



The Carruthers Wheel

Aka 'How to electrify the South and de-carbonise the North for fun and profit, using Very Low-Head Hydropower

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Very Low-head Hydropower,

Onshore VLH > 1,000GW
i.e. 16%, minimum, Global
Hydro-potential*
or 5-10% global demand at
European levels

% of demand level available

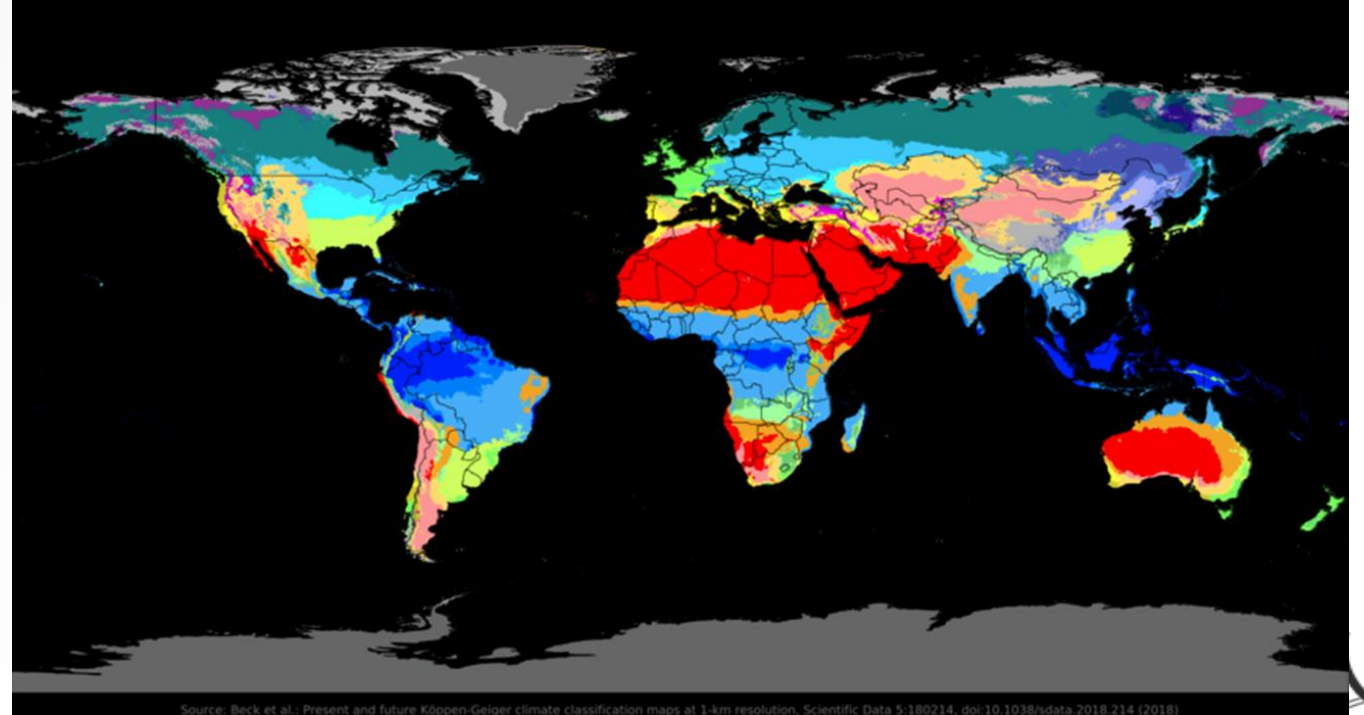
Blue = excellent, 50%

Green = very good, >10%

Yellow = OK, <10%

Red = Terrible

VLH = Drops < 6m



https://en.wikipedia.org/wiki/K%C3%B6ppen_climate_classification

*<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0171844>

Very Low-head Hydropower,

Foreshore/Tidal VLH =
As **big** as you want

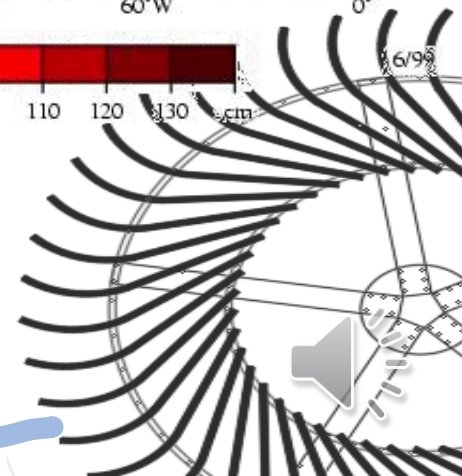
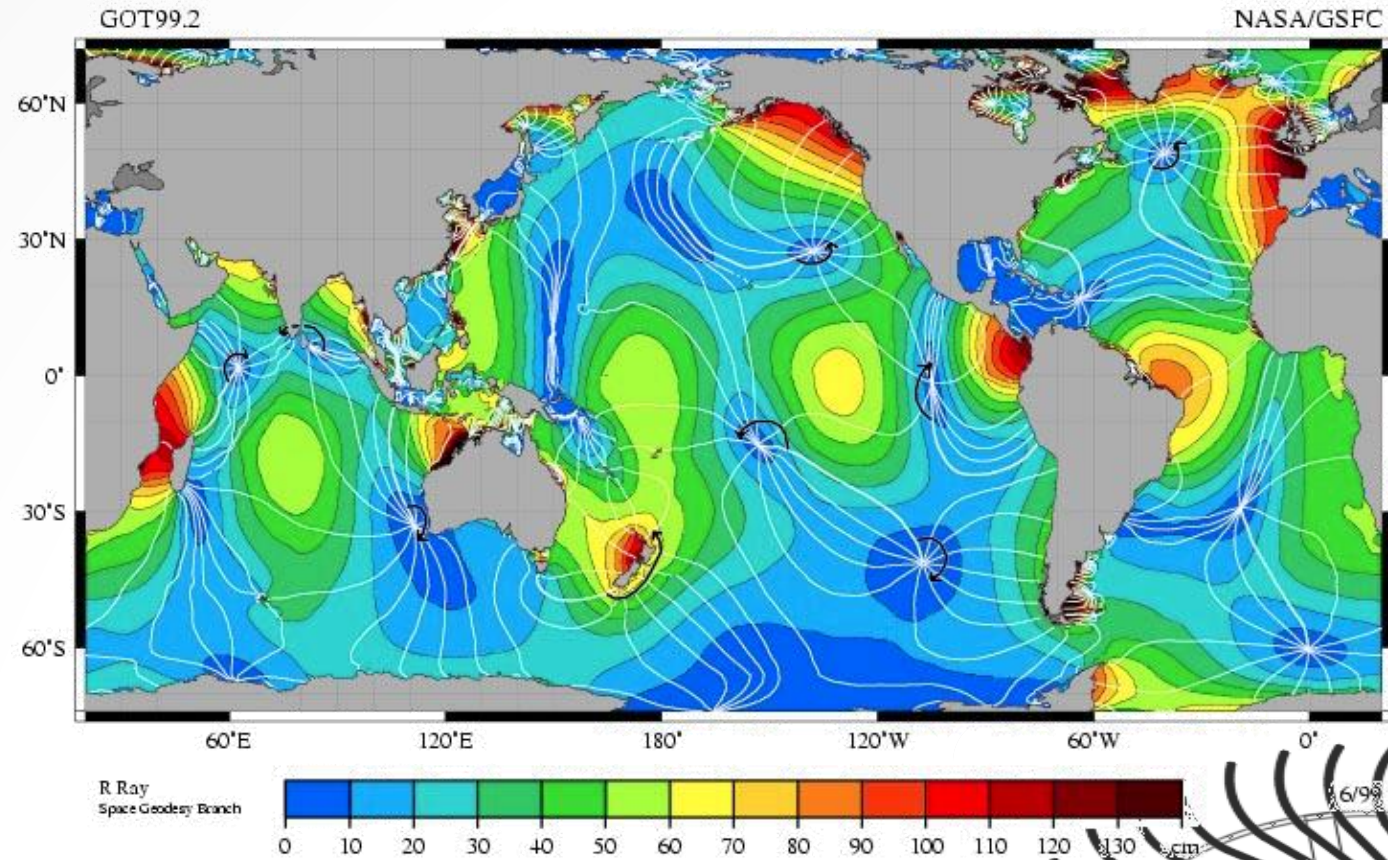
Red = excellent, a **lot** of energy but
more complex

Yellow = very good, middling

Green = OK, small & cheap

Blue = Domestic only

https://en.wikipedia.org/wiki/Tidal_range



Carruthers Wheel

Prototype

- Tested @ Abertay

<https://www.icevirtuallibrary.com/doi/abs/10.1680/jcien.17.00051>

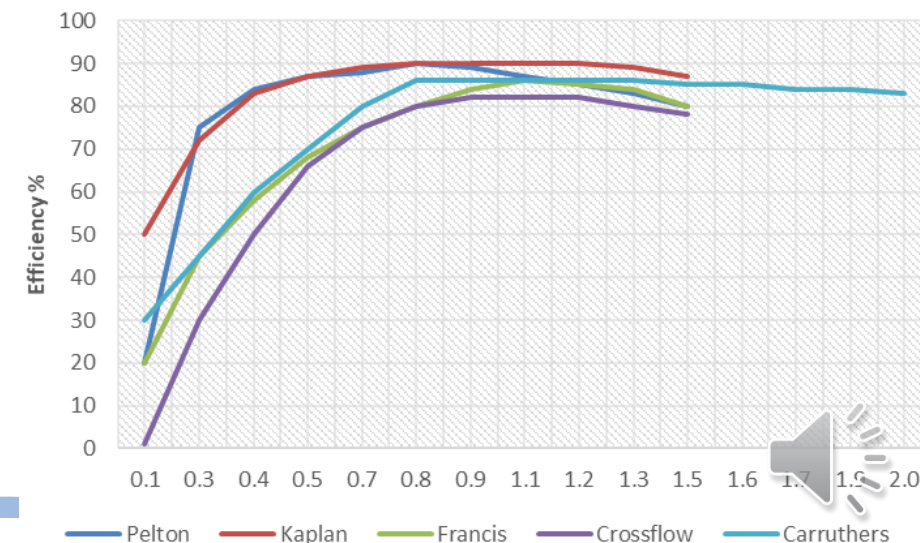
- Mass Manufacturing method developed with NMIS

- CFD model developed with AFRC

<https://pureportal.strath.ac.uk/en/publications/cfd-simulations-for-a-new-breastshot-waterwheel-design>



Efficiency vs Flow



Onshore VLH

300kW \equiv 2.4GWh/y

Scottish Salmon river

Cost = £350,000

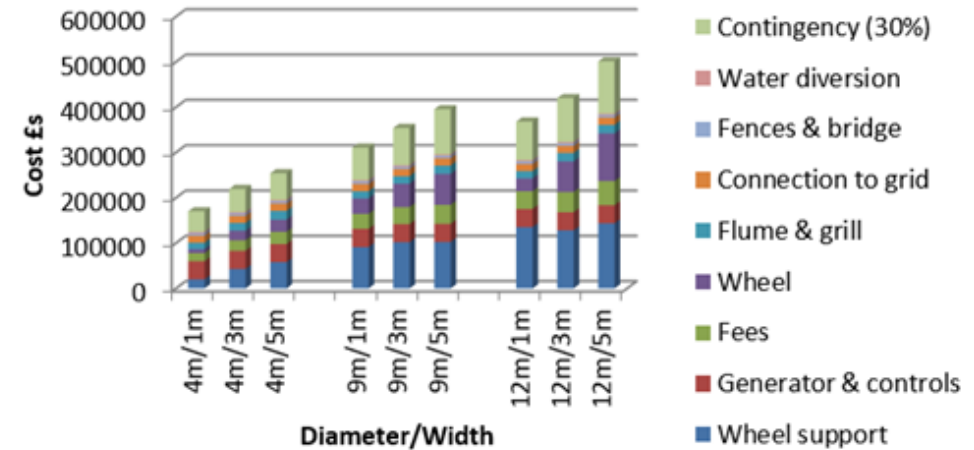
Grid quality electricity

Fish friendly

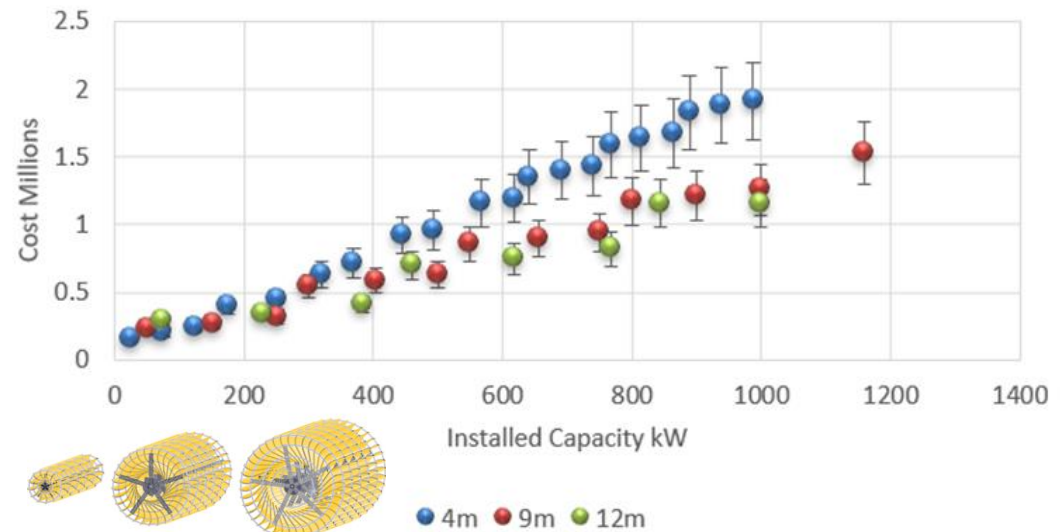
Good design \equiv improved fish passage



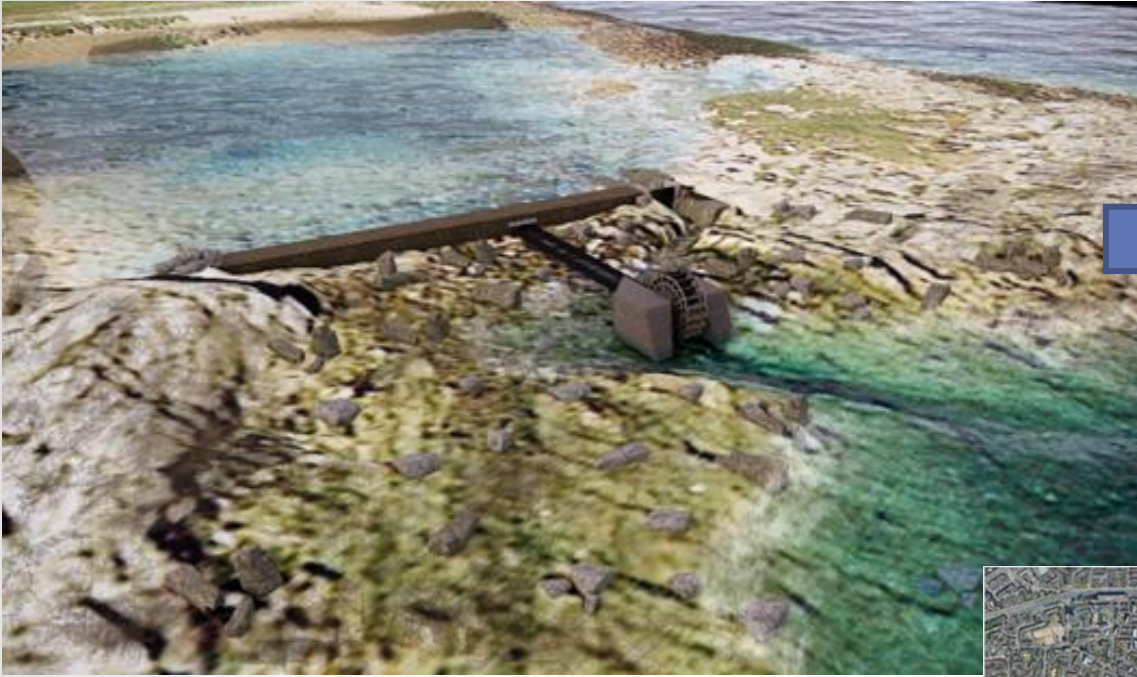
Costs Breakdown



Cost and Installed capacity



Foreshore VLH

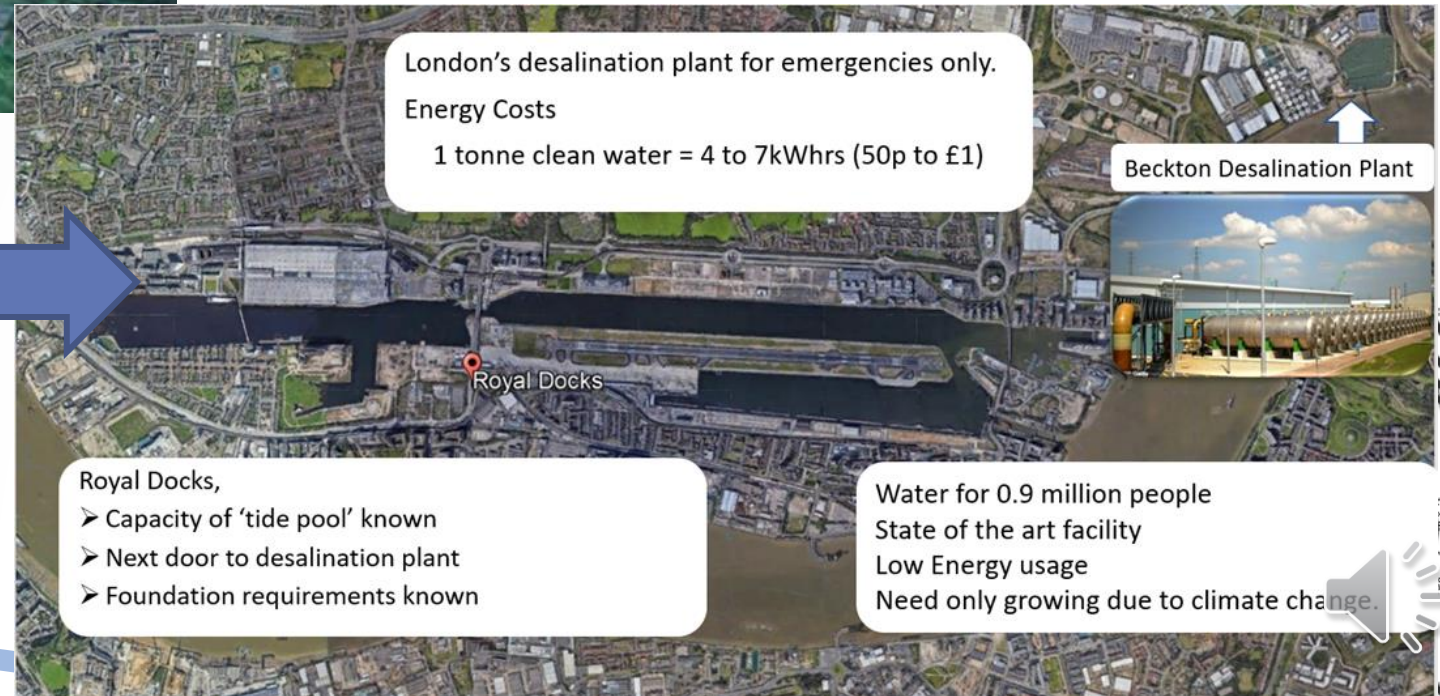


12kW \equiv 40MWh/yr.

Fife Ness tidal Lagoon
Site of medieval tidemill
Cost < £½ million

52MW \equiv 110GWh/yr

London's Royal Docks = tidal pool
Cost < £10 million
Next door to possible industrial user



London's desalination plant for emergencies only.

Energy Costs

1 tonne clean water = 4 to 7kWhrs (50p to £1)

Beckton Desalination Plant

Royal Docks,

- Capacity of 'tide pool' known
- Next door to desalination plant
- Foundation requirements known

Water for 0.9 million people

State of the art facility

Low Energy usage

Need only growing due to climate change.

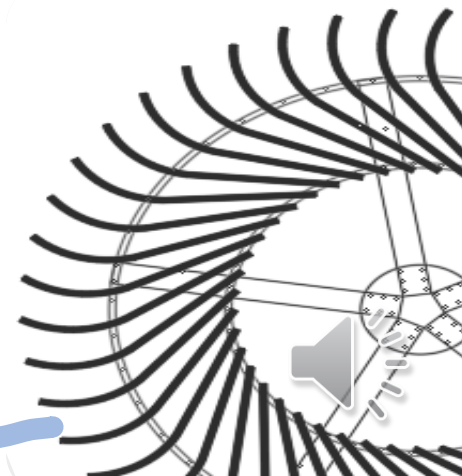
Products and Services

Now

- Licensing for Mass Manufacture of Wheel
- Engineering design and support for projects
- Off-the-shelf electricals

3yrs time

- Licensing for mobile wheel units
- Licensing for bespoke electricals
- Specialised software support for design, installation and smooth running





Making business sense
of climate change



**Crown Estate
Scotland**
Oighreachd a' Chrùin Alba

