ENERGY RESOURCES PRESENTATION

TIDAL ENERGY

GROUP - 18 :-

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Introduction

Welcome, everyone, Today, we're diving into a fascinating realm of renewable energy: Tidal energy..

- **Imagine harnessing the rhythmic, unstoppable power of the tides to generate electricity.**
- **It's a concept that not only showcases nature's incredible force but also holds the key to a cleaner, more sustainable future.**
- **This energy source is highly predictable and renewable, making it an attractive option for sustainable power generation..**
- **WORKING PRINCIPLE:Potential and kinetic energy of tides are used in rotating the turbines and thus this mechanical energy is converted into electrical energy.**

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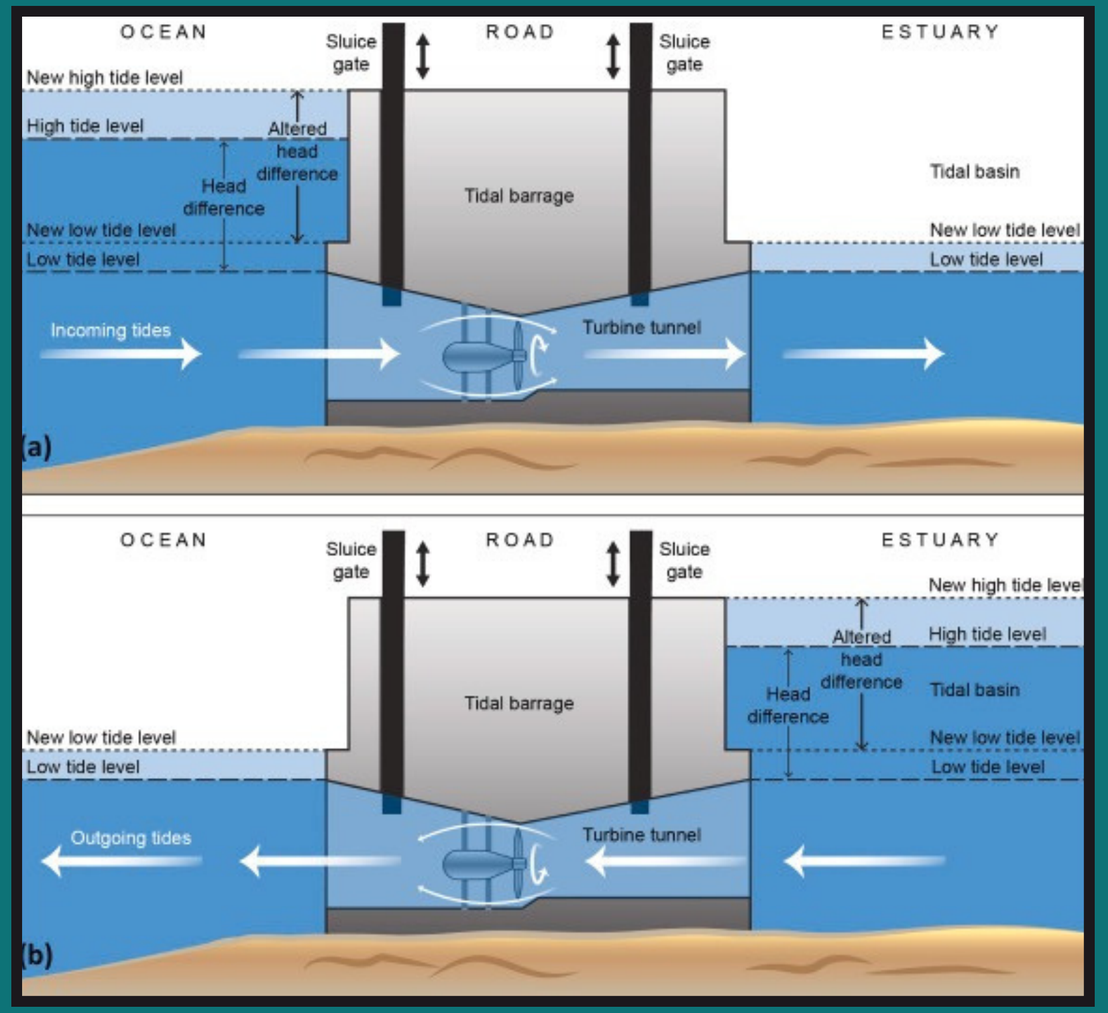
HOW IT WORKS

The arrangement of this system is shown in figure.

The ocean tides rise and fall and water can be stored during the rise period and it can be discharged during fall. A dam is constructed separating the tidal basin from the sea and a difference in water level is obtained between the basin and sea..

During high tide period, water flows from the sea into the tidal basin through the water turbine. The height of tide is above that of tidal basin. Hence the turbine unit operates and generates power, as it is directly coupled to a generator.

During low tide period, water flows from tidal basin to sea, as the water level in the basin is more than that of the tide in the sea. During this period also, the flowing water rotates the turbine and generator power.



TECHNOLOGIES USED IN HARNESSING

TIDAL RANGE TECHNOLOGIES

- Tidal range technologies make use of the potential energy in the difference in height between high and low tides.
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TIDAL CURRENT TECHNOLOGIES

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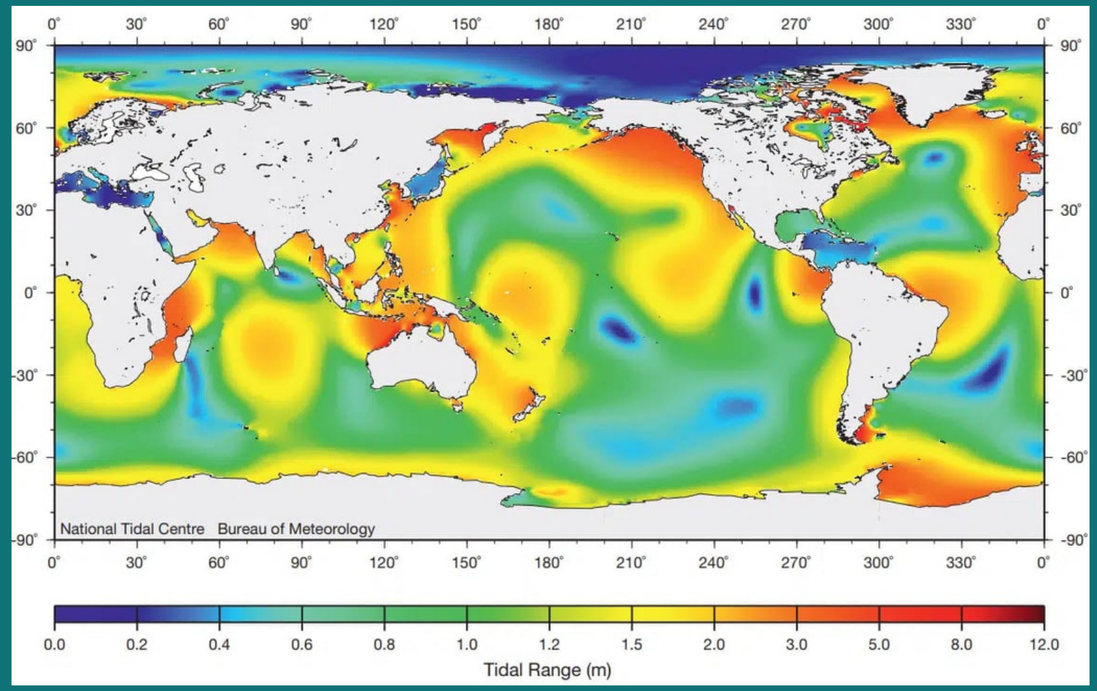

WORLD MAP OF TIDAL RANGE

HYBRID FORMS

Hybrid forms make use of both tidal current and tidal range technologies for electricity generation

https://earth.org/what-is-tidal-energy

CURRENT STATUS AND TRENDS

- There was a 13% growth in 2019, which is remarkably
- higher than the growth in the three preceding years.

- The status of marine power is still “not on track” since it is too far from the requirements of the Sustainable Development Scenario (SDS),

- Several countries like Canada, the UK, China, and Australia have already functioning sophisticated marine energy projects of 10 kW to 1 MW capacity

- The UK is one of the leaders in tidal energy with projects such as MeyGen tidal array.France has RANCE TIDAL POWER STATION with installed capacity of 240 MW

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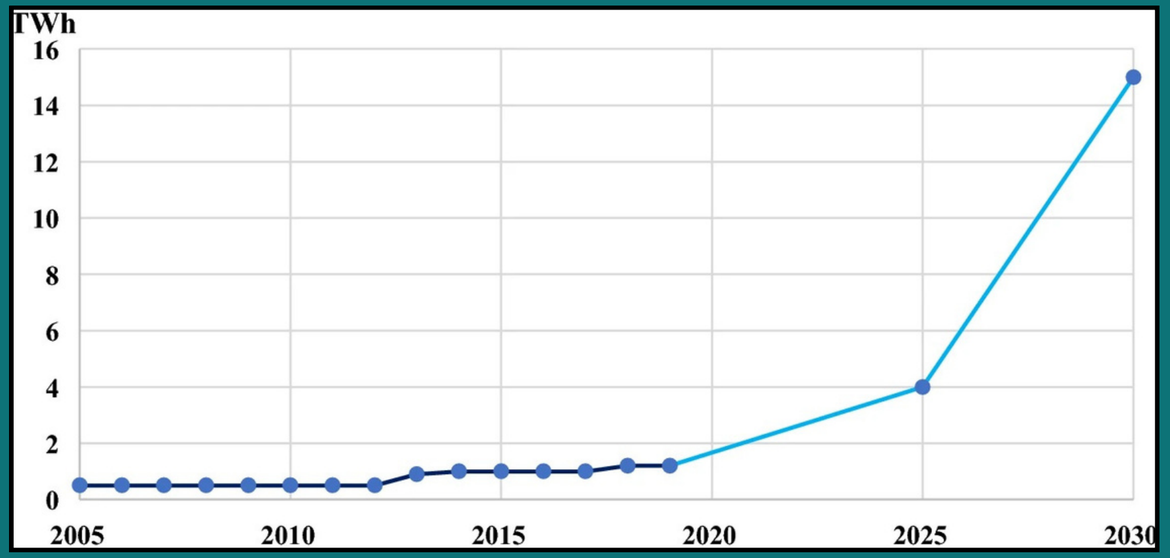


Country	Year	Installed capacity (MW)	Annual capacity (GWh)
Canada	1984	20	30
China	1980	3.2	4.4
Russia	1968	1.7	1.8
France	1966	240	480
South Korea	2011	254	552
UK	2008	1.2	–
South Korea	2009	1.5	2.4

https://link.springer.com/article/10.1007/s10668-020-01013-4#:

FUTURE PROSPECTS

- Aside from advances in applications close to the coast, several smaller technologies are being developed.These technologies could also be used for inland applications or as river current generators.
- Worldwide, the tidal resources are considerable and also largely unmapped.However, global resources are estimated at 3 TW
- The Sihwa power plant in South Korea, is the largest tidal range installation inthe world, is estimated tohave cost around USD 300 million and produce electricity for USD 0.024/kWh
- Tidal energy still requires investment and R&D to develop and deploy viable and scalable commercial technology and infrastructure, better understand environmental impacts and benefits, and to achieve market entr

Barrage	Country	Capacity (MW)	Power generation (GWh)	Construction costs (million USD)	Construction costs per kW (USD/kW)
Operating					
La Rance	France	240	540	817[1]	340
Sihwa Lake	Korea	254	552	298	117
Proposed/planned					
Gulf of Kutch	India	50	100	162	324
Wyre barrage	UK	61.4	131	328	534
Garorim Bay	Korea	520	950	800	154
Mersey barrage	UK	700	1340	5741	820
Incheon	Korea	1320	2410	3772	286
Dalupiri Blue	Philippines	2200	4000	3034	138
Severn barrage	UK	8640	15600	36085	418
Penzhina Bay	Russia	87000	200000	328066	377

FUTURE PROJECTS

INDIAN PERSPECTIVE

POTENTIAL TIDAL CAPACITY

Coastal region	Tidal range (m)	Typical tidal current[a] (m/s)	Ave. available PE per square kilometer (MW)
Khambhat	5–11	2.5	10.9
Kutch	4–9	3.0	7.2
South Gujarat	2–4	2.0	1.5
Maharashtra	2–4	1.5	1.5
Karnataka	1–1.5	1.5	0.2
Kerala	1–1.5	1.5	0.2

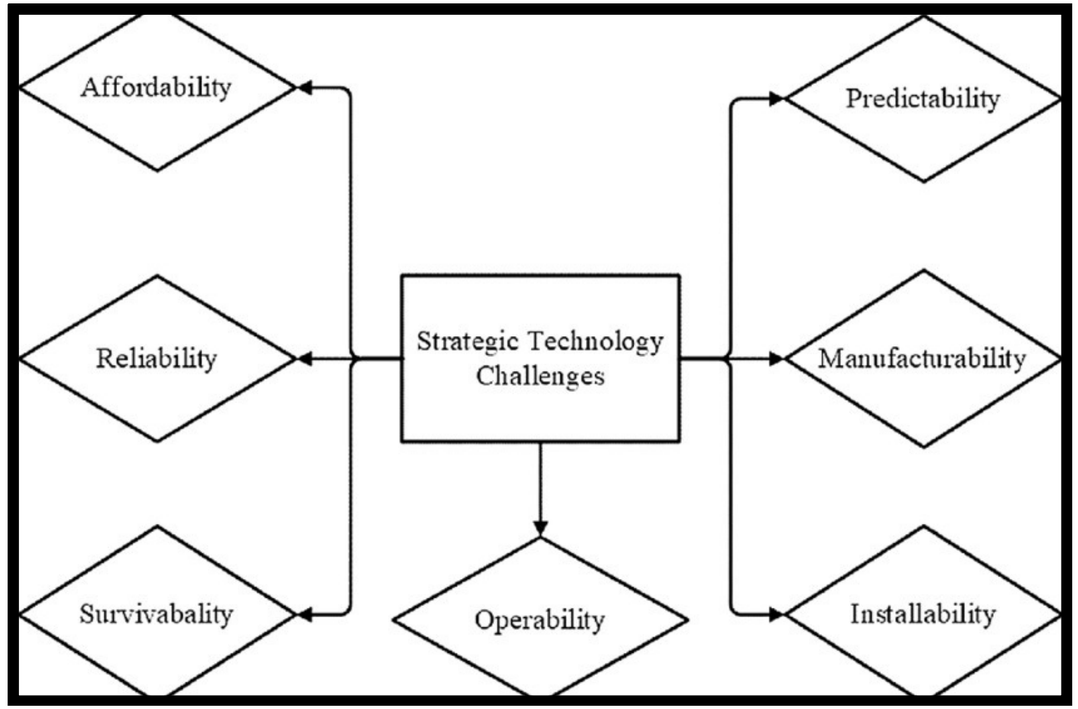
http://renewableaffairs.com

Tidal energy generation is significant in India for several reasons. Firstly, India has a long coastline of about 7,500 kilometers, providing ample opportunities for harnessing tidal energy.

The Gulf of Kutch followed by the Gulf of Khambhat is considered to be the two most important tidal energy generation sites.

As per a study that was conducted in Chennai, the potential of power generated from tidal energy was estimated at around 12,455 MW

CHALLENGES AND SHORT COMINGS



GEOGRAPHIC LIMITATIONS

Locations that are suitable for tidal systems are limited. Tidal energy power plants can
only operate along the coastline. Tidal turbines cannot be installed in shallow wate

HIGH CONSTRUCTION AND MAINTENANCE COST

More research on tidal technologies is needed to overcome its
geographical limitation, high expense, as well as its ecological impacts

IRREGULAR NATURE

It is dependent on the natural rhythm of the tides. Energy generation fluctuates with the tidal cycle, which may not align with periods of peak electricity demand unless coupled with energy storage systems.

ENVIRONMENTAL IMPACTS

Minimal land use:

Tidal energy is able to generate more energy per unit area than winds, taking up far less space than both solar and wind energy. Tidal energy takes up less space than solar and wind energy. For example, the Sihwa Lake Tidal Power Plant in South Korea is the world's largest tidal power station, but it only spans 12.7 kilometers. In comparison, one of the largest solar farms, Tengger Desert Solar Park, covers about 43 square kilometers.

Danger to marine life:

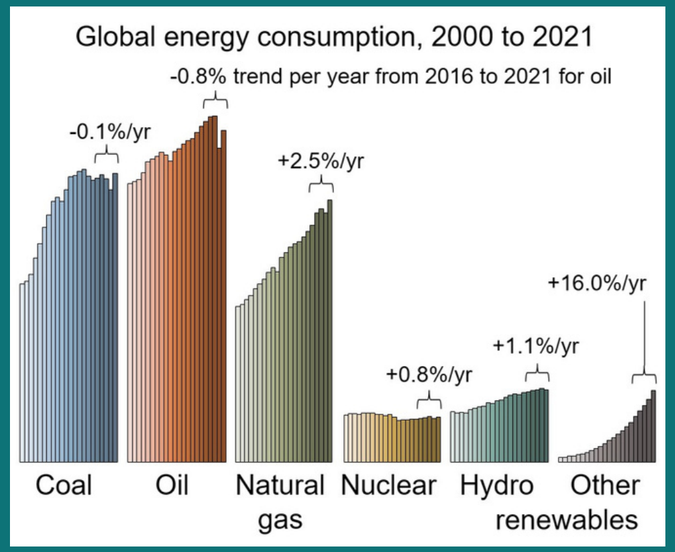
Underwater structures of the power plant may change the ambient flow field and water quality, harming the habitats of marine life.

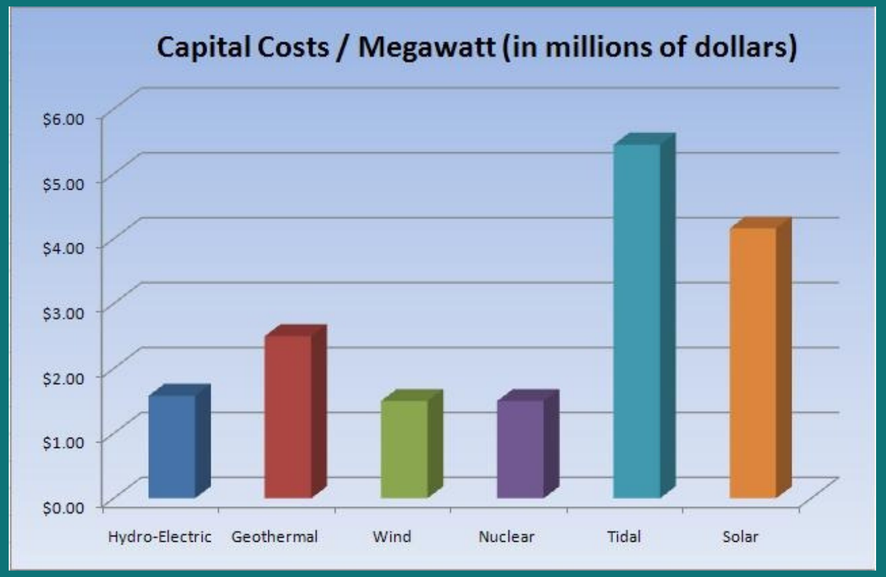
>Animal navigation and communication are also badly disturbed by the underwater noise produced by the turbines.

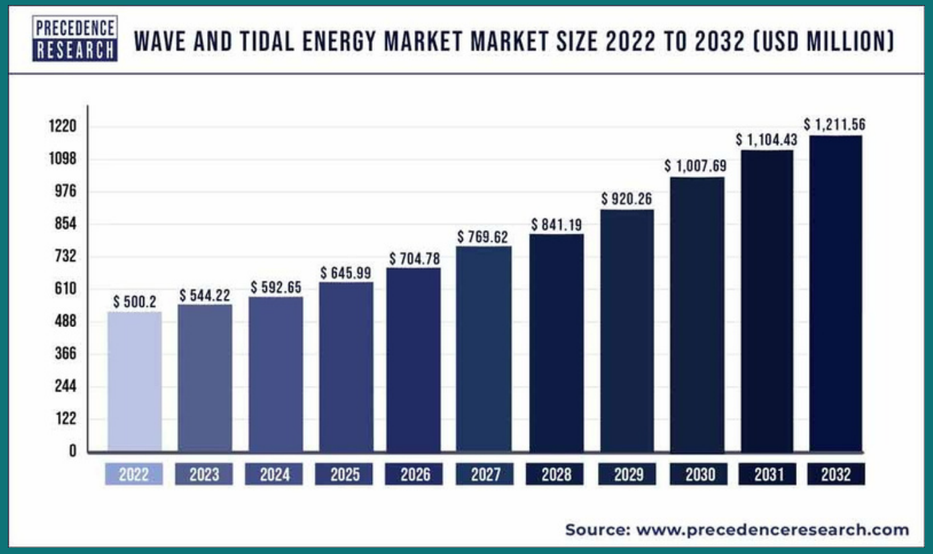
Increase oxygen content

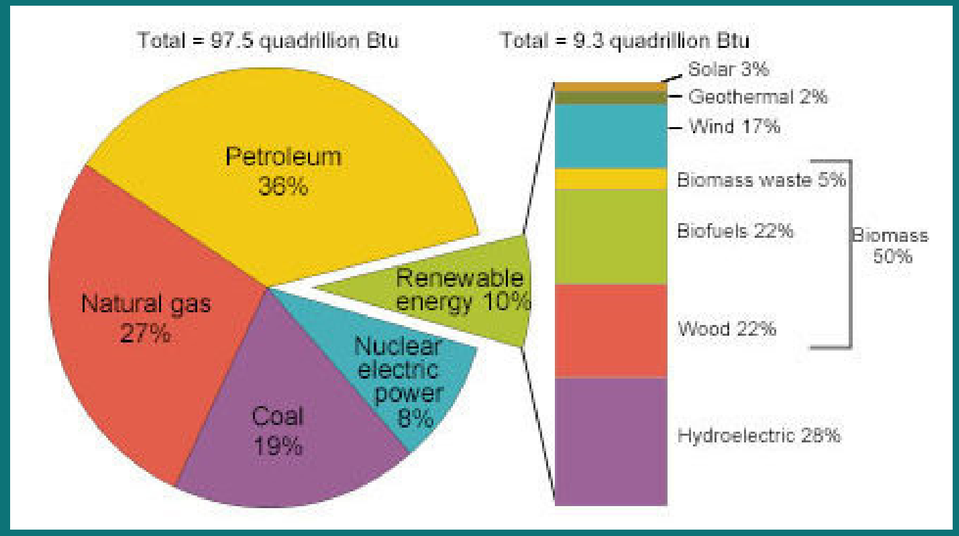
tidal power plants may be beneficial to the environment. Altering of gradient that benefits aquatic ecology is found after the construction of power plants; an increase in oxygen content is often observed, indicating an improvement in water quality

TIDAL ENERGY COMPARISON









POWER CONSUMPTIONS IN WORLD

http://large.stanford.edu/courses/2014/ph240/blandino1/

https://seekingalpha.com/article/4100135-tidal-power-growing-significant-source-of-renewable-energy

https://www.precedenceresearch.com/wave-and-tidal-energy-market

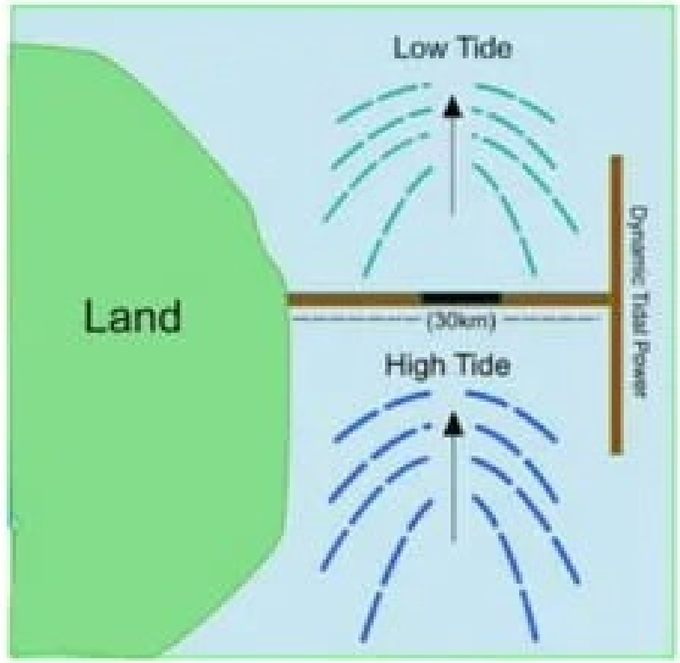
NEW INNOVATIONS

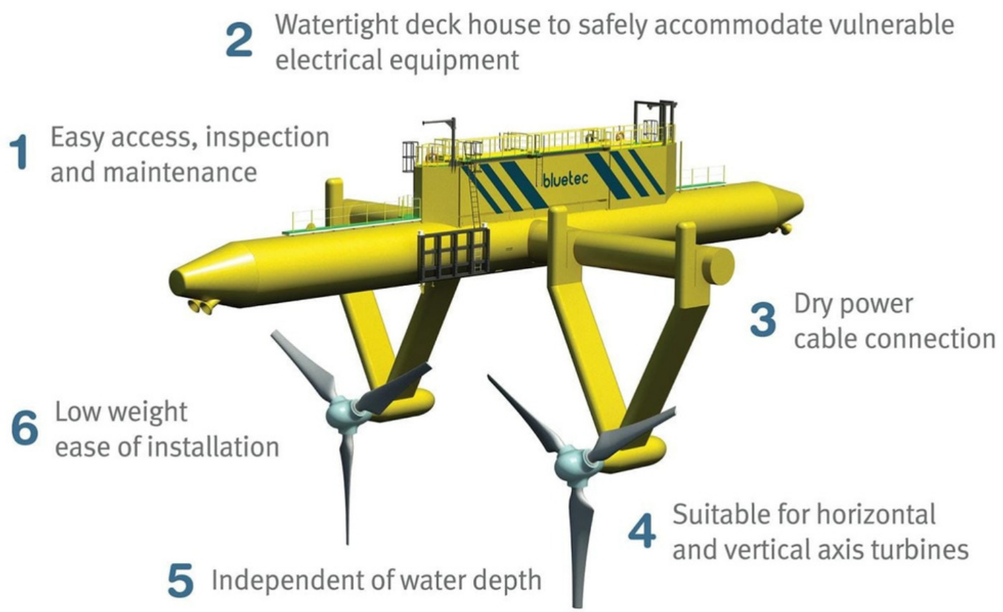
Dynamic tidal power (DTP) is one of the newest proposals to harness the power of tides. Dynamic tidal power is a technology that uses the difference between the potential energy and kinetic energy of tides.

A dynamic tidal power dam can be 30 to 60 km long and is typically built perpendicular to the coast, running relatively straight out into the ocean

These dams are designed with bi-directional turbines, which flip 180o after each tide in order to generate power both when the tide comes in and goes out.

FTEC (Floating tidal energy converters) are also currently in large use because of their efficiency and low risk to marine life





http://www.nationalgeographic.com

CONCLUSION

Tidal energy presents a compelling opportunity to harness the natural forces of our planet for clean and sustainable power generation

Despite facing challenges such as regulatory hurdles, environmental considerations, and technological complexities, tidal energy continues to evolve with innovative solutions and ongoing research and development efforts.

Looking ahead, the future of tidal energy appears promising, with projected growth, technological advancements, and increasing investment indicating a shift towards a more diversified and environmentally conscious energy mix.

THANK YOU