of sufficient sea port capacity will remain an essential element in ensuring sustainable growth in the UK - NPSfP paragraph 3.1.4

   b. It is identified that:

      - *first,* ports have a vital role in the import and export of energy supplies;
      - *second,* port handling needs for energy can be expected to change as the mix of energy supplies changes, and
      - *third,* that ensuring security of energy supplies through ports is an important consideration with ports needing to be responsive to changes – NPSfP paragraph 3.1.5.

   c. As part of what is described in the statement as fundamental policy, it is made clear that the Government seeks to encourage sustainable port development to cater for long-term forecast growth in volumes of imports and exports by sea with a competitive and efficient port industry capable of meeting the needs of importers and exporters cost effectively and in a timely manner – NPSfP paragraph 3.3.1 bullet 1.

d. As a further important part of its fundamental policy contained within the statement, the Government makes it clear that it allows judgments about when and where new port developments are proposed to be made on the basis of commercial factors by the port industry or port developers operating within a free market environment (NPSfP paragraph 3.3.1, bullet 2). This policy reflects the fact that:

(i) the ports industry has proved itself capable of responding to demand in this way – NPSfP paragraph 3.3.2, and

(ii) the ports industry and port developers are best placed to assess their ability to obtain new business and the level of any new capacity that will be commercially viable – subject to those developers satisfying decision makers that the likely impact of developments have been assessed and addressed – NPSfP paragraphs 3.4.12 and 3.4.13.

This approach is important to then understand how the Government's policy on need matters is to be applied in practice, namely that it is not for the Government or any other body or decision maker to undertake a predict and provide exercise in respect of the provision of capacity, but rather it is for the market to bring forward proposals it considers to be commercially viable, with such a consideration clearly relating to matters which go beyond more than just demand and forecast considerations.

e. And in this regard, the ports policy makes clear that the Government's own assessment of the total need for new infrastructure depends not only on overall demand for port capacity but also on the need to retain the flexibility that ensures that port capacity is located where it is required and on the need to ensure effective competition and resilience in port operations – NPSfP paragraph 3.4.1 – matters which I now explain further in turn.

f. *Firstly, the demand element of the Government's assessment of the total need -* The Government's assessment of this element is partly based upon its own forecasts of demand for port capacity. At the time the policy statement was designated in 2012 the Government anticipated that there might be updated forecasts but it did not expect any updates to result in any change in the policy that it is for each port to take its own commercial view and its own risks on its particular traffic forecasts (NPSfP paragraph 3.4.7). The latest national forecasts from 2019 confirm that prescient approach, confirming this aspect of the need and resulting in no revision to the ports policy.

Furthermore, in respect of this point the Government's assessment of the capacity needed to provide for the competition, innovation, flexibility and resilience elements of the total need for new infrastructure which it identifies is that such capacity can be delivered by the market and is likely to exceed what might be implied by a simple aggregation of demand nationally - NPSfP paragraph 3.4.9.

g. *Secondly, the requirement for capacity to be in the right location element of the Government's assessment of the total need* - The Government's assessment of this element highlights that capacity needs to be provided at a wide range of facilities and locations, to provide the flexibility to match the changing demands of the market - NPSfP paragraph 3.4.11.

   It is further explained in this regard that forecasts do not attempt to predict locations where demand would manifest and the Government does not wish to dictate where port development should occur. Port development must be responsive to changing commercial demands and the Government considers that the market is the best mechanism for getting this right, with developers – as already explained - bringing forward applications for port development where they consider them to be commercially viable - NPSfP paragraph 3.4.12.

h. *Thirdly, the competition element of the Government's assessment of the total need* - In respect of this element it is made clear that competition is a good thing and it is to be encouraged as it drives efficiency and lowers costs for industry and consumers so contributing to the competitiveness of the UK economy. Effective competition is identified as requiring sufficient spare capacity to ensure real choices for port users and also for ports to operate at efficient levels rather than operate at full capacity. National policy also specifically notes that total port capacity in any sector will need to exceed forecast overall demand if the ports sector is to remain competitive. Again, as already indicated, the Government believes that the port industry and port developers are best place to assess their ability to obtain new business and the level of any new capacity that will be commercially viable, subject only to developers satisfying decision makers that the likely impacts of any proposed development have been assessed and addressed - NPSfP paragraph 3.4.13.

i. *Fourthly, the resilience element of the Government's assessment of the total need* - In respect of this element it is highlighted that spare capacity also helps to assure the resilience of the national infrastructure where port capacity is needed at a variety of locations and covering a range of cargo and handling facilities. The Government believes that resilience is provided most effectively as a by-product of a competitive ports sector - NPSfP paragraph 3.4.15.

9. Having undertaken the analysis that I have just summarised, and having regard to the various conclusions the Government reaches in respect of the various elements of need it identifies, paragraph 3.4.16 of the policy then sets out the overall conclusions of the Government's assessment of the need for new port infrastructure, and this is as follows:

"….the Government believes that there is a compelling need for substantial additional port capacity over the next 20 – 30 years, to be met by a combination of development already consented and development for which applications have yet to be received. Excluding the possibility of providing additional capacity for the movement of goods and commodities through new port development would be to accept limits on economic growth and on the price, choice and availability of goods imported into the UK and available to consumers. It would also limit the local and regional economic benefits that new developments might bring. Such an outcome would be strongly against the public interest."

10. The Government's clear identification of the need for new port infrastructure set out in section 3.4 of the national ports policy then leads to the very clear guidance in section 3.5 of the policy that when determining an application for a Development Consent Order in relation to ports, the decision-maker should accept the need for future capacity for various matters and objectives, which clearly need to be read and

understood in light of the preceding explanation of the Government's identification of the need for new port infrastructure. In summary, future capacity is needed to :

(a) cater for long-term forecast growth indicated by the forecast figures, with demand likely to rise;

(b) support the development of offshore sources of renewable energy;

(c) offer a sufficiently wide range of facilities at a variety of locations to match existing and expected trade, ship call and inland distribution patterns and to facilitate and encourage coastal shipping;

(d) ensure effective competition among ports and provide resilience in the national infrastructure; and

(e) take full account of both the potential contribution port development might make to regional and local economies.

11. The Applicant's Proposed Development provides capacity which will address various of the matters and objectives which I have just summarised from paragraph 3.5.1 of the ports policy. Again, by way of a summary:

(i) Having taken its own commercial judgement, the Applicant – ABP - in conjunction with its first customer Air Products has determined that there is sufficient demand from the energy sector for this development at the Port of Immingham.

The Proposed Development will provide capacity to cater for the expected growth in the import and export of those liquid bulk products envisaged to be handled at the facility.

In this respect I would highlight that, in addition to the commercial view being taken by the Applicant and by way of context, within the latest national demand forecasts (produced in 2019 and superseding the previous forecasts referred to in the national ports policy) the forecast is for a significant growth in liquid gas products in the period to 2050. The headline figure for this cargo category is that there will be a growth of 68.2% between 2016 and 2050.

(ii) The Proposed Development will provide appropriate facilities at an appropriate location on the Humber to match existing and expected trade, ship call and inland distribution patterns. The Proposed Development also has the potential to be used for coastal shipping purposes. Further explanation of these points is provided in, for example, paragraphs 5.4.4 to 5.4.8 and 5.4.11 to 5.4.12 of the Planning Statement.

(iii) The Proposed Development would contribute to effective competition amongst ports and provide resilience in the national infrastructure. Further explanation of these points is provided in, for example, paragraphs 5.4.9 to 5.4.10 and 5.4.13 to 5.4.14 of the Planning Statement.

(iv) The Proposed Development will make a significant contribution to the regional and local economy, a summary of which is provided, for example in paragraphs 5.3.19 to 5.3.23 of the Planning Statement.

12. Given the level and the urgency of the need for such infrastructure as summarised in paragraph 3.5.1 of the national ports policy, the policy itself then makes it clear that the decision maker should start with a presumption in favour of granting consent to applications for ports development, with that presumption applying unless any more specific and relevant policies set out in the national ports policy or another national policy statement clearly indicate that consent should be refused – NPSfP paragraph 3.5.2, and in respect of this matter I would just emphasise the word ‘clearly’ as this means that the disapplication is only engaged where any specific and relevant policies clearly indicate that the presumption should be disapplied (i.e. a breach of such a policy would lead to refusal). For the avoidance of any doubt, there are no ‘disapplication factors’ of relevance to the Proposed Development.

13. So from all of what I have just set out, it is clear that it is already national Government policy - again which no party is entitled to challenge in this examination - that there is an urgent and compelling need for the Proposed Development for all the reasons identified in the national ports policy and which I have just summarised.

14. Having said all that, however, the Applicant – even though it does not need to do so - has produced further separate evidence of the urgent and compelling need for the Proposed Development at this location within the Humber Estuary. This separate identification of need relates to matters of energy security, energy decarbonisation and the wider decarbonisation of the economy and society, and is, in summary, based upon three matters which I now explain in turn:

Matter 1 - The need to achieve energy security through a diversity of technologies, fuels and supply routes.

15. As we are all aware, the UK is vulnerable to international energy prices and is currently dependent on imported oil and gas products. The significance of this aspect of the need is explained in the application documentation by reference to various statements of Government policy – statement which again no party is entitled to challenge through this examination.

16. For example, the Overarching National Policy Statement for Energy (EN-1) highlights (at section 2.5) the importance of having secure energy supplies. Paragraph 2.5.1, for example, states that:

"Given the vital role of energy to economic prosperity and social well being, it is important that our supplies of energy remain secure, reliable and affordable."

17. Reference in EN-1 (at paragraph 2.5.6) is also made to the British Energy Security Strategy (last updated 7 April 2022) which is said in EN-1 to emphasise:

"the importance of addressing our underlying vulnerability to international energy prices by reducing our dependence on imported oil and gas, improving energy efficiency, remaining open minded about our onshore reserves including shale gas, and accelerating deployment of renewables, nuclear, hydrogen, CCUS, and related network infrastructure, so as to ensure a domestic supply of clean, affordable, and secure power as we transition to net zero."

18. Further detail on this element of the Applicant's separate identification of need for the Proposed Development is provided in, for example, paragraphs 5.2.22 to 5.2.26 of the Planning Statement.

Matter 2 - The need to scale up low carbon hydrogen production capability as an established alternative clean source of energy.

19. As others will be more able to explain, hydrogen can be efficiently converted into energy for transportation and industrial uses without emissions of CO_2.

20. Policy documents such as EN-1, the UK Hydrogen Strategy (August 2021) and the British Energy Security Strategy all in various ways highlight the important role hydrogen production will play in future energy requirements.

21. Further detail on this element of the Applicant's separate identification of need for the Proposed Development is provided in, for example, paragraphs 5.2.27 to 5.2.39 of the Planning Statement.

Matter 3 - The general urgent need for carbon capture and storage technologies to support decarbonisation and the related specific need to address the growing and changing needs of the energy sector in respect of the decarbonisation of the Humber Industrial Cluster and the Humber Enterprise Zone.

22. The general urgent need for carbon capture and storage technologies is explained further in, for example, paragraphs 5.2.40 to 5.2.46 of the Planning Statement. This explanation highlights, amongst other things, that such infrastructure is considered by Government to be fundamental to the decarbonisation of certain industries on which the country relies.

23. The Humber specific aspect of this element of the Applicant's separate identification of need is explained further in, for example, paragraphs 5.2.7 to 5.2.21 of the Planning Statement. The importance of tackling the decarbonisation of the Humber area is highlighted having regard to various aspects of Government policy and guidance.

24. As will be clear from the analysis and explanation which I have just summarised – which is of necessity clearly only a very brief summary of the position – each element of the separate need identified by the Applicant is both urgent and compelling.

25. So, drawing all of these various strands together onto some conclusions.

(i) The Applicant, Associated British Ports – the owner and operator of the Port of Immingham - along with its first customer Air Products has made a judgement, operating in a free market environment, to bring forward the Proposed Development at this time in the form being applied for in the location proposed as a result of commercial factors they consider relevant to such a judgement. This is entirely how the national ports policy envisages individual port infrastructure projects coming forward to create the capacity the Government identifies as being needed.

(ii) The need for the Proposed Development is already established by the relevant National Policy – the National Policy Statement for Ports. That need is clear, compelling and urgent and, as it is established by settled Government policy, cannot be questioned through this examination process.

(iii) The need as established in the national port policy is one which the decision maker has to accept and is also of such a level and urgency that the decision maker is instructed to start with a presumption in favour of granting consent to the application for the Proposed Development.

(iv) That presumption in favour can only be dissapplied in very limited circumstances - none of which, as the Applicant's wider evidence demonstrates are relevant to the Proposed Development.

(v) Although there is no need for it to do so in light of the clear position set out in the national ports policy, the Applicant has separately demonstrated a need for the Proposed Development. That separate demonstration of need relates to urgent and compelling matters of energy security, energy decarbonisation and the broader decarbonisation of the wider economy and society.

1 **WHO WE ARE**

1.1 ABP is the UK's leading ports group with a network of 21 ports across the UK. Our mission is "Keeping Britain Trading". As a vital part of the supply chains of businesses throughout the nation, our 21 ports support 200,000 jobs and contribute £15 billion to the economy every year, handling £157 billion of UK trade annually.

1.2 ABP takes its responsibility to meet UK need for port capacity very seriously and bases its investment decisions around that approach. This is the expectation of government policy. This is carried out through redevelopment of existing port infrastructure and expansion and further development to meet changing requirements of customers and the market which is continually evolving as new technologies are developed.

1.3 ABP also offers large areas of development land across a wide range of strategic port locations, capable of attracting investment and delivering transformational benefits for the economy both locally and nationally.

2 **PORT OF IMMINGHAM**

2.1 The Port of Immingham is the UK's largest port by tonnage, handling around 46 million tonnes of cargo every year. Together with ABP's other ports on the Humber at Grimsby, Hull and Goole, Immingham is part of the UK's leading port complex, an unparalleled gateway for the trade connecting businesses across the UK, Europe, and beyond. The port is a critical part of the supply chain for sustainable electricity generation and other energy production, helping power the nation and helping to cement the Humber as 'the UK's Energy Estuary'.

2.2 Immingham occupies a key strategic port location with access to short sea European ports as well as all the key international shipping lanes. Immingham is centrally located within the UK with excellent deep water access which is capable of accommodating some of the largest ships in the world and with excellent connectivity with congestion-free, high-speed road links - from the M180 through to the M18 and M1.

2.3 Immingham is capable of accommodating a wide range of cargoes including agri-bulks, ro-ro, liquid bulks, containers and offshore wind. Immingham has adapted to the change in the nature of cargoes over time (for example conversion of Humber International Terminal to create a state-of-the-art terminal accommodating biomass where previously it took coal). The government's energy policy means the nature of the service has changed over time and is going to have to change further.

3 **APPROACH TO INVESTMENT**

3.1 We invest in the infrastructure, equipment and skills we need to handle a vast array of cargo safely, efficiently and sustainably. We are continuously evaluating how we can best use our port estate in terms of the existing services we are offering and the new services we need to provide to maintain competitiveness and meet market demand. Our expert teams work collaboratively to build long-term partnerships and deliver the right supply chain solutions for our customers (both existing and new), including value-added services and brand new facilities tailored to suit their business needs. This involves ABP proactively looking for opportunities to meet customer demands and on other occasions responding to direct approaches from customers for delivery of services and facilities that meet their requirements.

3.2 This approach defines how we take sustainable business investment decisions which deliver value to our customers, our shareholders and the UK economy. Increasingly this is being driven by the requirements of net zero and the energy transition in respect of which the Humber is a key strategic partner.

4 **IMMINGHAM GREEN ENERGY TERMINAL**

4.1 The Immingham Green Energy Terminal is a new bulk liquid terminal on the Humber. Our first customer of the jetty is Air Products who will import green ammonia to convert it to green hydrogen in their hydrogen production facility.

4.2 Our commercial judgement is that the terminal will in future handle significant volumes of CO2 for the purposes of Carbon Capture and Storage. This will involve import and export of Carbon for that purpose to support decarbonisation within the Humber Industrial Cluster and the Humber Enterprise Zone and elsewhere. ABP and Harbour Energy announced in October 2022 that they had entered an exclusive commercial relationship to develop a CO2 import terminal at the Port of Immingham that would link to Harbour Energy's Viking CCS project and the CO2 transport and storage network. In December 2023 Harbour Energy, ABP and London-based recycling and waste management company Cory Group announced an exclusive commercial relationship to collaborate on the transport and storage of shipped CO2 emissions from Cory's energy from waste (EfW) facilities to be processed through the Viking CCS project.

4.3 The jetty has been designed for those purposes and objectives. Without the provision of the green energy terminal, these objectives cannot be met on the Humber.

4.4 We have been working with Air Products around the development of the jetty and the Air Products facility since they approached us, having made the initial decision to investigate the viability of the green energy terminal on the basis that Air Products would be our first customer. After a full evaluation of the viability and deliverability of the Project internally within ABP and with Air Products, we have made the decision to promote the Project through the development consent order process. We have a signed commercial agreement and agreement for lease with Air Products. This has enabled us to take the business decision to invest in the new green energy terminal and it enables Air Products to deliver their Hydrogen Production Facility.

4.5 ABP and Air Products have jointly developed and adopted a number of key objectives for the Project.[1]

4.6 These objectives are concerned with the provision of essential port infrastructure for the import and export of liquid bulks in the energy sector in a safe efficient and sustainable manner whilst minimising effects on the environment to enhance both the local and regional economy.

4.7 This Project represents the further evolution of the facilities the port needs to provide. This investment allows the port to maintain its strategic contribution to the Humber the UK economy and to meet the changing needs of the energy sector.

4.8 In our judgment, the green energy terminal is a valuable addition to the Port of Immingham in terms of the facility and opportunity it provides. It is an investment decision we have taken alongside our partners Air Products and it is a decision that will deliver valuable port capacity and resilience for ports and the energy sector consistent with government policy. It is one of the first steps the UK needs to take in the step change towards its future energy provision and transition to net zero.

[1] Project objectives are set out in Chapter 1 of the Environmental Statement.

AIR PRODUCTS: ISH1-ISH3

ISH1 20 FEBRUARY DRAFT SPEAKING NOTES

1 AIR PRODUCTS STATEMENT

1.1 Introduction to Caroline Stancell and Air Products

1.1.1 Air Products is a world-leading industrial gas company and is the world's largest hydrogen supplier. We own and operate over 100 hydrogen plants and 1100km of hydrogen pipelines globally.

1.1.2 My role is Executive Director, Hydrogen for Mobility, Europe and Africa. I am responsible for the development of the renewable hydrogen business in these regions.

1.1.3 I have been deeply involved in the company's decision making with respect to renewable hydrogen projects at Immingham and elsewhere in Europe.

1.1.4 Hydrogen isn't new to us. We've been safely producing and supplying hydrogen for more than 60 years. We have a proven track record of project delivery.

1.2 Why this investment? – Air Products is bringing forward the IGET project because (1) we see demand from customers (2) we have secured the renewable energy feedstock to necessary for the project.

1.2.1 Consumer demand – sustainability, ESG, decarbonisation

(a) The current customer base for hydrogen is industrial. At present, most hydrogen is produced from fossil fuels (grey hydrogen) and used as a feedstock or process gas in refineries, chemicals, pharmaceuticals and glass production and numerous other industrial processes.

(b) The industries and operators we are working with are increasingly aware of their impact on the climate and are seeking to improve their Sustainability. This is leading to a demand from our existing customers – and new potential customers in renewable hydrogen – sometimes called green hydrogen (that is hydrogen made from a renewable energy source rather than fossil fuels).

(c) The main markets we are seeing for renewable hydrogen at this stage are (1) switch from grey hydrogen to renewable hydrogen in processing applications (2) new hydrogen demands which are 'fuel switching' to decarbonise hard to abate sectors such as replacing diesel in heavy duty transport or replacing natural gas in heat and combustion processes, such as furnaces.

(d) The switch from carbon based fuels to a low carbon intensity fuel, such as green hydrogen requires investment and changes to operations. Customers considering the change need to know that the renewable hydrogen will be available in the quantity required, at a high reliability to enable the switch.

(e) The IGET project proposes to produce 300MW of renewable H2. This is a substantial investment. To put it in perspective, of the total market need, however, IGET represents 3% of UK's commitment to deliver 10GW of hydrogen by 2030. Therefore the country needs approximately 32 more IGETs to meet its target.

(f) This is a demand that we are not just seeing in the UK but globally, and Air Products, alongside other companies, is looking to provide the products that the market is looking for.

1.2.2 The IGET project is only possible because Air Products has secured the renewable feedstock (NH3) required for the project.

(a) Neom Green Hydrogen company is building a $8billion plant in Saudi Arabi that will produce approximately 1.2 MM tonnes per year of renewable ammonia. This renewable NH3 can be viewed as stored renewable energy. In fact, the NH3 produced by the project is equivalent to c 400 wind turbines (based on a 5.3MW turbine and an average offshore wind load factor – 40.58%). The facility is anticipated to be operational in 2027.

(b) Air Products has a contract with Neom Green Hydrogen company to purchase 100% of the plant's green ammonia output and to market it around the globe to destinations that have an ambition and mandates to decarbonise.

(c) This is why Air Products has already announced similar scale port-side developments in Rotterdam and Hamburg. This is an opportunity to see the benefits from renewable hydrogen on the Humber and in the UK from 2027.

(d) It should be noted that alongside Air Products a number of other suppliers have announced their intentions to develop and install infrastructure for import/export and shipping of green ammonia. The Argus database which tracks announced NH3 Terminal Projects lists 15 Terminal projects in various stages of development around the UK and Europe.

1.3 Terminals cannot be built anywhere – selection of terminal location is important.

1.3.1 The location of a green energy import terminal as proposed for this project and other import terminals requires key characteristics:

(a) A deep-water port capable of berthing the large ships required to move the product.

(b) Nearby land to house the infrastructure required to import the green Ammonia from the jetty, and the storage tanks and production units for the hydrogen and its onwards distribution.

(c) Near to market: as with any commercial development a close proximity to customers is an advantage.

(d) Good road transport links for the onwards distribution of the product

1.3.2 Why Immingham? If you consider Immingham in light of the previous points, then Immingham is a fantastic location.

(a) It has a deep-water port suitably sized to receive Very Large Gas Carriers.

(b) It has the land available for a development of this scale in close proximity to the port.

(c) Within the Humber Estuary there are businesses that could benefit from the green hydrogen, and we are already receiving commercial enquiries.

(d) There are strategically important road links to the Midlands and the North of England and beyond.

1.4 Closing Statement

1.4.1 Building a large scale hydrogen economy is not just about the energy and decarbonisation, but also about driving growth on a local and national scale, creating jobs in supply and complementary sectors such as fuel cell manufacturers and driving innovation. We hope to help achieve this on the Humber.

1.5 Other green ammonia import terminal projects coming forward (as consolidated by Argus):

Location	Developer(s)
Rotterdam (NL)	Gasunie, Vopak, HES, ACE Terminal
Rotterdam (NL)	OCI
Rotterdam (NL)	Air Products, Gunvor
Vlissingen (DE)	Vesta, Uniper, Proton Ventures
Vlissingen (DE)	Vopak
Antwerp (DE)	Fluxys, Advario
Brunsbüttel (DE)	Yara
Brunsbüttel (DE)	RWE
Wilhelmshaven (DE)	BP
Wilhelmshaven (DE)	Uniper
Hamburg (DE)	Air Products, Mabanaft

Duisburg (DE)	Duisport, Koole Terminals
Rostock (DE)	Yara, VNG
Immingham (UK)	Air Products, Associated British Ports
Stanlow (UK)	Essar Group, Stanlow Terminals

1.6 In response to questions from the Panel, it was confirmed:

1.6.1 Air Products already produces hydrogen from ammonia using electrolyser cracking at other facilities (not as yet using green ammonia).

1.6.2 The cracking of ammonia is a well-established technique used in many industries over a number of years, though the majority of it is not green because the ammonia used is not green.

1.6.3 The technology to crack ammonia is the same whether you are passing a grey or green molecule through it.

AV Speaking Notes ISH1 Presentation

(iii) Comparison with other liquid bulk port developments

- **Immingham Oil Terminal:**
    - This is the best comparison of a Liquid Bulk port development to make; in the same location, handling a liquid bulk and similar sized vessels. (Equivalent of an IOT Berth 4).
    - Highlight the terminal's key feature: a single Liquid Bulk Jetty stretching approximately 900 meters.
    - There are 7 liquid bulk berths available, which showcases the terminal's capacity to handle multiple vessels simultaneously.
    - Emphasize the vessel size accommodation with a maximum Length Overall (LOA) of 366 meters and a maximum draft of 13.1 meters, indicating its capability to service very large vessels.
    - Note the substantial landside storage facility of 8 hectares.
    - There is a strategic 8-km long pipeline connection to Prax Lindsey Oil Refinery and Phillips 66 Humber Refinery, underlining its significant role in contributing to 27% of the UK's refining capacity.
- **Milford Haven:**
    - Contrast with Immingham by stating Milford Haven has 4 Liquid Bulk Jetties and 14 Liquid Bulk Berths, with the largest berth exceeding 950m in length.
    - The maximum vessel size that Milford Haven can accommodate at Valero, with an LOA of 365m and a draft of 16.1m, comparable to Immingham but with a deeper draft.
    - The storage capacity at Valero alone is impressive, with 85,000,000 (85 million) barrels in 52 tanks.
    - Milford Haven has a significant role in energy supply, with its largest jetty connecting to the South Hook LNG Terminal, which handles 20% of the UK's gas demand and is one of Europe's largest.
- **Immingham Gas Jetty:**
    - The jetty's capability with its length in excess of 400 meters, enabling it to handle large vessels.
    - There is a single Liquid Bulk Berth feature, for the import and export of LPG / Butane and the maximum vessel size it can accommodate: a Length Over All (LOA) of 280.0m and a draft of 11.10m.
    - The jetty has a critical role in the gas supply chain due to its strategic connectivity to underground storage caverns operated by Phillips 66 and Calor Gas.
- **Fawley Oil Terminal:**
    - Fawley features two Liquid Bulk Jettys, with an impressive length of approximately 450 meters.
    - It has extensive capacity with 9 Liquid Bulk Berths and a jetty head in excess of 1,500 meters, showcasing its ability to service multiple large vessels.
    - The maximum vessel size for Fawley with an LOA of 368m and a draft of 14.9m.
    - Fawley hasa significant contribution to the UK's energy sector, servicing the 506 ha Fawley Refinery and providing 20% of the UK's refinery capacity.

(v) Operation of the NSIP

With reference to the flow chart included on the slide (slide 7), I will look to outline the steps involved in a maritime vessel's journey from the planning phase through to berthing at a port. This is typical of the operations involved in the journey of one of the 34,000+ vessel movements that are undertaken on the Humber, each year.

1. **Planning Phase:**
   - The process begins with negotiating cargo handling contracts.
2. **Vessel Assignment and Loading:**
   - A vessel is assigned and loaded at the port of departure. This step is crucial as it involves preparing the vessel for its journey and securing the cargo.
3. **Pre-Arrival Preparations:**
   - As the vessel departs and is in transit to the discharge port (Humber), preparations for arrival begin.
   - A commercial agent is nominated for the discharge port, and vessel visits are booked through agents online, including providing CERS data for Dangerous Goods.
4. **Port and Vessel Information System (PAVIS):**
   - Information about the incoming vessel is input into PAVIS, ensuring that the port authorities have all the necessary details to manage the vessel's arrival and stay.
5. **Vessel Arrival:**
   - The vessel arrives at the harbour limits, marking the beginning of the port entry process.
   - Vessel Traffic Services input the arrival into PAVIS, and pilots are allocated to guide the vessel safely to the dock.
6. **Pilotage and Towage:**
   - A pilot boards the vessel to navigate through the Humber Passage, and tugboats are arranged at the Sunk Spit Buoy to assist with manoeuvring.

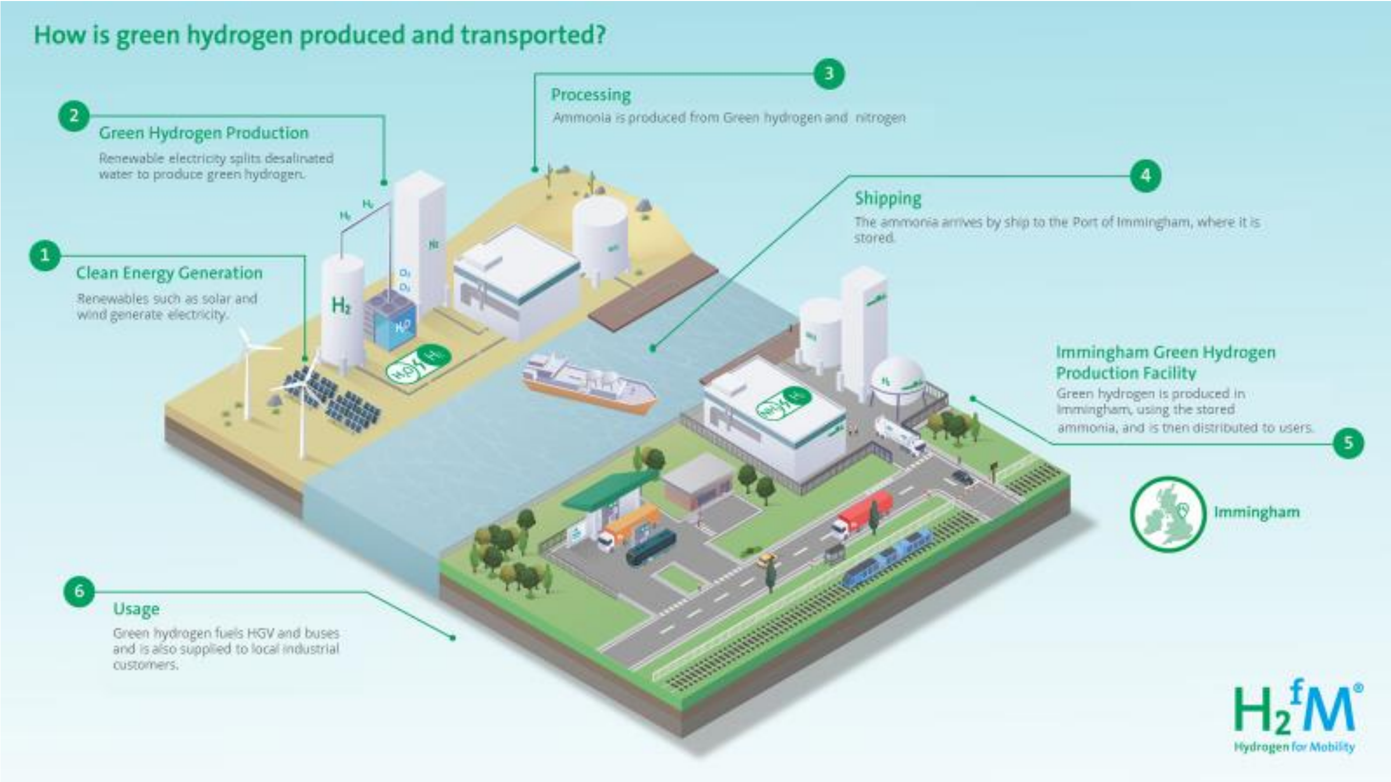
This flowchart represents a standard procedure in maritime operations, highlighting the importance of coordination between the ship's crew, port authorities, and agents to ensure a smooth and safe transition from sea to port.

1. **Berthing:**
   - The Berthing Master is contacted to oversee the final docking process, and the vessel continues its inward passage under the guidance of the Harbor Master & Dock Master.
2. **Approach:**
   - The vessel approaches the jetty, aligning with the berthing line, indicated by the dotted line in the image.
3. **Mooring Dolphins:**
   - Upon approach, the vessel utilises mooring dolphins. These are structures used to secure the vessel with mooring lines. The diagram shows IGET’s 8 mooring dolphins along the jetty which the vessel's crew and berthing team will use to tie the ship.
4. **Breasting Dolphins:**
   - Once the vessel is aligned, it moves towards the jetty, making contact with the breasting dolphins. These structures absorb the energy of the vessel and assist in keeping the vessel at a fixed distance from the jetty.
5. **Loading Platform:**
   - The vessel is positioned alongside the loading platform, where cargo operations will occur.

6. **Pipeline Key:**
    - The coloured lines indicate the pipeline key for ammonia and future provisions for CO_2 operations. The pipelines are used for loading or unloading liquid or gas products to and from the vessel.
7. **Berthing Line:**
    - The vessel is finally berthed at IGET, where it will offload or take on cargo.

During the berthing process, tugs and pilots may assist the vessel to ensure it is safely and correctly positioned along the jetty. The crew on board and port personnel coordinate to secure the vessel and commence cargo operations.

Air Products - components and operation of the Associated Development

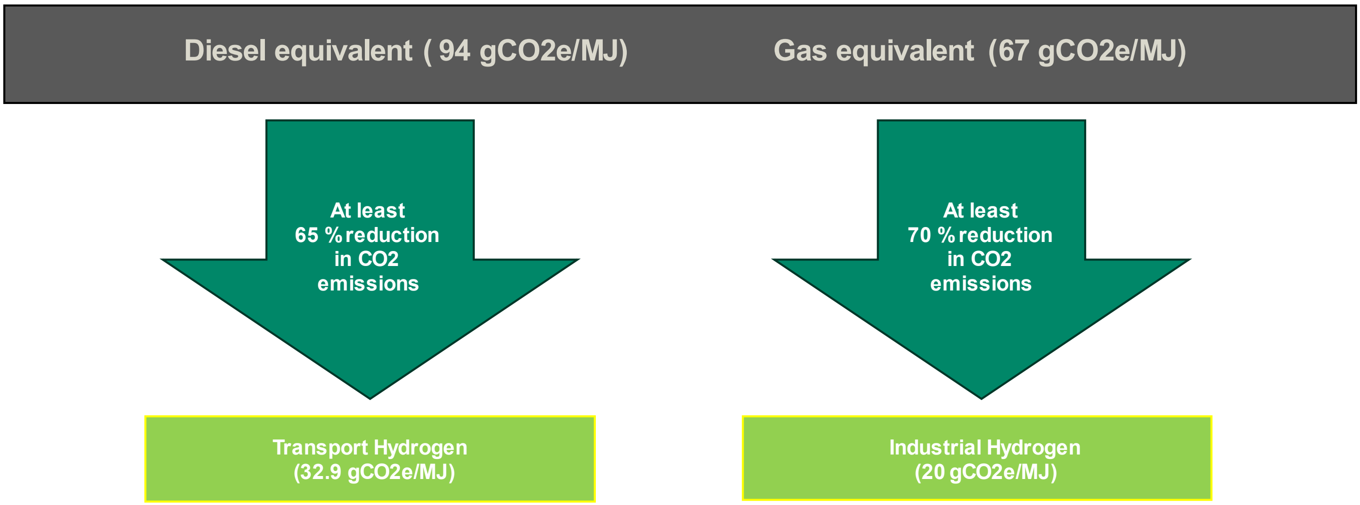


Timon Robson, Air Products Project Director speaking on behalf of The Applicant.

I'm showing a simple pictorial showing how we will create hydrogen in the Middle East using only wind and solar energy and ultimately deliver green hydrogen to HGV drivers around the UK and to local industrial consumers.

What I will do over the coming slides is to explain each separate step in a little more detail and the green credentials of the overall process and for each step.

(v) Overall benefit of hydrogen produced by the project



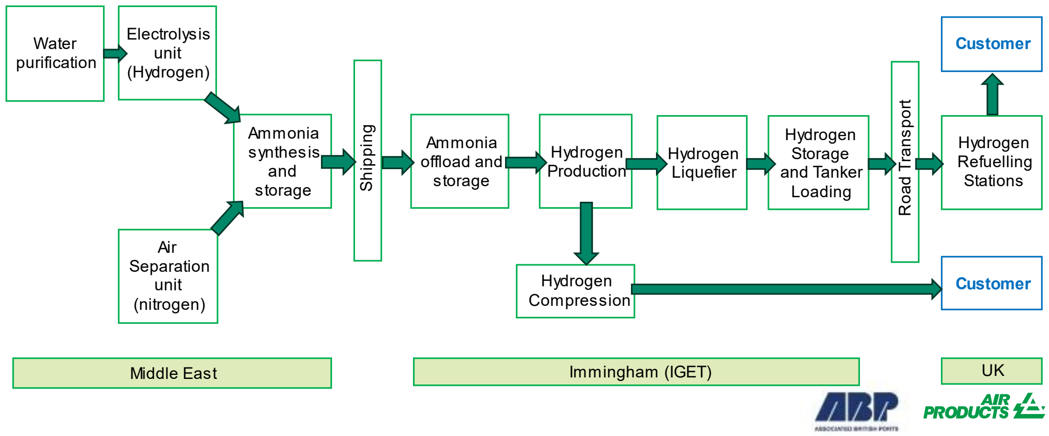
The green credentials of the process is expressed in terms of **carbon intensity** which refers to the life-cycle emissions of greenhouse gases from the fuel supply chain. It is expressed in units of carbon dioxide equivalents per megajoule of fuel (gCO2e/MJ).

Before I explain each process step, I want to clarify a couple of things:

- The green credentials of the end product (and overall supply chain) is expressed in a **carbon intensity** (CI) value which is a measure of the life cycle emissions of greenhouse gases from the fuel supply chain – including direct CO2 emissions but also equivalent emissions from things like manufacture of lubricating oils
- Low carbon hydrogen for the transport market must have a CI value which is about 35% of the equivalent diesel value
- for industrial hydrogen users it is about 30% – **so a 65 or 70% reduction from where we are today**
- In the coming slides, when I explain each process step and the energy used / carbon intensity contribution to the overall green hydrogen product, this in relation to the remaining 35%. We've already achieved a 65% reduction in meeting the standard

The carbon intensity threshold values are set in some key standards, which I will explain in a later slide

(v) Step-by-step description during operations

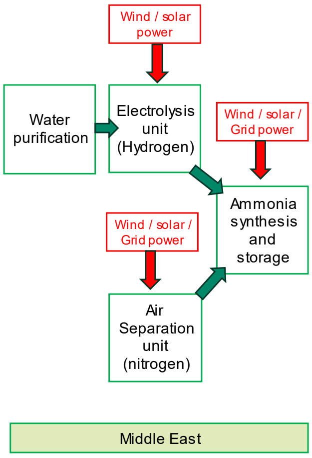


This is a simple flow chart showing all the key process steps in the whole supply chain:

- We make green hydrogen from water initially in the Middle East
- In order to make it easier to transport we convert it to ammonia (NH3) which contains a lot of hydrogen and can be in liquid form
- We ship it to Immingham, where we break the ammonia apart again into hydrogen and nitrogen gas
- We liquify the hydrogen to make it easy to transport by road tankers to hydrogen refuelling stations where it is converted to gas for use by HGV
- Industrial gas customers will take gaseous hydrogen

Over the next few slides I'll explain each section in a little more detail.

(v) Creation of green ammonia at NEOM in Saudi Arabia



The generation of hydrogen molecules through electrolysis is entirely from renewable power.

- This process accounts for about 3% of the overall Carbon intensity of the final green H2
- There is CI contribution from areas such as catalysts, lubricating oils, water treatment etc

The generation of nitrogen and ammonia uses renewable power but also some electrical power from the local grid.

- This is due to critical equipment not being able to tolerate any fluctuations in electrical supply.
- This accounts for about 9% of the overall Carbon intensity of the final green H2 product

The NEOM facility is located in Saudi Arabia because that location has both wind and solar energy in abundance.

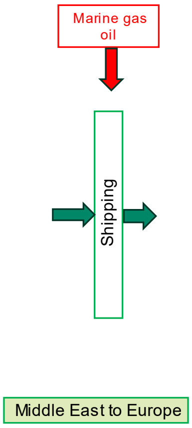
There, water is purified and split into hydrogen and oxygen by electrolysis. **The generation of hydrogen in this way is entirely done using wind and solar energy** and so this initial step contributes just 3% of the CI of the overall supply chain.

At the site, there is an air separation unit to generate nitrogen from the air and an ammonia plant which generates ammonia NH3 from H2 and N2.

The ammonia is liquified and stored in a tank ready for shipment.

These processes do not tolerate variations or interruptions in power supply and so use some grid power, in addition to the wind and solar, giving a CI contribution of about 9% of the overall supply chain CI

(v) Step-by-step description during operations



- VLGC vessels will be used to transport refrigerated liquid ammonia to Europe (Immingham, Rotterdam and Hamburg initially)
- These will be LNG carrier ships (180m – 230m long) or specific ammonia carrier ships of which some are now in construction

Green credentials

- Currently these ships are powered by marine gas oil.
- Shipping accounts for about 14% of the overall Carbon intensity of the final green H2 product
- Future technology improvements and regulations in the shipping industry means shipping emissions is expected to reduce
  - First Ammonia fuelled engines expected to be on market in 2024 (MAN) and new ammonia carriers are likely to be the first users of his technology. Expected that 1st ammonia fuelled vessels to be operational in the second half of this decade, however large technological uptake is not expected until the early 2030s

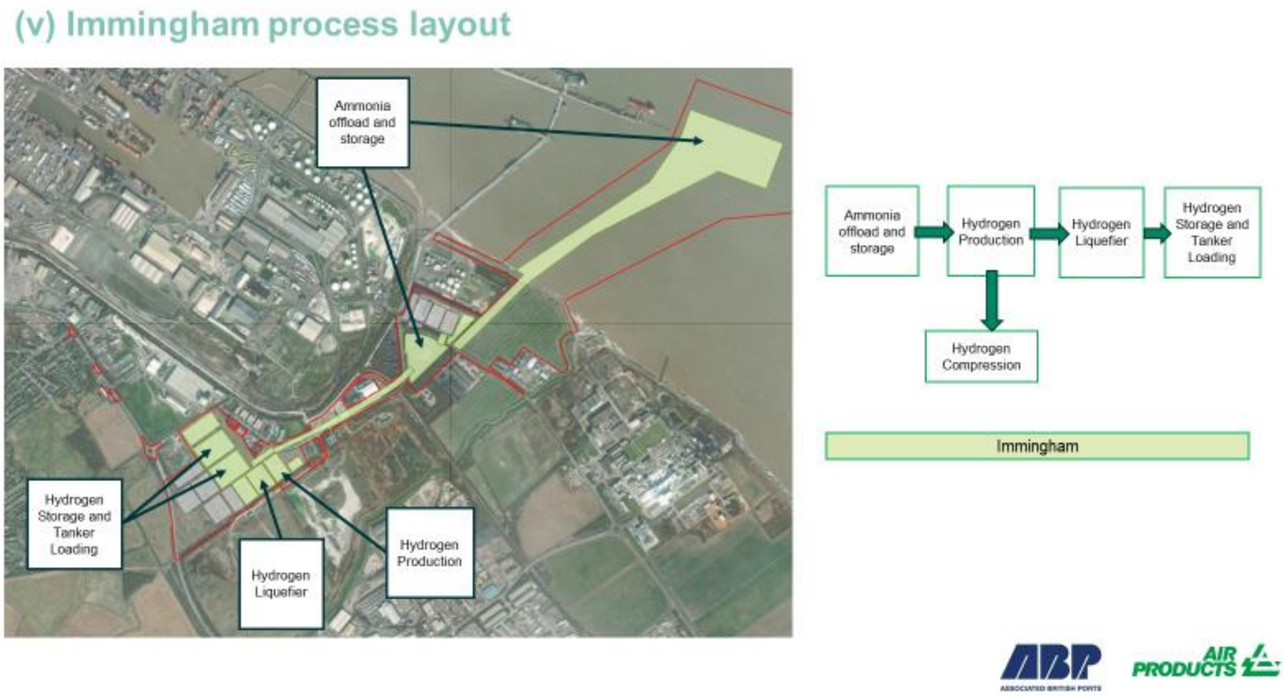
The ammonia is shipped from the middle east to Europe and Immingham

It will be shipped in liquid form (-32C) in very large gas carriers (up to 230m long).

Using big ships minimises the CI impact of the shipping but because ships currently are still fuelled by marine gas oil, this step contributes about 14% of the overall supply chain CI

In the future there will be improvements in shipping emissions:

- The government has signed legally binding targets for shipping as part of its net zero 2050 commitments
- Also there is ongoing research work by large engine manufacturers hat is expected to put a marine engine running on ammonia onto the commercial market in the next year. Ammonia carriers would be the first users of this technology



Before I describe the process steps in Immingham, I thought it would be useful to show the layout

The ammonia offload is at the jetty head (Work No. 1)

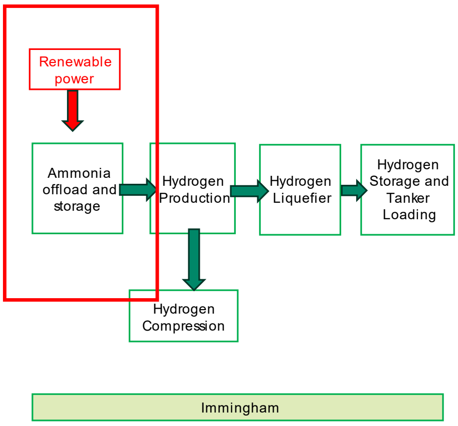
The ammonia storage tank is in Work No. 3, about 1500m from the jetty head

In phase 1, the hydrogen production units are in Work No. 7, connected to the tank by underground pipelines

The hydrogen liquefier units are also in Work No. 7

The liquid hydrogen storage tanks and the tanker loading are adjacent

(v) Step-by-step description during operations



- Ships will dock at the IGET jetty in Immingham and offload liquid ammonia, using ships pumps, via above ground pipelines (Work No 1 and 2) into the large storage tank in Work No 3
- Prior to offloading, NH3 will be circulated through the pipelines to cool them down. Offloading will take about 24 hours
- The ammonia will be kept in liquid form at -33C and a vapour recovery process unit will compress / liquify any vapour from the tank
- This area is supported by utility and safety systems (flare, instr air, fire water, emergency generator etc)
- Ammonia is pumped to the hydrogen production process units (located in Work 7 for phase 1)

<u>Green credentials</u>

- Ammonia storage accounts for about 4% of the overall Carbon intensity of the final green H2 product

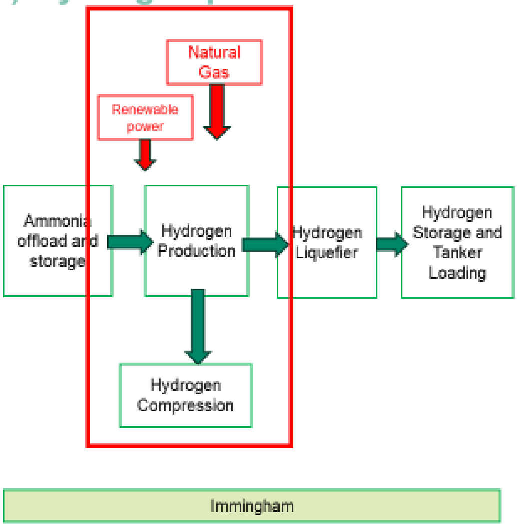
ABP AIR PRODUCTS

At Immingham, the ships will dock at the jetty and offload liquid ammonia using ships pumps via the above ground pipelines into the storage tank.

Prior to offloading the pipelines have to be cooled down to -32C by circulating ammonia

The ammonia in the tank is effectively boiling and the vapours produced are re-liquified in the boil off gas compressors and put back into the tank. The power required for these mean this section contributes about 4% of the overall supply chain CI

(v) Hydrogen production



- Ammonia is split into H2 and N2 by heating the ammonia in a gas fired furnace with catalyst to assist the reaction.
- The produced H2 is then purified in a separate process unit. The nitrogen is released to atmosphere
- The design is optimised to minimise energy requirements (re-use of spare heat)

Green credentials

- Currently natural gas is used in the process
- Hydrogen production accounts for about 37% of the overall Carbon intensity of the final green H2 product (33% due to gas and 4% due to power)
- Future process improvements may allow use of hydrogen as a firing gas either wholly or partially

Ammonia is pumped from the storage tank to the hydrogen production units, where a furnace is used to break the ammonia molecule back into hydrogen and nitrogen gas.

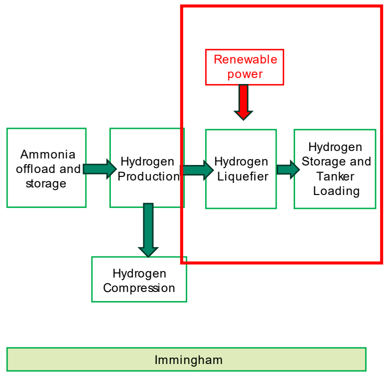
The reaction in the furnace is assisted by a catalyst and is made as efficient as possible through things like using heat exchangers to re-use spare heat in the process

The furnace uses natural gas and so this section of the process contributes about 37% of the overall supply chain CI.

future process improvements may allow hydrogen to be used as the firing gas either wholly or partially.

It is worth noting that the end product will meet the overall CI requirements with natural gas being used in the process. Reducing the overall CI further is an aspiration and future intention enables future proofing of the supply chain but is not a current requirement.

(v) Step-by-step description during operations



- Gaseous hydrogen from HPU is further purified and refrigerated to liquid form in the H2 liquefier process unit. This is done by a series of compression, cooling and expansion sequences.
- The liquid hydrogen is stored in long bullet shaped vessels from where liquid hydrogen is loaded into road tankers

Green credentials

- Hydrogen liquefying accounts for about 15% of the overall Carbon intensity of the final green H2 product.
- Power will be purchased from a renewable source through a renewable power purchase agreement

In the liquefier, gaseous hydrogen is purified and refrigerated to form a liquid at -252C.

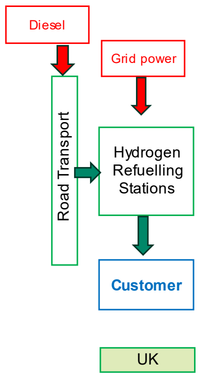
The liquid hydrogen is then stored in long horizontal tanks before being loaded onto road tankers.

Liquefying is done through a series of compression, cooling and expansion stages.

This requires both power and cooling water and as a result this section adds about 15% to the overall supply chain CI.

A proportion of the power required at Immingham will be renewable and purchased through a Power Purchase Agreement (PPA), - a long-term contract to purchase electricity directly from a renewable energy generator

(v) Step-by-step description during operations



- Liquid hydrogen will be transported by road tanker to hydrogen refuelling stations (HRS) where the hydrogen will be stored and loaded into HGV as the end user.

Green credentials

- Current assessment is that transport is by diesel HGV but Air Products will convert its road tanker fleet to hydrogen power as soon as manufacturing and legislation enables this
- Road transport accounts for about 7% of the overall Carbon intensity of the final green H2 product.
- Hydrogen Refuelling stations accounts for about 11% of the overall Carbon intensity of the final green H2 product.

The liquid hydrogen is transported by road tanker to a series of hydrogen refuelling stations around the country which will be built by Air Products as separate projects.

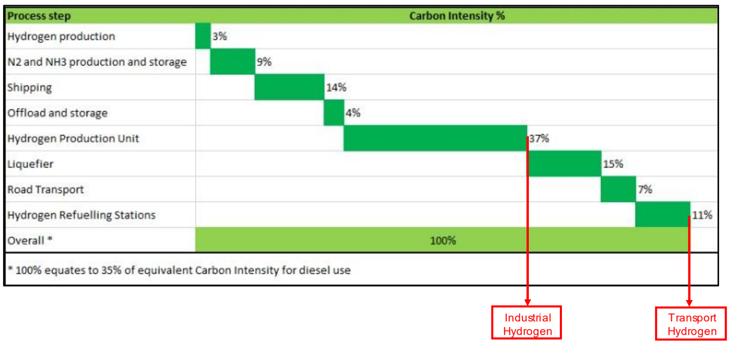
Hydrogen powered HGVs will receive the hydrogen at the refuelling stations

Currently the road tankers are assumed to be diesel powered (in line with current HGV availability and legislation) and so this step contributes about 7% of the supply chain CI.

However, Air Products intends to convert all its fleet to hydrogen powered vehicles as a first mover in the market.

The hydrogen refuelling stations are connected to the grid for electrical power and so this contributes a further 11% approximately.

(v) Step-by-step description during operations



The above diagram is a summary of the overall carbon intensity split of the supply chain

You'll see that the industrial hydrogen is taken at a different stage in the cycle

Noting again that the overall CI value is 35% of the equivalent diesel value

(v) Low carbon certification

A separate written response will be provided (against Q1.3.3.4) explaining the current standards and obligations for certification of low carbon hydrogen, how they function and are secured.

The key standards related to green hydrogen are:

- **The Renewable Transport Fuel Obligation Order (RTFO)**
- **UK Low Carbon Hydrogen Standard**

Transport hydrogen (for HGV):

- Compliance with the **RTFO** requires a carbon intensity of less than **32.9 grCO2e/MJ** for its full supply chain from production to the fuelling point (Hydrogen Fuelling station).
- This is about 35% of the equivalent value for diesel
- The Air Products green hydrogen for road transport will meet this threshold

Industrial hydrogen (for pipeline customers):

- Compliance with the **UK Low Carbon Hydrogen Standard** requires a carbon intensity of less than **20 grCO2e/MJ** for its full supply chain from production to user.
- This is about 30% of the equivalent value for natural gas
- The Air Products green hydrogen for industrial use will meet this threshold

There are two key standards which currently govern low carbon hydrogen and essentially set the definition for what is known as “green hydrogen”

- RTFO – which applies to hydrogen used as transport fuel
- Low carbon hydrogen standard – which applies to the hydrogen supplied to industrial customers in gaseous form

The RTFO sets a threshold CI value of 32.9 grCO2e/MJ, which as I’ve said before is 35% of the equivalent diesel value.

Air products will meet this threshold

The low carbon hydrogen standard sets a threshold of 20 gr Co2e/MJ. Air Products green H2 will meet this threshold.

How the RTFO works, the mechanism for credits, the rules for independent verification of the supply chain CI across the chain of custody etc is quite complicated and so we will cover this in mor detail in a written response.

The economic model for production of green hydrogen is wholly dependent on the final product meeting these threshold values. Without doing so, it can’t be sold as low carbon hydrogen and the economic model fails. It is therefore in Air Product’s fundamental interest to ensure that it does comply, regardless of any legal obligation.

IMMINGHAM GREEN ENERGY TERMINAL

ISSUE SPECIFIC HEARING 1 (ISH1) – STRATEGIC OVERVIEW AND OPERATION OF THE PROPOSED DEVELOPMENT

Agenda item 3(vi)

vi. Forecasts of other users and jetty related activity that are expected to be accommodated to fully use the port capacity

Speakers Notes

1. In responding to this agenda item, I think that it is first helpful to set out some background contextual points that relate to the consideration of port capacity and its usage.

2. The first point to note is that it is very difficult to give a definitive position on the capacity of a specific piece of port infrastructure over its lifetime. This is because port infrastructure capacity is influenced by a number of different matters including factors such as the type of cargo or product to be handled, the available berth capability and capacity, the capability and capacity of available landside storage facilities, the capability and capacity of relevant loading / unloading infrastructure and the length of time the cargo or product 'dwells' at the port.

3. The second point to note is that the ports industry does not, as general operational practice, look to operate its facilities at full physical capacity. This point can be most easily explained by reference to the National Policy Statement for Ports, where it is made clear in respect of competition and resilience matters that;

   "Effective competition requires sufficient spare capacity to ensure real choices for port users. It also requires ports to operate at efficient levels, which is not the same as operating at full physical capacity. Demand fluctuates seasonally, weekly and by time of day, and some latitude in physical capacity is needed to accommodate such fluctuations …… (NPSfP paragraph 3.4.13)

4. Against that contextual background, and having regard to the fundamental policy principle contained within the NPSfP which I have already outlined under agenda item 3(i) that it is for each port to take its own commercial view and its own risks it terms of what it considers to be viable, the Applicant – doing the best that it can at this stage of the process - estimates that the maximum theoretical capacity of the

marine infrastructure is the handling of 292 vessels moving approximately 11 million tonnes of liquid bulk cargo products per year.

5. It is important to highlight, however, that this is not a specific target which the proposed development has to achieve, but rather this is the upper level of activity which has been defined to ensure that a reasonable worst case environmental assessment has been undertaken of the Proposed Development.

6. It is not, therefore, necessary that this defined capacity has to be utilised or achieved overall, and neither is it necessary for certain levels of capacity to be utilised by a particular point in time. It is certainly not necessary for such matters to be achieved in order for the need for the Proposed Development to be proved or for the benefits of the Proposed Development to be achieved.

7. In terms of the breakdown, the Applicant's commercial view is that this results in:

   (i) a minority element of created capacity being utilised for the handling of liquid ammonia – reflecting the requirements of Air Products, matters which have been clearly explained by Air Product representatives in response to earlier agenda items, and

   (ii) the majority of the created capacity being utilised for the handling of carbon dioxide.

8. In respect of the liquid ammonia / hydrogen element of the project, it is once again highlighted that there is an existing identified user of the facility in this regard – Air Products. In respect of this use I would highlight that it is not always the case in respect of port development proposals that a specific user of the proposed facility is known at the time of the application, rather, it is often the case that the reason for promoting the development – which reflects the position set out in the NPSfP - is one which is based just upon the commercial judgement of the port industry promoter operating in a free market environment on the basis of relevant commercial factors.

9. As Mr Bird has already explained, ABP effectively takes both of those approaches on a case-by-case basis in terms of the investment it makes in infrastructure.

10. In terms of the carbon dioxide element of the Proposed Development, the Applicant considers that this use will very likely occur, having regard to both the wider policy context surrounding such activity and the commercial discussions the Applicant has had and continues to have in this regard – matters which Mr Bird has already explained. It is the Applicant's commercial judgement – having regard to relevant commercial factors – that there is a clear need for capacity to serve the 'carbon' market in this location and that the capacity to be made available through the Proposed Development will be significantly used for this purpose.

11. The actual use of the marine infrastructure for carbon will, however, clearly require some form of additional supporting infrastructure (i.e. a further new storage or processing facility or, at the very least, a land side connection to an existing storage facility or distribution network). Such additional supporting infrastructure will trigger the need for further consents and approvals, along with the associated assessment of impacts through the EIA process, as necessary.

12. Although, as Mr Philpott has already indicated, there are no specific proposals yet defined in this regard, the Applicant's view is, having regard to:

(i) the nature of the infrastructure likely to be required, i.e. pipelines and facilities for storage and transport;
(ii) the characteristics of the physical environment of this part of the Humber Estuary,
(iii) the local land use policy position of relevance to the area, and
(iv) the clear need for such infrastructure and the urgent nature of that need,

- that any necessary consents for supporting infrastructure would be able to be secured. There is, in the Applicant's view, no obvious impediment in this regard.

13. If, however, for whatever reason, the envisaged carbon element of the Proposed Development were not to occur into the future - and, for the avoidance of any doubt having regard to the clear policy support for such activity and the clear need the Applicant is aware of this is considered highly unlikely - and another liquid bulk product were proposed to be handled, then this would similarly require some form of landside infrastructure and potentially even marine side infrastructure changes triggering the need for further necessary consents and approvals, along with associated assessment of impacts through the EIA process as necessary. The

acceptability of any such future proposal would have to be judged through the relevant statutory process against the relevant policy and material considerations applicable at that time.