



LEGISLATIVE ASSEMBLY

16th of September 2022

Committee on Transport and Infrastructure

Parliament House, Macquarie Street,
Sydney, NSW 2000, Australia

**SUBJECT: Emission free modes of public transport - Supplementary questions for witnesses
(Public hearing – 19 August 2022) – Austal Response**

Dear [REDACTED],

Thank you for affording Austal the opportunity to participate in the public hearing, please find enclosed our responses to the supplementary questions as requested.

1) Are there any specific challenges or regulatory barriers in NSW that have prevented Austal from establishing manufacturing operations in this state?

Austal would point to a number of areas that would significantly increase risk and the cost of investing in new passenger ferries built in New South Wales (NSW):

- Availability of skilled labour and established supply chain network is likely to be more challenging to source when compared to more established shipbuilding states, i.e. Western Australia (WA) and South Australia (SA), given the ability to leverage off high volume naval shipbuilding programs.
- The capital investment required for Austal to develop suitable shipbuilding infrastructure in NSW, would mean that amortising such an investment would require a large scale and / or long-term pipeline of work to make it commercially viable.
- Adding additional capacity in NSW would require Austal to service additional operating expenditure, which will be a significant cost driver to the end user.

a) What advantages for maritime manufacturers exist in other Australian jurisdictions?

- The avoidance of adding to the construction cost of the vessels needed to services the additional capital and operating expenditure needed for Austal to expand into NSW.
- As mentioned earlier, established naval shipbuilding states such as WA and SA hold an advantage in accessing skilled labour, infrastructure, as well as established supply chain networks and subject matter experts.
- Austal is increasingly utilising a distributed build strategy across Australia and Asia, to make best utilisation of its network of shipyards in Henderson, WA as well as Cebu in The Philippines and Vung Tau in Vietnam. Which could present several direct program opportunities to reduce costs, and retain quality by contracting with one, Australian owned company, to design, build, delivery and support the vessels.

Additional Commentary Relating to Hybrid and Electric Vessels

To assist with our response Austal has taken the liberty to provide some additional information relating to the technologies under consideration; Hybrid and Fully Electric Passenger Ferries.

Hybrid electric-diesel vessels

- Hybrid electric vessels have the advantage to be able to operate part of the voyage in “zero emissions mode” by switching off the diesels and running on the onboard batteries.
- However, the vessels are normally heavier than equivalent diesel-powered vessels, due to the increased weight of the additional propulsive systems.
- It is important to distinguish between the 2 most common types of hybrid vessel options: Plug-in Hybrids and Non-Plug-in Hybrids, as described below.
 - Depending on the vessel design and operating profile some efficiency gains are possible, however, generally speaking this is not sufficient to offset the additional weight, especially at higher speeds (>20kts).
 - As a result, even though hybrids can operate in zero emission mode during part of the voyage, the total diesel consumption for the voyage will generally be higher, especially for Non-Plug-in Hybrids.

Non-Plug-in Hybrid electric vessel

- The onboard battery is charged only by the onboard diesel generator. A diesel generator provides energy to either the electric motor, or to a small battery that can also independently drive the electric motor for a short period of time at lower speed.
- 100% of energy consumed by a series hybrid vessel is provided by burning diesel onboard and, due to increased weight and the added inherent inefficiency of converting energy from mechanical to electric and back again, will burn more diesel and thus produce more emissions than an equivalent diesel only powered vessel per voyage. However, the vessel will be able to operate in “zero emission mode” for parts of the voyage.

Plug-in Hybrid electric vessel

- A plug-in hybrid is powered partially by the onboard diesel engine and partially by electricity from the grid stored in onboard batteries. The onboard battery is charged while docked, from the electricity grid. Plug-in hybrid vessels that are primarily diesel powered and only marginally battery powered will produce more emissions than an equivalent diesel-powered vessel, due to their increased weight (increased power consumption).
- Increasing the percentage of power from batteries and reducing the percentage of power from diesel on a plug-in hybrid vessel increases vessel capital expenditure, but dramatically reduces operating costs (dependant on fuel and energy prices), and total cost of ownership even in the short term.

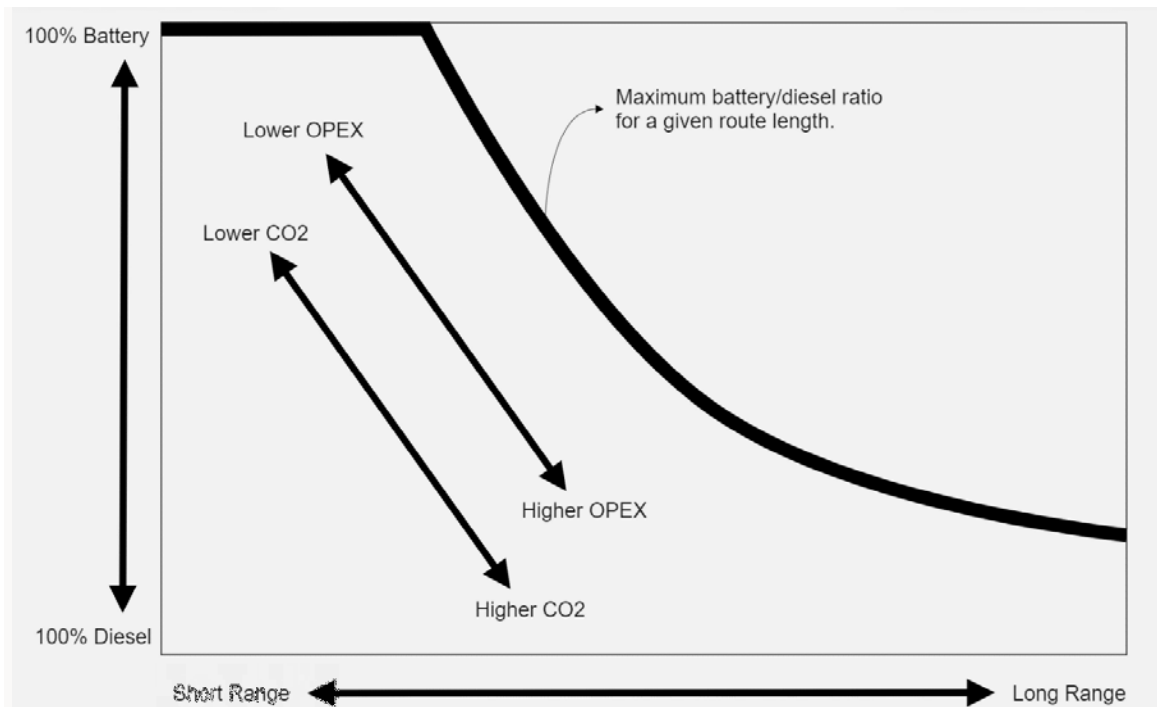
Fully Electric

- A fully electric vessel is the most efficient option to reduce both emissions and fuel costs, as long as the requirements for vessel range and sailing schedule can be met.

- A full electric ferry design can maximize the high efficiency of electric only propulsion (~80%) versus a diesel propulsion efficiency of (~40%), while also reducing weight were possible by removing the diesel components. Furthermore due to the design and installation flexibility that a fully electric propulsion system allows the vessel hull shape can be further optimised, resulting in a reduced energy consumption.
- A fully electric 40m Austal Volta ferry, capable of carrying 300 passengers at 25 knots can be designed for a range of 20 to 30 nautical miles (nm), depending on the operating and charging profile.
- With a maximum unbroken travel leg distance of 7nm between most stops in Sydney Harbour these routes are very comfortably within the envelope of feasibility for a fully electric vessel in this case.

Comparison Fully Electric vs Plug-in Hybrid

- A comparison between a fully electric ferry and a plug-in hybrid is depicted in the graph below.
- For a non-plug-in hybrid the emissions and OPEX (Operating Expenditure) would be even greater due to the extra weight and fuel consumption of the larger diesel engines required to charge the batteries.
- The most efficient solution, both for reduced emissions and reduced fuel cost, will always be to maximize the time travelled on electric propulsion. It is advised to only switch to diesel power when the range requirements exceed the installed battery capacity.



2) Can you estimate the cost of converting an existing diesel-powered ferry to a hybrid engine?


- The above graph provides some guidance on the expected cost implications of a conversion; generally speaking, an increased requirement for zero emission operations will increase the cost for conversion.
- Numerous factors play a role in determining the final cost for a conversion, it is therefore extremely difficult to provide a figure without any project specific information.

a) How would this compare to converting a diesel-powered ferry to fully-electric?

- The comments made above in regards to the hybrid conversion are also applicable here.
- However in a way this can potentially be a more “straight forward” conversion by removing the diesel drive line and replacing it with electric motors, batteries and a battery management system.

Austal would like to thank the Committee on Transport and Infrastructure for the opportunity to provide information in relation to the assessment of emission free transportation in NSW.

Yours Sincerely,

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JAMIE ANDERSON | SALES MANAGER | P 

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