White Bay Cruise Terminal

Shore Power Feasibility, Costing and Emission Benefits Study

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PORT AUTHORITY
OF NEW SOUTH WALES

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Glossary of Acronyms and Terms

AMSA	Australian Maritime Safety Authority
AMSA Direction	Direction as outlined in the AMSA Marine Notice 21/2016, authorised under Subsection 246(1)(b) of the Navigation Act 2012
CARB	California Air Resources Board
CO_2	carbon dioxide
Cruise Ships Regulation	Protection of the Environment Operations (Clean Air) Amendment (Cruise Ships) Regulation 2015
ECAs	Emission Control Areas
ECGS	exhaust gas cleaning system, also known as a scrubber
EPA	Environment Protection Authority
EU	European Union
IMO	International Maritime Organisation
kV	kilovolt
LGA	local government area
LOD	limit of detection
MARPOL	International Convention of the Prevention of Pollution from Ships
NEPM	National Environment Protection Measure
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
PM_{10}	particulate matter less than 10 microns
$PM_{2.5}$	particulate matter less than 2.5 microns
Port Authority	Port Authority of New South Wales
ppm	parts per million
RAN	Royal Australian Navy
SHFA	Sydney Harbour Foreshore Authority
SO_2	sulphur dioxide
SO_x	sulphur oxides
GMR	Greater Metropolitan Region - Sydney, Illawarra, lower Hunter
VOC	volatile organic compounds
WBCT	White Bay Cruise Terminal

Executive Summary

White Bay is located in Balmain, in the local government area of Inner West Council. The White Bay Cruise Terminal (WBCT) has been in operation since 15 April 2013. Since that time, some local residents have expressed concerns about air emissions, odour and noise impacts from cruise ships berthed at WBCT.

In March 2015, as an election commitment, the NSW Government (Minister for the Environment) pledged to provide a benefit-cost analysis of installing shore power at each of the major NSW shipping ports used by the cruise industry, in conjunction with the investigation of the introduction of low sulphur fuel as a means to mitigate emission impacts at WBCT.

The Department of Premier and Cabinet's post-election *Policy Implementation Plan* required Port Authority of NSW (Port Authority) to prepare a report on the feasibility and cost of providing shore power to cruise terminals in Sydney Harbour.

On 13 August 2015, further reinforcing this commitment, the NSW Government response to Recommendation 12 of the Legislative Council General Purpose Standing Committee No. 5 inquiry into the Performance of the NSW Environment Protection Authority (EPA), committed to the Port Authority to undertaking a feasibility study of shore power.

In subsequent discussions with the EPA, Port Authority was requested to augment its technical feasibility study with some benefit-cost analysis. It was agreed to focus the study on the feasibility and costs of installation of shore power at WBCT, with investigation of the associated emissions benefits also to be undertaken.

This report includes the results of the Port Authority's investigations into the feasibility of the installation of shore power, the associated costs and potential environmental emissions benefits. It does not, however, address the associated health impacts or health costs in detail.

Port Authority acknowledges that there are sensitive receivers in close proximity to WBCT, with residences located at distances and elevations relative to WBCT where air emissions, odour and noise issues have arisen from cruise ships that have resulted in community concerns. It should be noted that the emissions modelling undertaken for the purpose of this report (total annual cruise ship emissions) has been at a scale that does not assess the direct emission benefits due to shore power at individual receivers. The noise assessment however has considered the benefits of shore power at the nearest receivers.

Port Authority has prioritised the investigations based on WBCT, however, these investigations could be extended to include other locations in NSW or to provide a detailed benefit-cost analysis of shore power and other emission control options.

'Shore power' is an emissions control measure that provides a connection to the local land-side power grid, rather than utilising the ship's engines when at berth.

Key findings of Port Authority's investigations are summarised as follows:

- Uptake of shore power by cruise lines will be minimal unless incentivised or mandated by Government:
  - 25% of vessels currently calling at WBCT are capable of using shore power. The additional cost estimated within the modelling to retrofit the fleet currently calling at WBCT is in the order of $27 million;
  - Use of shore power is not aligned with industry plans for emission control measures, with both key customers of NSW cruise terminals (Carnival Corporation and Royal Caribbean Cruise Lines, representing over 90% of vessel visits to Sydney) having announced significant programs for the progressive installation of exhaust gas cleaning systems, also referred to as 'on-board scrubbers', to meet International Maritime Organisation shipping industry requirements for emission control by 2020.
- There are 10 international ports with shore power for cruise ships, but none of these are in Australia:
  - Shore power has been implemented primarily as an emission control strategy in the Pacific Northwest of the United States where:
    - (i) the potential for emission reductions and benefits to the community, as well as government regulation, were the main drivers;
    - (ii) there was an excess of clean, renewable and lower cost power (hydroelectric) with necessary infrastructure already in close proximity to the port; and
    - (iii) there was Federal Government funding which facilitated the implementation.
- Shore power at WBCT is technically feasible, with an estimated landside infrastructure cost of $36 million[1], based on a two-year installation period.
- The introduction of Low Sulphur Fuel Requirements through the Protection of the Environment Operations (Clean Air) Amendment (Cruise Ships) Regulation 2015 (Cruise Ships Regulation) which was subsequently replaced by the Australian Maritime Safety (AMSA) Direction as outlined in the AMSA Marine Notice 21/2016, authorised under Subsection 246(1)(b) of the Navigation Act 2012 (AMSA Direction), have had a major positive effect on reducing cruise ship-related air emissions in Port Jackson – reducing the potential for subsequent benefits of shore power.

[1] The estimated lower to upper cost is $23-28 million, and with an assumed margin of error ranges from $21-36 million.

- Port Authority modelling of air emissions at WBCT[2] demonstrates an 87% reduction in sulphur oxides (SO_x) and a 69% reduction in particulate matter less than 2.5 microns ($PM_{2.5}$) emissions, as a result of the AMSA Low Sulphur Fuel Requirements. Installation of shore power would provide negligible further incremental reduction in SO_x and a further 10% in $PM_{2.5}$;

- Air quality data collected from the Port Authority's air monitoring station located in Grafton Street, Balmain, indicates that whilst there has been a significant reduction in SO_x since the introduction of Low Sulphur Fuel Requirements, $PM_{2.5}$ concentrations are not discernibly different between ship and non-ship days at WBCT and appear to be dominated by sources other than cruise ships at WBCT. All SO_x and $PM_{2.5}$ measured emissions are below national ambient air quality standards set by the National Environment Protection (Ambient Air Quality) Measure.

- Based on modelling including the land-side power grid emissions (as well as the emissions at the source at WBCT), shore power would increase the overall air emissions of SO_x and carbon dioxide (CO_2) within Sydney's Greater Metropolitan Region (unless clean energy was sourced for the supply of electricity).

- Port Authority modelling of air emission at WBCT demonstrates shore power will provide a reduction in the emission of nitrogen oxides (NO_x) and volatile organic compounds (VOCs), which are not significantly reduced by Low Sulphur Fuel Requirements. However, as existing levels emitted from cruise ships are at relatively low levels when compared to relevant national ambient air standards, the introduction of shore power will not provide a significant emissions reduction benefit.

- Shore power would provide a reduction in odorous emissions. However, the reduction in odour may not be discernible as there would still be odours related to diesel boilers (which are used on ships to generate heat when a ship is using shore power).

- Shore power provides a reduction to noise emissions. However, it is not the most cost-effective solution for reducing audible noise, as the points below demonstrate:

  - Shore power would reduce audible noise in the order of 9–10 decibels, which provides similar benefit to other noise reduction measures, but is comparatively expensive. For example, the installation of a noise barrier would provide a similar reduction in audible noise at a significantly lower cost (estimated at $2.5–4 million);

  - Shore power capable vessels at WBCT represent 25% of vessel calls, reducing to 8% of overnight stays (based on 2015–16 visits) and noise benefits will vary from ship to ship;

[2] It is noted that all modelling of the benefits of shore power was based on an assumed regulatory requirement that cruise companies calling more than 20 times would need to reduce emissions via shore power and all ships with shore power capabilities will plug in; similar to the shore power regulation scheme in California (namely, the modelling assumed for 2015–16 there were 116 calls out of 132 that were shore powered; and 10 ships with shore power infrastructure). The reality is that for the 2015–16 cruise season, currently 6 of 24 cruise ships are shore power-ready, and those ships make 29 of 132 calls or 22% of visits.

- Port Authority has completed investigations as outlined in the Noise Mitigation Strategy for WBCT and conducted community consultation as documented in a Response to Submissions Report prepared for the consideration of the NSW Department of Planning and Environment. The investigation comprised evaluation of all identified noise mitigation options including operational and engineering changes to ships and treatment of receivers. The Final Noise Mitigation Strategy is to be considered by the Department following their review of the Response to Submissions Report;

- The key elements of the Noise Mitigation Strategy are a Noise Restriction Policy, Noise Attenuation Program, and Noise Logging. Port Authority has allocated $5.3 million to fund the implementation of the Strategy.

➢ Air emission strategies can be assessed using a number of different methods. This assessment employed a methodology used by the California Air Resources Board (CARB). Using the CARB benchmark, shore power at the WBCT was not found to be a cost effective solution:

- Projects with values less than the benchmark (i.e. a ratio less than 1.0) are considered cost-effective, while those higher than the benchmark are not considered cost-effective. The investigation found that the use of shore power would range from 2 to over 7 times higher than the benchmark and would therefore not be considered cost-effective;

- Additionally, using the NSW EPA method for assessing the health impacts, the benefit of implementing shore power is approximately 11 to 24 times less than the cost of the project over the 10 year implementation period;

- Shore power is only one possible emission control solution. Other options include:

  - engine and boiler technologies
  - after treatment technologies
  - alternatively fuelled on-board energy generation
  - alternatively generated power systems
  - operational efficiency improvements.

Recommendation

Based on investigations and potential air emissions benefits, Port Authority of NSW does not recommend the installation of shore power at White Bay Cruise Terminal as a cost effective solution.

It is further recommended that Port Authority of NSW continues working collaboratively with relevant stakeholders to implement the Noise Mitigation Strategy for White Bay Cruise Terminal in 2017.