**Wave Power**

([1])

* Generated from large energy changes in deep water sea waves
* Power proportional to A^2\*T, e.g. 10sec 2m waves have energy fluxes between 50 and 70 kW/min
* Actual power extraction is difficult
  + Wave patterns irregular
  + Risk of extreme weather – structure of power device must withstand \*\*
  + Best power available in hard to reach/ dangerous oceans -> maintenance and power transmission to land is difficult
  + Wave periods are very low (0.1Hz) compared to the requirements of electrical generator
  + Large power requirement of industrial sites -> plans scaled up so smaller sites of less power potential are ignored.
* Advantages – large power fluctuations and predictability of wave conditions (waves result of wind/weather)
* Very inefficient, if wave makes 10TW estimated that only 2 TW can be successfully converted to electric power [2] 🡪 technology does not exist/is not feasible
* Some wave capture systems
  + Onshore – Tapchan – tapered channel, wave energy converted to potential, entirely passive (no moving parts), energy conversion same as hydroelectric power plant, operating in Norway[3].
  + On shore – Oscillating water column (LIMPET device) – uses rising and falling water column to push air in a piston like action to turn turbine to convert energy into usable form – naturally occurring in blowholes [4]
  + Off shore - whale

The use of wave power will require an offshore generator, transmission to land, and transmission inland to Newman 🡪 **very** expensive for this project. Maybe if we needed a lot more power than 90kW it could be an option…

**Tidal Power**

Ocean tides are caused by the gravitational pull of the sun and the moon on the earth (very predictable) (REF). Tidal energy can be captured by tidal stream or tidal current turbines. Barrages could also be used to capture potential energy created by the changing height of tides. Predicted 3.7TW of which 0.8TW available due to fluctuations in tide[2].

**Diesel Generators**

Generators convert mechanical energy into electric energy.

Require 90-100 kW generator (plus a backup if it’s the only power source) ~ $25, 000 (<https://www.electricgeneratorsdirect.com/power/70-90-kw-generators.html>)

The average retail price of diesel in Australia in 2016 was 121.6c/L according to Australian institute of petroleum (<http://www.aip.com.au/pricing/retail.htm>). A 120kW generator uses 32.1L/hour at full load (<https://www.ablesales.com.au/source/Diesel%20Generator%20Fuel%20Consumption%20Chart%20in%20Litres.pdf> )

Diesel could be transported by pipeline or vehicle (this project probably requires a vehicle),

Storage of diesel tanks must comply with AS 1692 (Tanks for flammable and Combustible liquids),

Generator Used as backup system:

<http://www.sciencedirect.com/science/article/pii/S0973082609000532>

<http://www.sciencedirect.com/science/article/pii/S096014811100320X>

http://www.sciencedirect.com/science/article/pii/S0960148100000409

[1] J. Twidell and J. Twidell, *Renewable Energy Resources*, 2nd ed. ed. Taylor and Francis, 2014.

[2] M. H. Rashid, *Alternative Energy in Power Electronics*. Saint Louis, UNITED STATES: Elsevier Science, 2014.

[3] E. Mehlum, "TAPCHAN," in *Hydrodynamics of Ocean Wave-Energy Utilization: IUTAM Symposium Lisbon/Portugal 1985*, D. V. Evans and A. F. O. de Falcão, Eds. Berlin, Heidelberg: Springer Berlin Heidelberg, 1986, pp. 51-55.

[4] T. V. Heath, "A review of oscillating water columns," *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences,* 10.1098/rsta.2011.0164 vol. 370, no. 1959, p. 235, 2011.