Fact Sheet to compare the energy outputs and capital costs of an example tidal range project with other mature, clean-power technologies operating over a 120-year lifetime.

Definitions
1 TWh = 1 million MWh. An annual anergy output of 1 TWh has been used for all the examples in this fact sheet.

1 MegaWatt (MW) = the power output. A 1MW generator working at full capacity will produce 1MWh in one hour.

Capacity Factor is the ratio of the energy produced by a project to the theoretical maximum that it could produce.

This short paper considers the following clean power technologies to determine the amount of capital expenditure that is required to produce the same amount of energy (1TWh/yr) over a 120-year period:

- Tidal Range – based on 2025 estimates of cost from the Severn Estuary Commission[1] and Mersey Tidal Power[2] based on a 700MW barrage or tidal lagoon (details of the key project characteristics can be found at the end of this paper).
- Nuclear – based on 2025 published data for Sizewell C[3]
- Offshore Wind – based on 2025 published data[4]
- Solar – based on industry analysis by Eon[5]

The capital cost from each of the technologies for the annual generation of 1TWh is set out below in tabular and graphical form. The total capital costs are scaled *pro rata* to 120 years for the technologies with lives shorter than 120 years.

Derivation of Capital Costs for annual generation of 1TWh per year for 120 years

	Tidal Range	Nuclear	Offshore Wind	Solar
Cost per MW	£5m	£11.9m	£3.7m	£1m
Capacity Factor	20%	92.5%	49%	10%
MW for 1TWh/yr	571	123	233	1,142
Capex (£m)	2,854	1,469	862	1,142
Operating Life (years)	120	60	30	25
Total Capex (£m):	**2,854**	**2,937**	**3,448**	**5,479**
Ranking:	**1**	**2**	**3**	**4**

[1] https://www.severncommission.co.uk/
[2] https://www.liverpoolcityregion-ca.gov.uk/its-time-for-tidal
[3] https://www.sizewellc.com/news-views/final-investment-decision-reached-for-sizewell-c-the-biggest-british-clean-energy-project-in-a-generation/
[4] https://guidetoanoffshorewindfarm.com/wind-farm-costs/
[5] https://www.eonenergy.com/business/renewable-energy/solar-farms.html?utm_campaign=organic_search&utm_medium=organic&utm_source=www.google.com

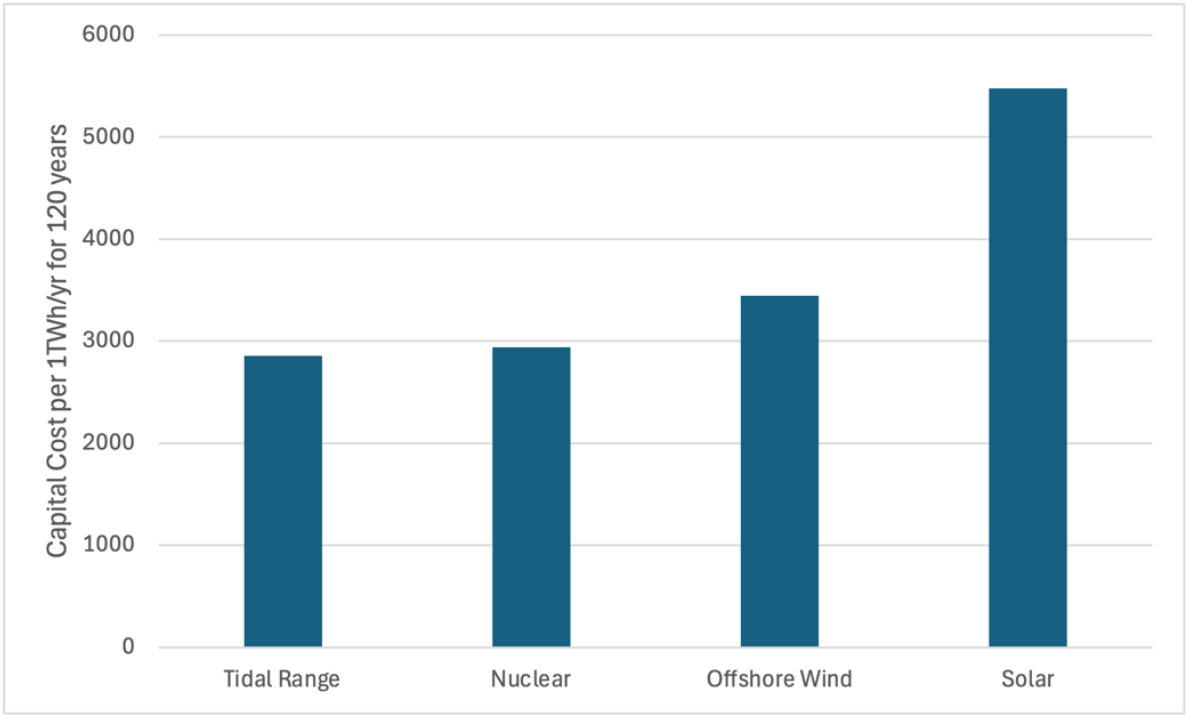

Figure 1: Capital Costs (£m) per 1TWh/yr of energy production over 120 years

This analysis is rather simplistic but useful. It clearly shows that more energy is generated per £ of capital expenditure from tidal range projects than from other comparable technologies, primarily because the latter have to be rebuilt to extend their energy generation over 120 years.

This conclusion is based on the *same logic* used by BEIS[6] in their fact sheet accompanying their decision not to award a Contract for Difference to Swansea Bay tidal lagoon in 2018.

A significantly more detailed analysis is available from the Agilia[7] report prepared for the Severn Estuary Commission. This also shows cost reductions to the consumer over the project lifetime.

Conclusion: Tidal Range Projects produce more energy per £ of capital expenditure than nuclear, offshore wind and solar technologies and reduce cost to the consumer in real terms over the operational life.

Swansea Bay is a more expensive example of tidal range than other locations under consideration for tidal range development. This is because it was relatively small combined with a lower tidal range. The published cost of the Swansea Bay lagoon in 2015 was £1.3bn. Updating this to a 2025 cost base gives £1.82bn for 320MW or a cost of £5.7m per MW. To generate 1TWh requires an installed capacity of 615MW. The total capex for Swansea Bay per TWh of annual energy over 120 years would have been 615MW x £5.7m = £3,500m. This is higher than the other tidal range projects cited in this paper.

Conclusion: Swansea Bay Tidal Lagoon should therefore not be considered as representative of the financial performance from tidal range technologies.

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[6] https://assets.publishing.service.gov.uk/media/5b3109a5e5274a55b88ed307/tidal-lagoon-programme-factsheet.pdf

[7] https://www.severncommission.co.uk/wp-content/uploads/2025/03/Severn-Estuary-Commission-Final-Agilia-Report-06.02.25-v2_compressed.pdf

In summary, using the same logic as set out in the 2018 BEIS assessment of Swansea Bay's proposed tidal lagoon, larger tidal range projects, located in areas with high tidal ranges, cost less than equivalent nuclear, offshore wind and solar projects operating for the same operating period.

Conclusion: Tidal Range Projects should be actively considered by Government as a viable clean power technology to meet the 2050 net zero objective.

There are currently two publicly funded tidal range projects being considered in the Mersey and one in the Severn Estuary. The Mersey Barrage is being promoted by the Liverpool City Region MCA. The West of England MCA and Cardiff Capital Region are working jointly on a tidal lagoon demonstration project as recommended by the Severn Estuary Commission in its report published in March 2025.

Figure 2: Illustration of the proposed Mersey Barrage

Figure 3: Plan on the proposed commercial demonstration lagoon in the Severn Estuary

The analyses undertaken by both these project teams demonstrate that the construction of a Tidal Range project would, with the application of the RAB funding model, reduce customer bills year on year once the tidal range project starts operation. Whilst customers are charged from the

start of construction, this would be around £2.50 per year for 5 years and leads to much lower costs to consumers over the project's lifetime. The comparable charge for Sizewell C charge is approximately £12 per year over 12 years. Because the design of energy RAB's include a contract for difference component, costs to the consumer will also fall as and when the revenues from the wholesale energy market rise above the regulated revenues.

There are also important co-benefits relating to grid security and socio-economic factors, but these vary from project to project so are not quantified in this paper.

The characteristics of the tidal range example project are as follows:
Type: Tidal barrage or lagoon
Installed Capacity: 700MW
Load Factor: 20%
Mode of Operation: Ebb + Flood + Pump
Capital Cost £5m/MW (range from £4.4m/MW to £5.5m/MW)
Annual Energy Output = 1.23TWh
MW needed for 1 TWh = 571
Operating Life = >120 years