



pure, plentiful power

harnessing new zealand's tidal power


neptune power



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The Neptune Project

The Mission: To acquire the knowledge that will enable the low-risk construction of large-scale tidal turbine farms in Cook Strait.

The Project: A risk-reduction process to enable the design and construction of a marine-current turbine that will deliver reliable power to the national Grid.



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The Neptune Project

The Risk: While the turbine technology is based on existing knowledge, little is known of the possible interactions with the Cook Strait physical and biological environments.

The Technical Strategy: To design, construct and deploy a single trial turbine unit at a convenient site; to research the environmental effects and develop a viable technical and operational system.

Trial Site Selection

Site selection was based on the lowest cost power delivery to the grid, while remaining in the strong currents of the Karori Rip. A suitable connection point was found in Owhiro Bay, and a suitable turbine site south of Sinclair Head.

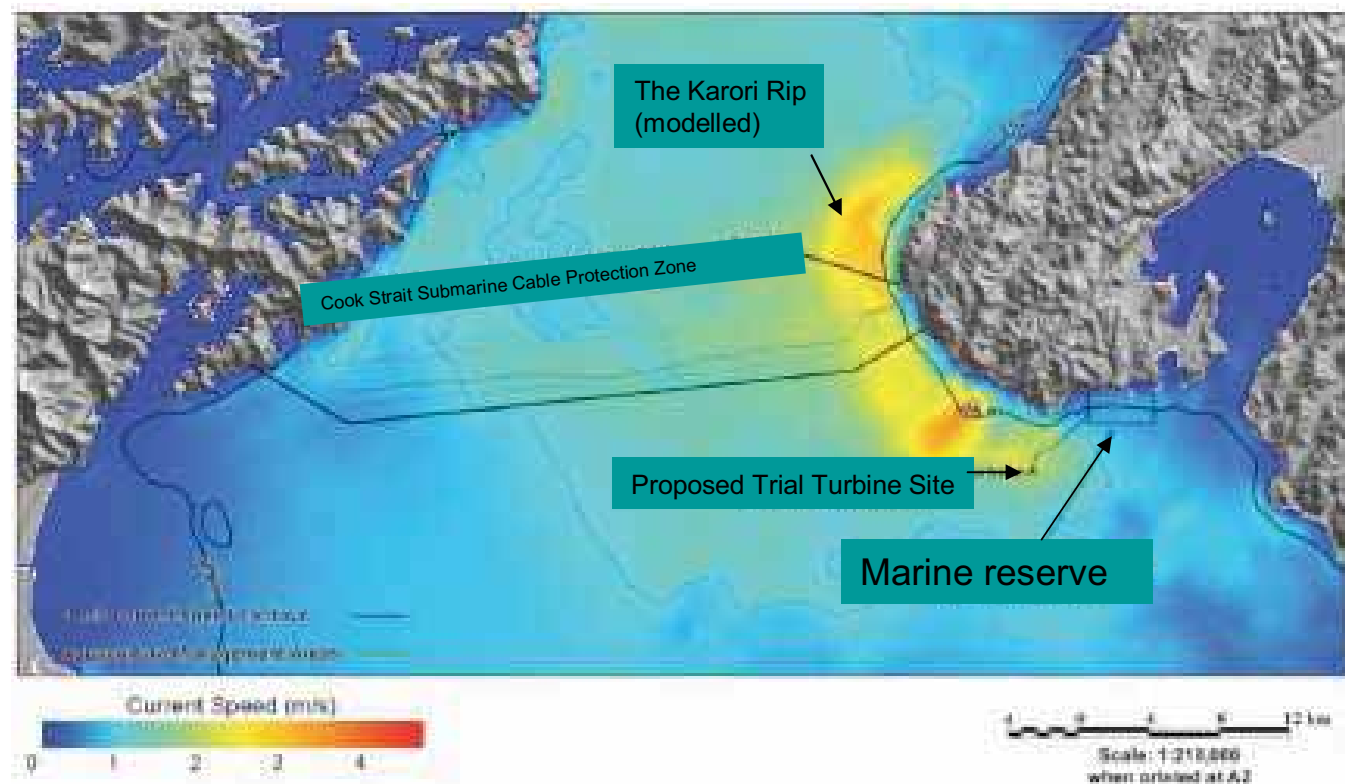


Figure 7.3: Maritime Constraints in the Cook Strait CMA

Note: discontinuities in the submarine cables indicate where the cables are buried

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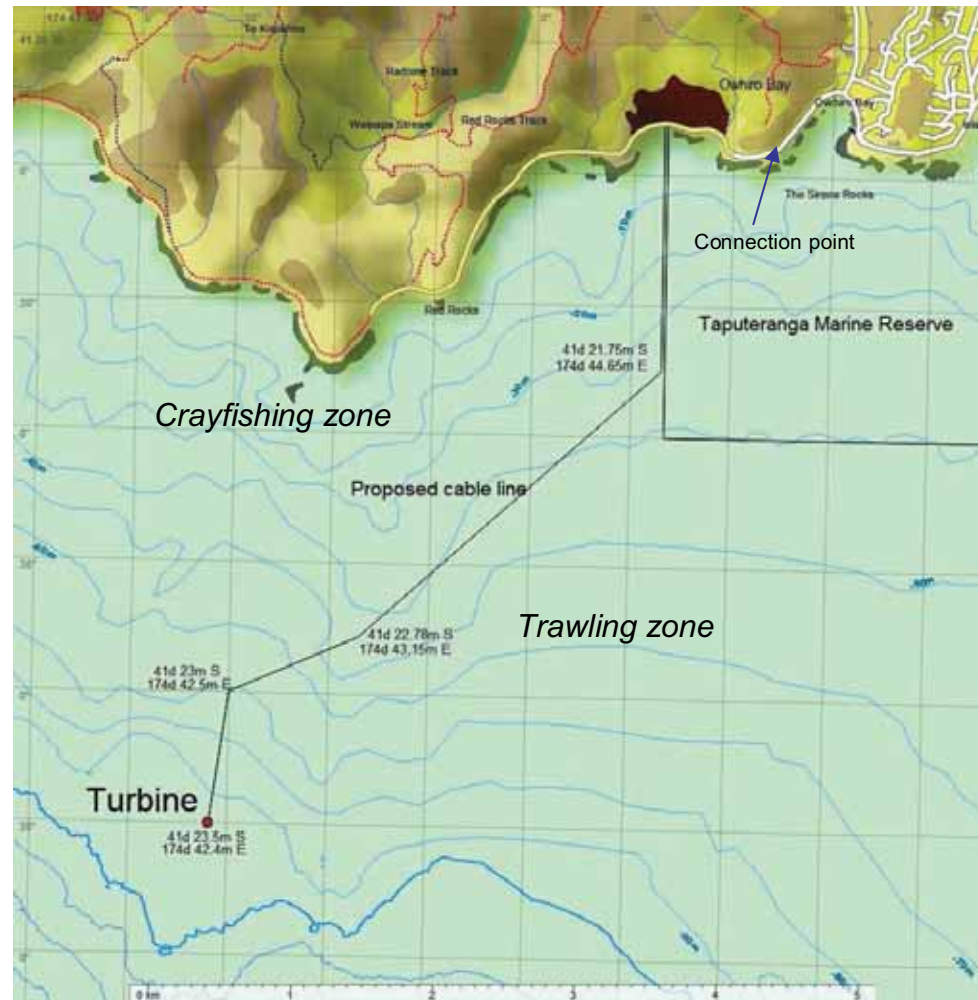
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The Coastal Permit

The cable route to this test site is fairly tightly constrained, but it was possible to obtain unconditional agreement with the fishing organizations concerned.

An application to the Greater Wellington Regional Council, for a Coastal Permit under the RMA, was initiated in October 2007.

It was granted 6 months later.





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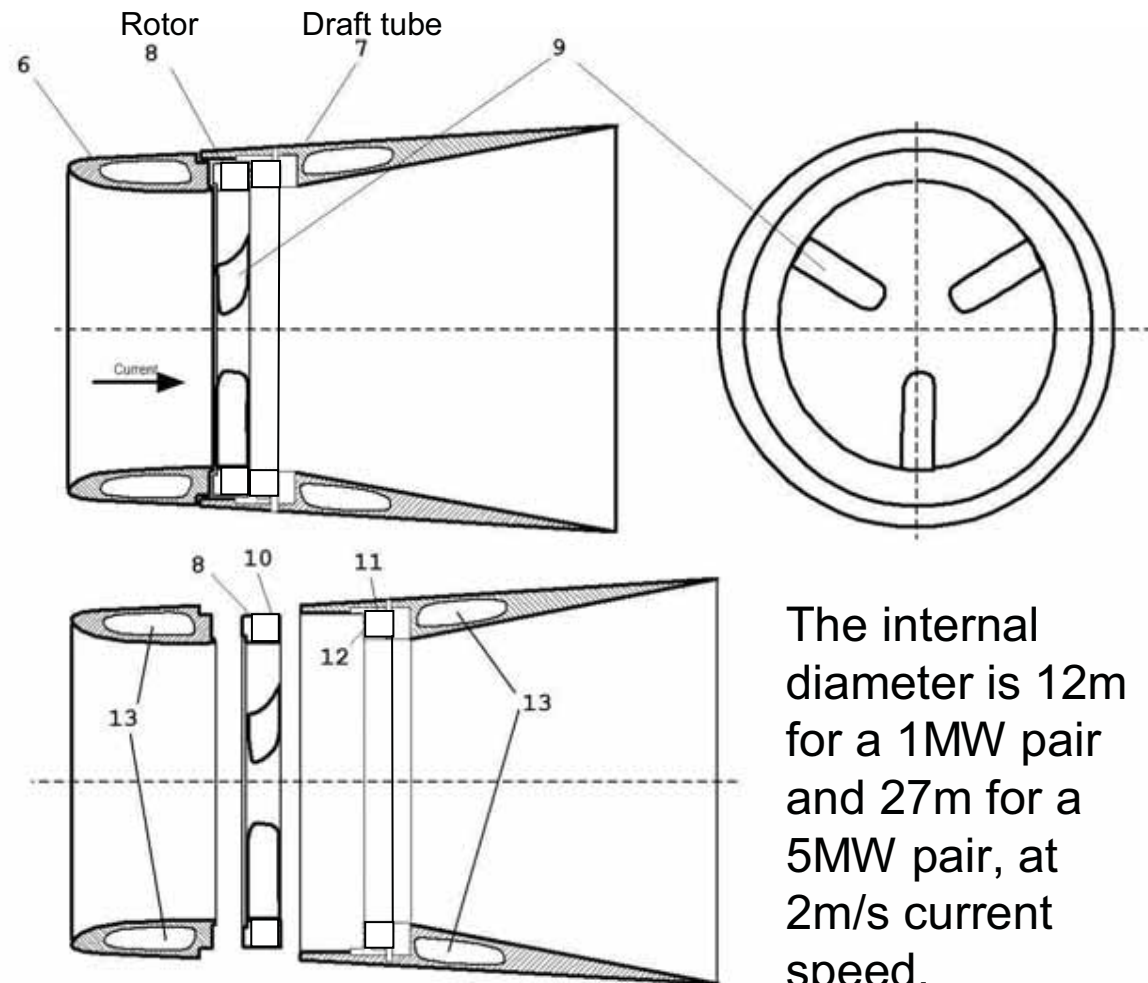
Conditions set by the Coastal Permit

- Obtain unconditional agreement from 16 nominated affected parties
- Ten year period but five year limit to operations
- Minimal physical interference with charismatic marine mammals or other fauna.
- Minimal noise.
- Minimal interference with fishing industry and other users.
- No interference with the sea bed.
- No antifoul paints needed.
- Ability to remove all equipment at the end of the trial, if not re-consented by NIWA.

The Turbine

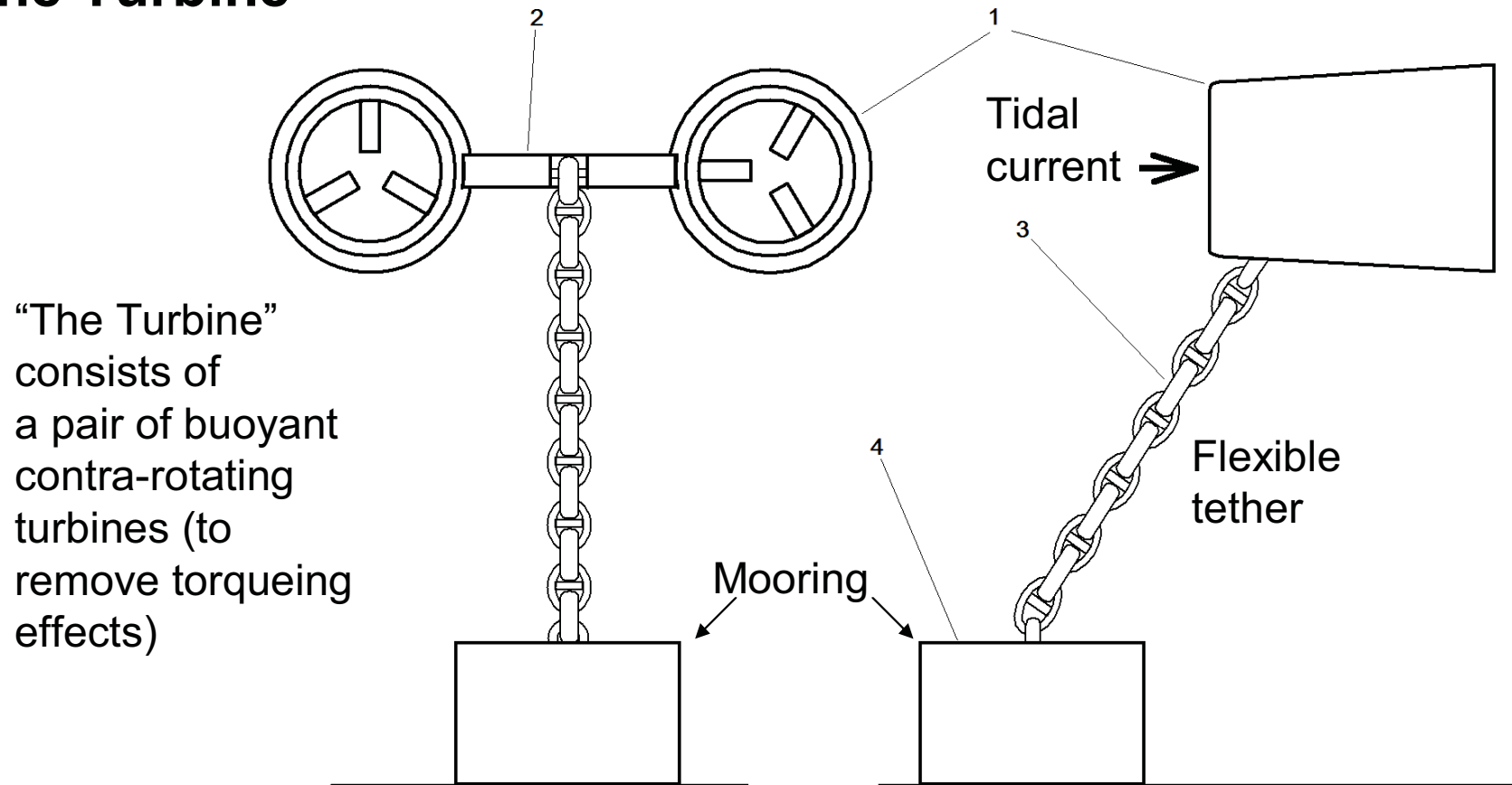
The RMA consent requires a ducted turbine for minimum interaction with marine biota (especially whales, dolphins, etc).

Ducting enhances the turbine efficiency, so is desirable, and also enables a rim generator that requires no gearbox or bearings.



The internal diameter is 12m for a 1MW pair and 27m for a 5MW pair, at 2m/s current speed.

The Turbine



“The Turbine” consists of a pair of buoyant contra-rotating turbines (to remove torquing effects)

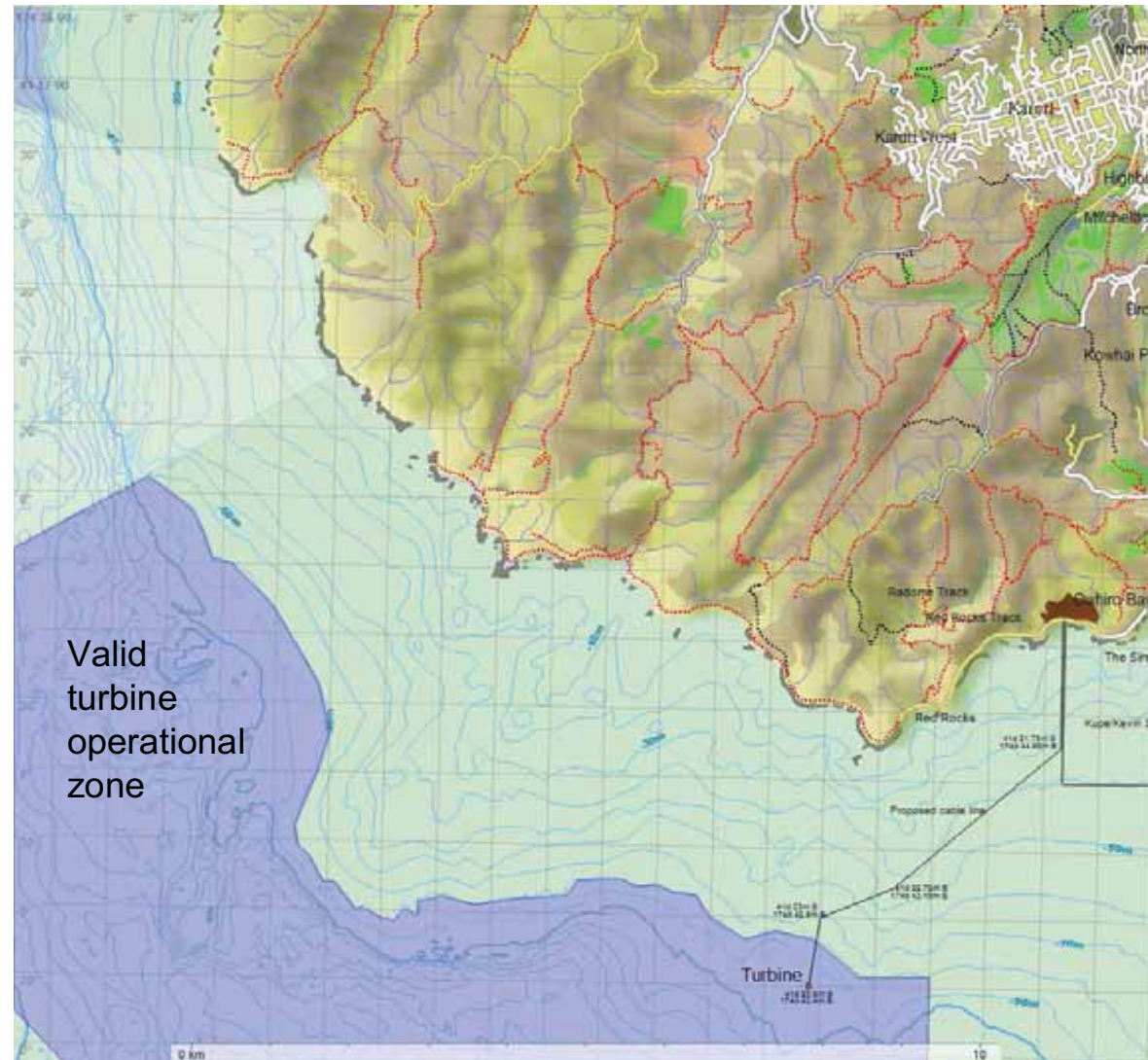
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Years 3 – 5

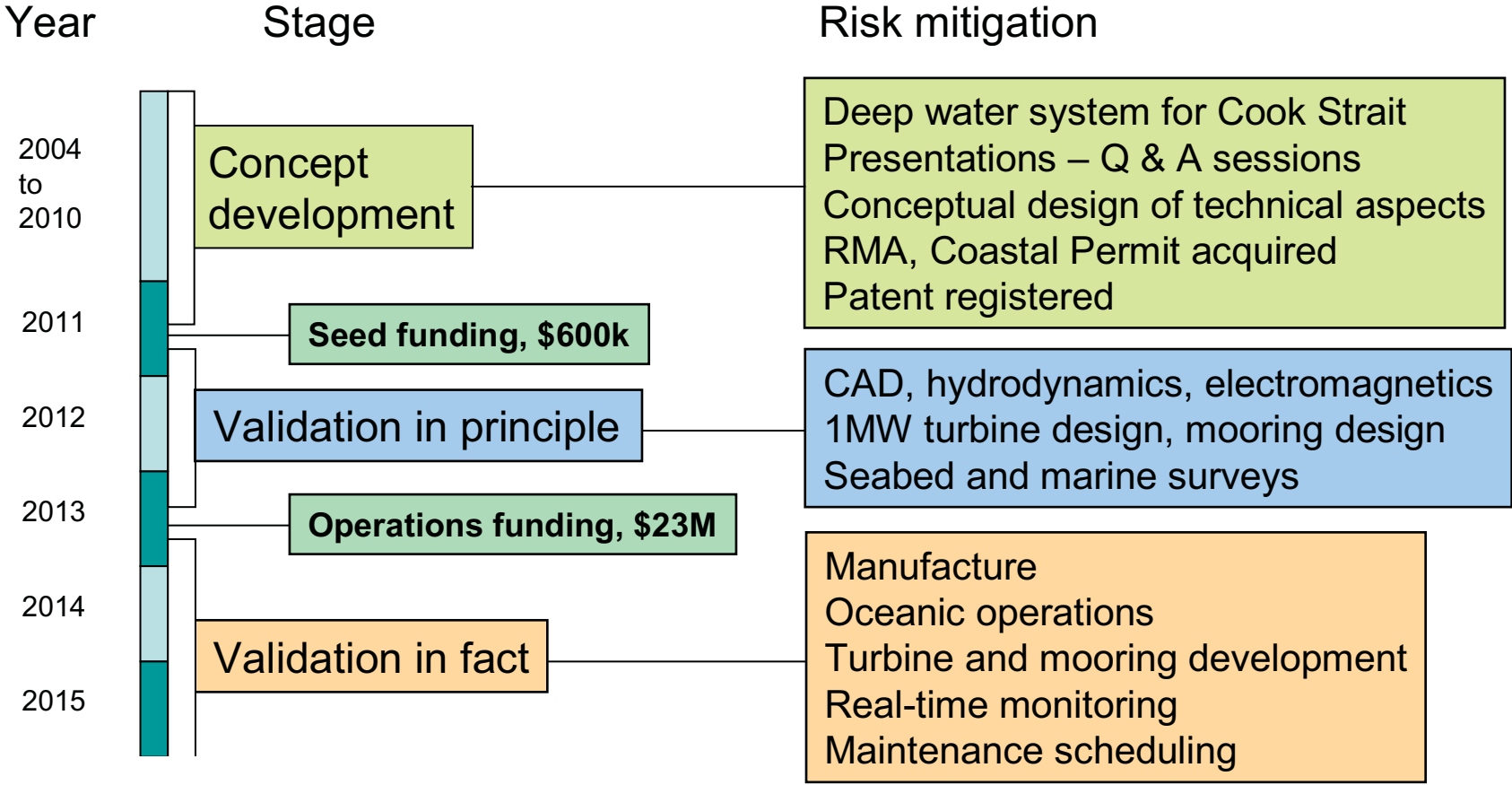
The first part of the project is to install the single test turbine unit South of Sinclair Head to acquire the data that will enable planning for a full scale multi-turbine installation.

The Cook Strait marine energy resource must be fully characterised in this first operational phase.





Neptune Project Overview



Neptune Power Ltd Project timeline

Project component		Timeline	Year 1	Year 2	Year 3	Year 4	Year 5
Design	Generator design		■				
	Magnetics		■				
	Electromagnetics		■				
	Phase wiring		■				
	Power converter		■				
	Plug&Play module		■	■			
	Shopfloor model		■				
	Thrust bearing		■				
	Turbine design		■				
	Shroud		■				
	Rotor		■				
	Blades		■				
	Turbine bridge		■				
	Tether		■	■			
	Mooring		■	■			
	Deployment/Retrieval		■				
Manufacture	Shopfloor model		■				
	Generator		■				
	Power converter		■				
	Plug&Play module		■	■			
	Thrust bearing		■				
	Shroud and bridge		■				
	Rotor & Blades		■				
	Assembly		■	■			
	Mooring/Tether		■	■			
Deployment	Ship modifications		■	■			
	Components		■	■			
	Marine cable order		■	■			
	Marine cable deployment		■	■			
Operation	Turbine deployment		■	■			
	Operation				■	■	■
Operation	Management		■	■	■	■	■
			■	■	■	■	■



Finance

- Cons: High initial risk, high cost, no income, multi-year duration
- Pros: Rapid risk reduction, high knowledge gain
- The prize: High scalability, high value 24/365 generation potential
- The problem: High risk-aversion, economic depression
- The solution: Recognition of the near-future energy crisis
- The source: Almost certainly overseas



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