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Feasibility of onshore power supply in Australian Ports

PIANC APAC: Connecting Asia Pacific ports in a changing world

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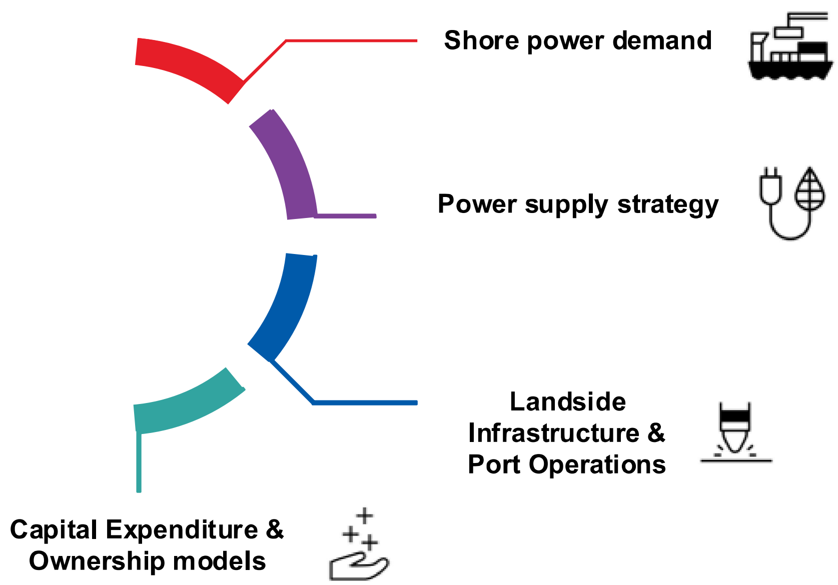
Considerations

Onshore power supply (OPS)



Maximum power demand is defined as per global standards. Energy consumption varies.

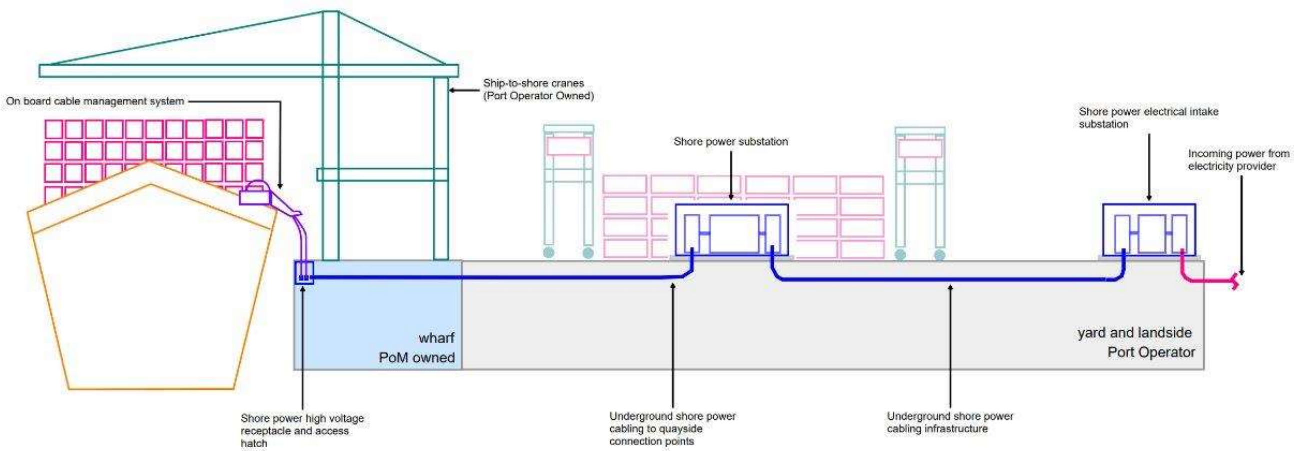
Step change in energy consumption when vessels are connected to the grid.

Challenges with existing infrastructure, planning and operations.

Significant cost uptake and introduction of new energy consumer into the port energy mix.

Shore power infrastructure

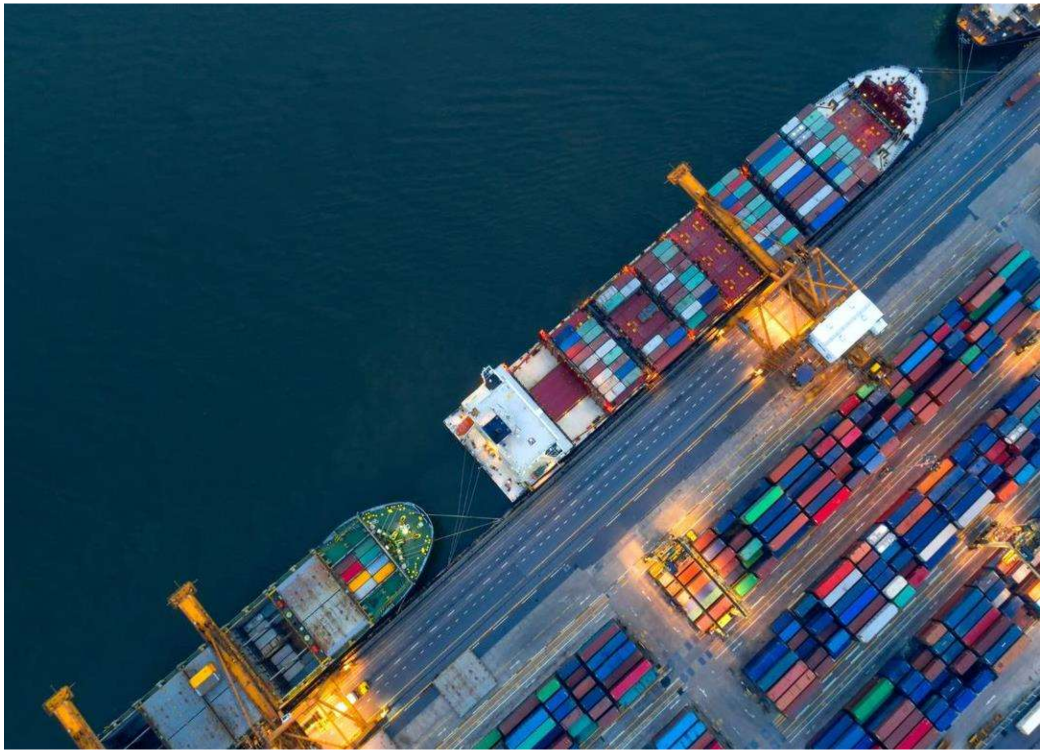
- Varied types – age / size / on board systems / connection location
- New mechanism of suppling vessels with energy from the grid
- Landside constraints – existing infrastructure, operational ports



Landside infrastructure

Considerations at the wharf

- Cable management system – on board / shoreside.
- Interfaces on the wharf with:
  - Port operations – e.g. STS cranes, logistics
  - Vessel mooring lines
  - Connection pits for junction boxes
  - Connection location on vessel



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Standardisation for vessel types

IEC 80005-1 requirements

- Container and Ro-Ro cargo vessel requirements are as per IEC/IEEE 80005-1.
- Maximum power demand determines electrical system infrastructure.
- Bulk carriers – no specific requirements.
- Local assessment undertaken directly with operators to understand vessel requirements and operational constraints.

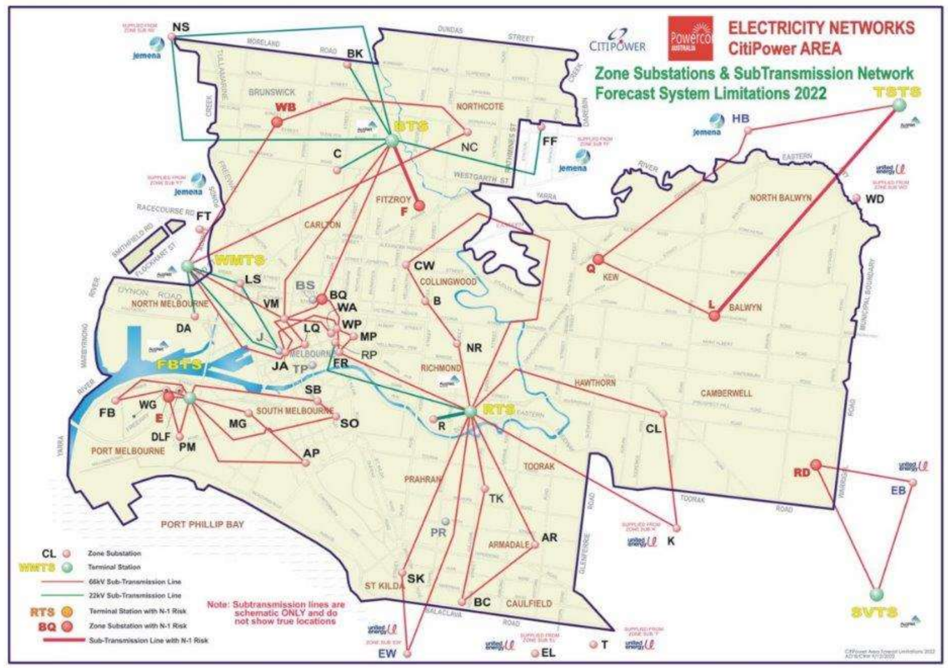
Parameters and Vessel type	Container vessel	Ro-Ro cargo vessel	Cement carriers (CSL only)
Shore power standard and reference configuration	IEC 80005-1, Annex D	IEC 80005-1, Annex B	No specific Annex in IEC 80005-1 or IEC 80005-3
Voltage	6.6kV	11kV	Under review
Frequency	50/60Hz	50Hz	50/60Hz
Maximum power demand	7.5MVA	6.5MVA	5MVA (based on operator information)
Cable configuration	Two 6.6kV parallel cables with three pilot conductors each	One 11kV cable with three pilot conductors	Under review
Cable management system	On-board vessel	Shore-side gantry crane	Shore-side gantry crane
Connection location	Port and starboard side, located towards the stern.	Port side, located on the superstructure.	Port side, located mid ship and towards the stern, upper deck.

Supply side assessment

Electricity grid

- Urban ports are located close to major cities and connected to the grid at multiple interface points.
- Significant additional power demand can introduce constraints to the electricity network.
- For forward planning estimates, energy usage can be examined in stages.
- Data by utility providers on future planning can be used as an initial assessment.
- Large power demands – utility providers should be early stakeholders for OPS implementation.

B.1. CitiPower area map with forecast system limitation



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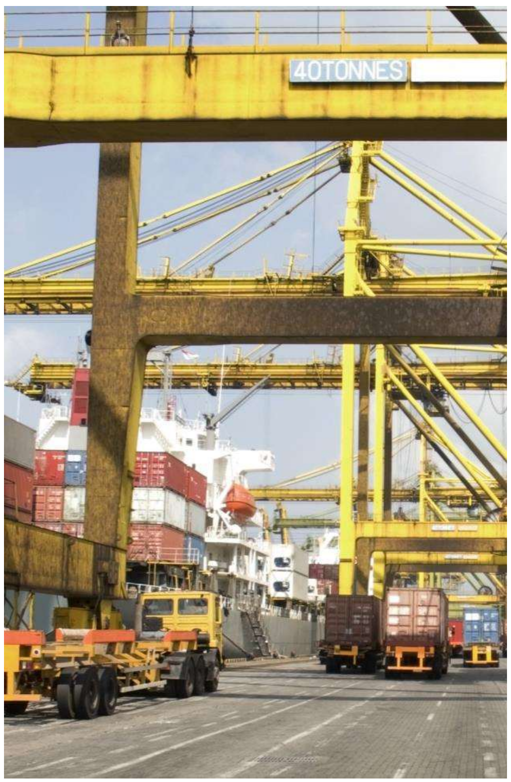
OPS Capex and Opex

Key considerations



Capital expenditure

- New vs upgraded, site conditions
- Factoring in uncertainties
- Network augmentation
- Operational constraints, berth availability

Operational expenditure

- The cost of electricity
- OPS maintenance regime
- Personnel required for OPS operations

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Cost of abatement

Emissions reduction analysis

- Based on the case study completed, the cost of abatement for OPS indicates that there is a higher cost associated with the removal of C02 as compared to other benchmarks.
- Initial assessment does not include revenue streams and other criteria such as social license to operate, air quality and/or sustainability objectives.

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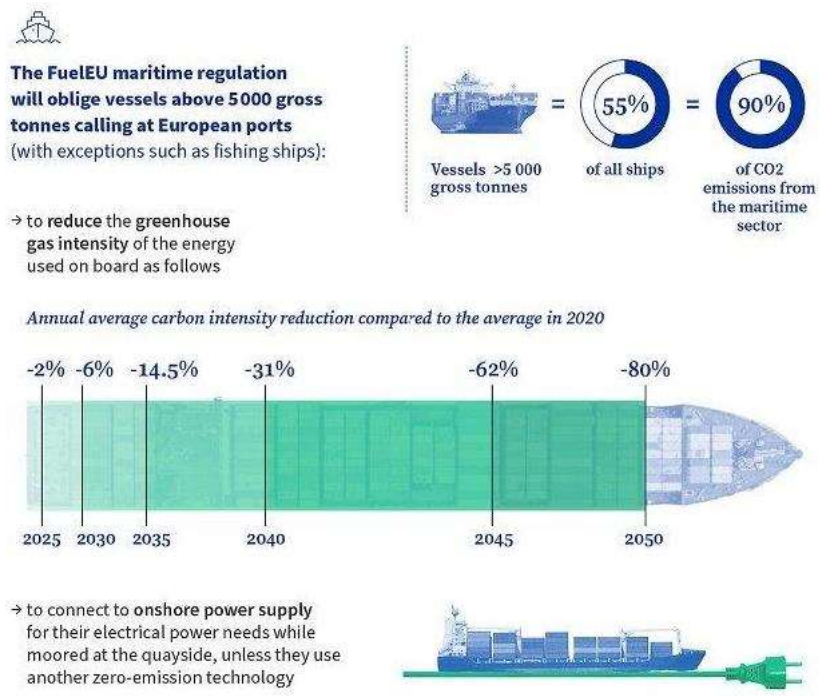
Decarbonising maritime transport

Fuel EU Maritime

- New requirements will apply to ships with a gross tonnage of more than 5,000 entering, leaving, or staying in ports in the territory of an EU Member State.
- Mandates the use of on-shore power supply or alternative zero emissions technologies by 2030.
- Potential to influence uptake of OPS on a global scale.
- Successful implementation of shore power is dependent on government mandates and funding, in combination with commitments from Australian ports.



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Conclusion

- OPS is a technologically mature solution with numerous examples globally on implementation and operations.
- Standardized approach to OPS is becoming a norm with adoption of IEC/IEEE requirements.
- Upgrades to electrical infrastructure can be significant and challenging within existing operational ports.
- OPS as a stranded asset risk is low due to cost difference with alternatives and global growth of implementation.
- Increasing adoption of OPS globally is dependent on regulation, incentives, innovation and collaboration.

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