

Title of meeting: Cabinet

Date of meeting: 05 October 2021

Subject: Green recovery sustainability measures and the provision of shore power to Portsmouth International Port

Report by: Mike Sellers, Port Director

Wards affected: All

Key decision: No

Full Council decision: No

1. Purpose of report

To update the Cabinet of the work of the Portsmouth International Port (PIP) in its green recovery, sustainability measures and the potential provision of shore power to visiting ships in order to reduce ambient emissions.

2. Recommendations

- That the Cabinet support the port for the provision of shore power, subject to securing funding, including the short term development of a battery storage solution (for providing shore power to smaller cruise vessels and new Ro-Ro vessels) as well as a full term solution of supplying all vessels into PIP.
- That the Cabinet continues to support the port's green recovery sustainability drive which includes a hydrogen electrolyser on the port, rolling-out further the current fuel filtering project and the construction and piloting of an external fine particle filter at the port boundary.

3. Background

PIP is a major UK port and the largest and most successful municipal port. The port contributes £189 million to the Portsmouth City Council local economy, supports 2,410 jobs and provides £8 million per annum to essential council services. It is a vital economic contributor to the city and will be critical towards the economic recovery from the COVID-19 pandemic. As such, the port is developing a 20-year masterplan that is due for completion this year. The port's success is the city's success and it is extremely conscious that the economic recovery is a green recovery plan.

PIP has a PCC approved carbon reduction plan and has been taking significant measures towards achieving net zero carbon emissions by 2030.

Landside measures include solar PV, solar carports and battery storage. Further measures such as wind power have been submitted to the planning authority and await decision. Regardless of wind power 70% of the port's power will come from renewable energy by the end of 2022.

Transparency is a core value of PIP and therefore it is the only major UK port with live air quality monitoring which is shared with regulatory services. The data collected will help direct operations to take out peak activity and the results so far show that none of the port's emissions are in exceedance of permitted levels.

However the port recognises that shipping contributes to ambient levels and is working with shippers to provide clean maritime measures. The largest user of the port, Brittany Ferries have commenced fleet renewals and the UK's first Liquefied Natural Gas (LNG) ferry will arrive in 2022. Noble Caledonian have agreed to retrofit their ships to take shore power and the port is moving to supply that shore power for those ships on berth 1. By 2024/5 there will be a mixture of LNG and hybrid ferries calling at the port with a requirement for plugging into shore power; all of which will significantly reduce emissions.

4. Port Sustainability Measures

PIP has pushed its own way ahead with sustainability measures since 2010 when it undertook its first carbon audit (by the Carbon Trust) which resulted in 10 key action points to reduce its carbon footprint. Included in this was the start of replacing all port lighting with LED. Since 2010 the port has built one of the foremost sustainable buildings in the UK with the new terminal building having a sea water heat transfer pump for heating and cooling, sea-water flushing toilets and wind cowls to ventilate.

The port has its continuous improvement of sustainability recognised locally and globally winning the International Quality Organisation of the Year for 2019 and the Portsmouth News Sustainable Business of the Year in 2020 and 2021.

Current sustainable projects include:

- Solar PV installation (currently being installed) which features solar carports in a UK-first for a port.
- Artificial Intelligence/machine learning controlled lithium/lead storage battery being commissioned.
- A 1MW lithium-ion battery energy storage systems (BESS) being installed for storing renewable energy from the solar arrays.
- New zero emission port light vehicles and vans powered by electricity.
- New electric vehicle charging points for customers at the port.
- Planning applications submitted for land-based wind turbines.

- Portico now using Gas to Liquid Fuel (GTL), instead of diesel, reducing emissions including particulates.
- Portico pre-filtering of diesel oil to large cranes to screen-out particles and improve fuel efficiency.
- Five air quality sensors fitted around the port with live data.
- A 35kW Hydrogen Electrolyser Pilot to be installed at the port in collaboration with Portsmouth University fully funded under the Clean Maritime Demonstration Call.
- A 300HP Hydrogen powered launch for port conservancy, mooring operations and safety patrols fully funded by the Clean Maritime Demonstration Call built in collaboration with Portsmouth and Brighton Universities.
- A virtual 'Digital Twin' of the port to be used to investigate energy management potential for visiting ships fully funded by the Clean Maritime Demonstration Call and in collaboration with Portsmouth University.
- SBRI funded study at Portico into the use of geo-spatial data for reducing traffic congestion and improving air quality and the potential use for 'last mile' logistics between Portsmouth and the Freeport area.
- An application to Innovate UK for a 1MW Flow-Battery prototype, barge mounted, as a scalable solution to the lack of UK infrastructure to supply through the grid. This in conjunction with marine South East.
- In collaboration with Portsmouth University, the development of an external boundary fine particle filter to capture and measure fine particle emissions from port operations at the port boundary.
- Feasibility to provide shore power for visiting fishing vessels at the Camber.

5. Ship Sustainability Measures

Since 2015, environmental issues have taken precedence in the shipping sector. The EU Alternative Fuels Infrastructure Directive focussed on shore-power and liquified nitrogen gas (LNG), with LNG taking priority. Alongside this, new International Maritime Organisation (IMO) regulations on air pollution limits focussed ship-owners' attention on scrubber technology. All vessels calling at PIP meet these requirements.

Brittany Ferries are PIP's largest customer and user of the port, accounting for 60% of the port income. They have commenced fleet renewals which includes the introduction of two (LNG) ferries, the first of which will arrive in 2022. Additionally, Brittany Ferries announced that orders have been placed for two hybrid LNG / electric ferries for sailings to France from Portsmouth commencing 2024/5.

Part of PIP's business plan is to grow the 'niche' cruise market of luxury boutique and expedition ships. These regular callers at the port are focused on environmental measures and are the latest generation of new builds which optimise fuel and energy performance in order to improve sustainability and social impact.

For example, Virgin Voyages 'Scarlet Lady' incorporates a number of sustainable measures that are not limited to but include the following:



- A Wärtsilä open/closed loop scrubber which removes 97% of sulphur dioxide emissions as well as a separate selective catalytic reduction system that removes up to 75% of Nitrogen oxides.
- Clean Energy Technology that converts heat from the ship's engines into electricity, reducing the amount of fuel needed to power the ship.
- Eco-mode sensors within cabins that switch off lights, close window curtains and lower air-conditioning when the cabins are unoccupied.
- Single-use plastics are banned on all Virgin ships including bottles, cups, cutlery, straws, bags etc.
- Standard disposable items used in food, beverage and hotel operations have been reduced from 42 to 16 items. Those disposable items that could not be replaced with a reusable item are sourced responsibly from recycled materials.
- There are no wasteful food buffets on-board which prevents an estimated 225 tonnes of wasted food per annum. Instead all food is made to order.
- Water is conserved on-board using a vacuum toilet system that uses only 1 litre per flush rather than the more usual 4 litres and the ship (when at sea) is 100% self-sufficient for water.
- Virgin Voyages are looking at a system of microwave assisted pyrolysis (MAP) that will eventually lead to all waste products from their ships into clean power.

6. Shore Power – Barriers and Solutions

There is a recognition that the provision of shore power will reduce the emissions of ships when alongside by 90%¹. However, there are very few ships that are ready to take shore power and currently there are no ships regularly calling at PIP that are equipped to take shore power.¹

However with the increase in cruise calls and PIP's main port user investing in LNG and Hybrid ferries, PIP wishes to connect these ships to shore power when berthed alongside the port. However there are challenges that need to be addressed:

- A study of PIP by the National Grid identifies that the port needs around 50MW of supply capacity by 2030 and as much as 140MW by 2050. The Bulk Supply Point that feeds half of Portsmouth (south of Fratton) can only take 100MW. The Grid Supply Point in Lovedean can only handle a maximum of circa 650MW, and that feeds everything south of Lovedean from Titchfield to the West and past Chichester to the East.
- There is not enough supply capacity at the port gate to supply the larger cruise ships – for example the port's power supply totals 4.32MW; just one medium size cruise vessel carrying 2000 passengers requires around 6MW, the largest vessels closer to 10MW.
- Current regular visiting ships are not equipped to take shore power.
- The infrastructure to supply the power does not currently exist in the port.

¹ Evidence to the NSW Environment Protection Authority of Australia (2015)

- The avoidance of significant infrastructure that may be entirely funded by government.²

In the UK, there is prominence for shore power as one of the solutions to decarbonisation in the Department for Transport’s, Maritime 2050 ‘Clean Maritime Plan’. There is however currently no actual policy support for shore-power in the UK. Shore power has had very slow global growth in the last two decades with the exception of Norway and California. There has been some progress and growth with shore-power installation projects at over 100 ports worldwide.²

For shore-power to grow in the UK, the Government will need to set out a clear framework for shore-power, to reduce uncertainty, and a package of policies to help ports, ship operators and electricity network operators. The package could also aim to focus on delivery of “quick wins” at the locations where shore-power would lead to the greatest benefits.

7. Provision of shore power at PIP

The port has a five staged plan in addressing this problem with a target of providing shore power to berths in stages however this is dictated by the current insufficiency of UK power infrastructure.

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Shore Power Study to determine viability of provision of shore power from Battery Energy Storage Systems , initially to Berth 1 but if successful (and scalable) onto other berths.	To install shore power to Berth 1 either through BESS or through direct grid connection to supply sub 1MW to small cruise liners.	To supply power to Berth 2/3/4 either through BESS or massively uprated grid connection supplying these berth with up to 10MW. Supplying power to hybrid ferries and cruise ships.	To supply power to berth 3/4 either through BESS or massively uprated grid connection supplying these berth with up to 10MW. Supplying power to hybrid ferries.	To supply berths 5 with up to 6MW each to supply shore power to the new generation of Hybrid Condor vessels either through BESS or through massively uprated grid connection.
End 2021	End 2022	End 2024	End 2025	End 2028

In all the cases above there will be direct negotiation with the Distribution Network Operator to increase supply to the port or private wire from the local Combined Heat and Power (CHP) unit.

Discussions are also taking place with National Grid concerning the potential provision of a private wire providing green energy direct from offshore wind farm renewables.

As part of the large solar array currently being deployed in the port, PIP will shortly have a large battery storage capacity of 1.1MW. This should be sufficient to supply

² Government Strategy Bullock, S 2020 Barriers and solutions for UK shore-power.

either of the Noble Caledonian vessels on Berth 1 for the 8 hours duration of their stay.

Please see the Letter of Support from Noble Caledonia³ stating that if PIP were to invest in supplying shore power to Berth 1, Noble Caledonia will invest in retrofitting to each of these ships (during their next dry-docking period) with capacity to take that power.

It is important to note that there is no financial business case that supports the provision of shore power without government subsidy. The port's trade association, British Ports Association (BPA) carried out a study of worldwide port shore power schemes and all were achieved with substantial public funding support. Furthermore the port industry is lobbying government to provide a shore power fund.

With the announcement of the Solent Freeport, there will be support towards green initiatives that PIP will also look to explore.

8. Cost of Shore Power at PIP

Prior to the port embarking on a suitable measure to address the provision of shore power, the initiative will be costed and a funding source agreed. Further work is needed prior to being able to accurately identify the cost of the provision of shore power at PIP but it is anticipated that:

- With the existing AI controlled 'master' battery (funded by Innovate UK) and a new lithium-ion batteries (being installed concurrently with the new solar array) providing enough power to not need an upgraded grid supply system, Berth No.1 could receive shore power within a year at under £2 million, sufficient to supply small cruise ships such as Island Sky and Island Princess.
- Should the port be successful in its current bid for funds (in conjunction with Marine South East) for a prototype 'proof of concept' 'flow' battery of 1MW capacity then berth 1 could be provided with shore power for around £500K. Project 'BlueStor'.
- It is unlikely that the Distribution Network Operator could or would agree to provide the power identified as being necessary by the National Grid Study. National Grid are themselves however looking to provide the port with a 'private wire' direct from a sub-station 14 miles from the port with electricity taken from off-shore wind farms. Alongside with this would be a financial agreement to take that electricity for a period of time sufficient to defray the substantial cost of this infrastructure which would likely be for a period of around 50 years and somewhere between £20million to £50million. This makes for an extremely challenging financial business case that would not be possible without government funding.

³ Letter of Support from the Managing Director of Noble Caledonia attached to this report.



9. Reasons for recommendations

Shipping remains the most environmentally efficient method of transporting goods. PIP is leading the way in decarbonisation and a front runner for being the first zero emission port and the only UK major port with live air quality sensors that have identified that we are currently not in exceedance of UK government guidelines.

Shore power will most certainly play a part in environmental shipping in the future. The fleet replacement of vessels takes decades and the shipping industry is continuing to find environmental means for supply renewable fuel. PIP's largest customer is replacing their fleet with a mixture of LNG and hybrid LNG and electric vessels. PIP are ahead of most major UK ports in landside environmental controls, thanks to the support of the Council and external funding.

PIP's cruise targets are modern vessels that have invested in environmental measures with at least one regular caller committing to conversion to take shore power. There is an opportunity to achieve short term "quick wins" in providing shore power to smaller cruise ships and a medium term demand to provide this for the new build ferries by 2024/5.

10. Integrated impact assessment

Attached.

11. Legal implications

11.1 There are no legal implications arising directly from the recommendations in this report.

11.2 However, the measures proposed (subject to funding being identified) are, as explained in the body of the report, wholly consistent with the commercial and environmental objectives of the Port.

12. Director of Finance's comments

Prior to the port embarking on a sustainability measure, the initiative will be costed and a funding source agreed.

Feasibility study being undertaken with establish an estimate cost for the provision of shore power at PIP, but it is anticipated that this could cost circa £50 million. The financial case will only be achievable with the support of government funding.

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Signed by:

Appendices:

Background list of documents: Section 100D of the Local Government Act 1972

The following documents disclose facts or matters, which have been relied upon to a material extent by the author in preparing this report:

1. Evidence to the NSW Environment Protection Authority of Australia (2015)	https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/soe2015/20150817soe-2015.pdf
2. Bullock, S. 2020. Barriers and solutions for UK shore-power. Tyndall Centre for Climate Change Research, University of Manchester.	https://www.research.manchester.ac.uk/portal/files/188647824/Shore_power_Tyndall_FINAL_EMBARGO_1st_MARCH_2021.pdf
3. Letter of Support from the Managing Director of Noble Caledonia	Attached at the end of this report.

The recommendation(s) set out above were approved/ approved as amended/ deferred/ rejected by on

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Signed by:



NOBLE CALEDONIA

3 August 2021

To whom it may concern

SHORE POWER TO VESSELS AT PORTSMOUTH INTERNATIONAL PORT : LETTER OF SUPPORT

This company has been the principal cruise client of Portsmouth International Port over many years and the port features heavily in future plans as the UK base port for our expedition style cruise vessels.

Over the years and as a tour operator, we have developed a responsible tourism initiative so it was pleasing to note that Portsmouth International Port is considering the installation of shore power facilities to be used by vessels berthed within the port as the project entirely accords with our own ambitions in this regard. We specialise in the operation of smaller vessels which carry smaller numbers of passengers and crew and this style of operation is particularly suited to operations at Portsmouth International Port.

We recognise the challenge that maritime decarbonisation poses to ports and the wider energy supply infrastructure and welcome the innovative BlueStor project to help address this challenge. We would hope to use the pilot BlueStor battery to deliver all-electric vessel operation when alongside at Portsmouth, thus eliminating emissions and reducing our carbon footprint. This can only bring benefit not only to local residents and other neighbours to the port estate but also to the wider community and to the environment as a whole.

Should this project come to fruition, Noble Caledonia would plan to upgrade on-board systems to be able to take full advantage of the BlueStor battery installation.

Noble Caledonia would welcome the future deployment of energy storage infrastructure at Portsmouth to enable our ships to eliminate their use of fossil fuels when berthed.

Yours sincerely

Tim Cochrane
Managing Director

