

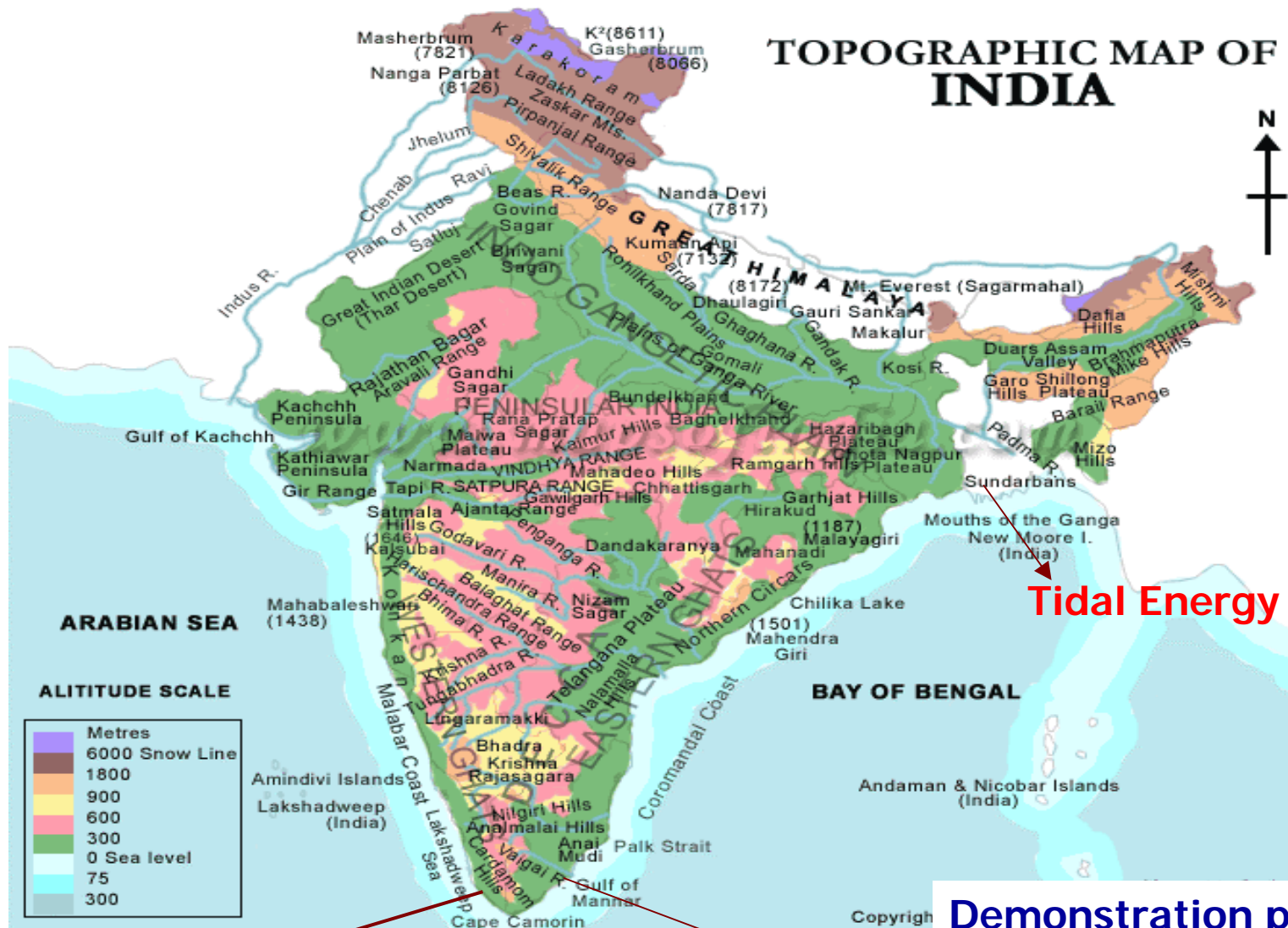
Ocean Energy Scenario in India



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TOPOGRAPHIC MAP OF INDIA



Wave Energy

OTEC

Demonstration plant
 Non-self propelled barge
 1 MW
 40km from shore
 Closed cycle

Wave energy plant

Sponsored by the DOD, Government of India,

- **Wave Energy Group at IIT, Madras conceived wave energy plant since 1983**
- **Vizhijam, Kerala**
- **Sea-bed slope 1:50**
- **Wave power: 20kW/m during monsoon**
- **5 to 10 kW/m non-monsoon periods.**
- **Oscillating water column.**
- **Extensive model testing was carried out.**



Wave energy program...

- **IIT Delhi – electrical module design.**

Joint venture of Harbour Engineering Department, Government of Kerala, the Centre for Earth Sciences Studies, Trivandrum, and IIT Delhi.

- **The entire system has been fabricated by four Indian firms - Larsen and Turbo, KCP, Audco and the Kirloskar Electric Company.**



The model testing

- A 1:10 scale was tested at the large wave flume of the Institut für Wasserbau und Wasserwirtschaft (IWAWI) of the Technical University in Berlin.
- Acrylic glass model.
- 200mm acrylic glass tube at the top and removable 6 orifice.



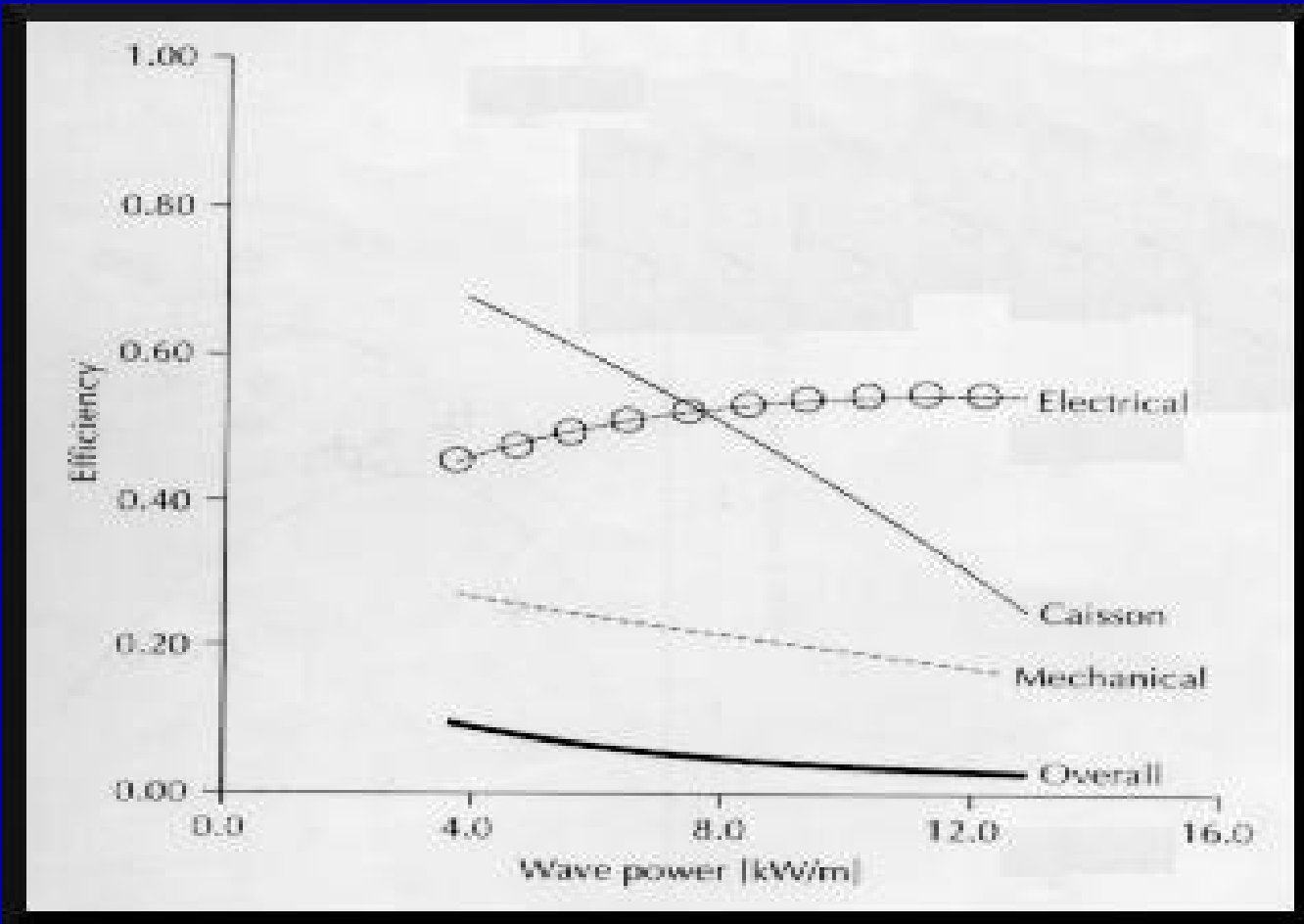
The Model testing

Various models of different sizes were fabricated and tested by the project group to find the influence of different geometries on the hydrodynamic performance of OWC.

Different models having rectangular and curved back walls, streamlined entry, etc. were tested in a 30 cm narrow wave flume, 90 cm wide wave flume, 2 m and 4 m flumes.











Energy generation

- Pneumatic energy- Mechanical- electrical.
- **The maximum capacity of 150 kw.**
- The power output varies according to the frequency of waves and monsoon.
- **The generator was connected to the shore transformer through a 600 m long cable which runs along the breakwater up to its tip and along the bridge to the power module.**

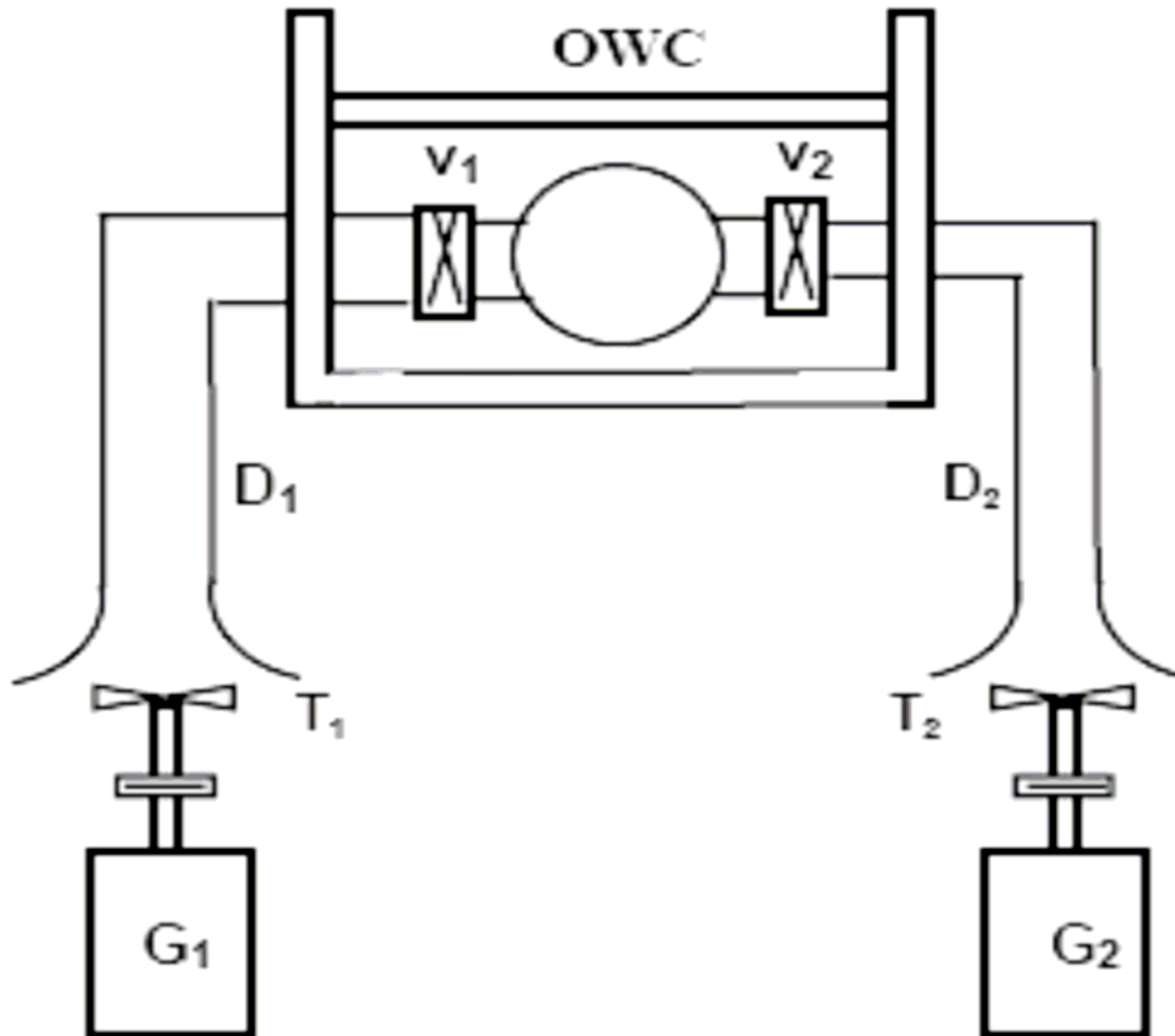


Technical facts to be taken care of-

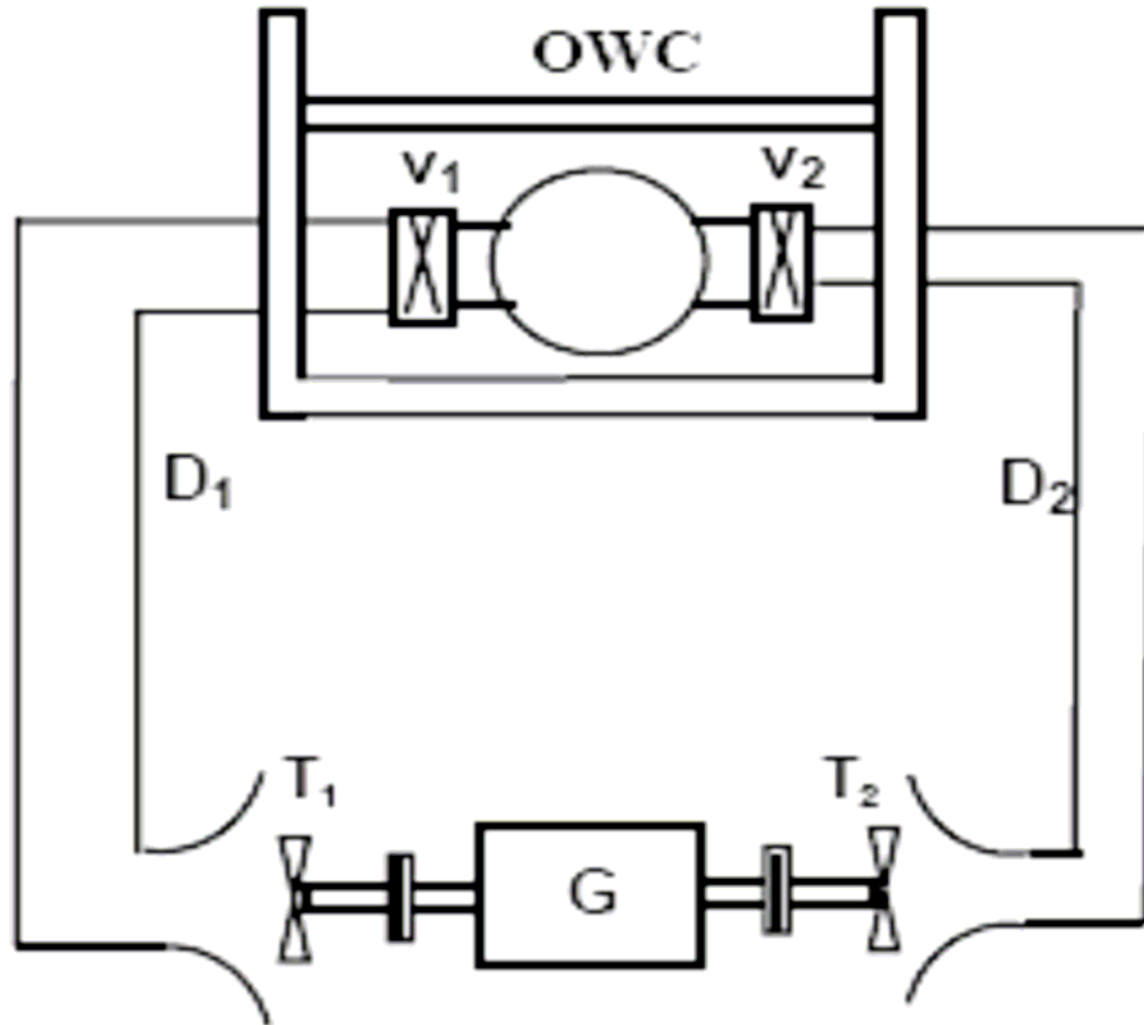
- **Power grid failure.**
- **Marine environment protection.**
- **Vertical shafting for turbine.**
- **Much larger speed variation required for the turbine for the optimum efficiency.**
- **Machine overheating.**
- **Huge no load loss upto 15kW**



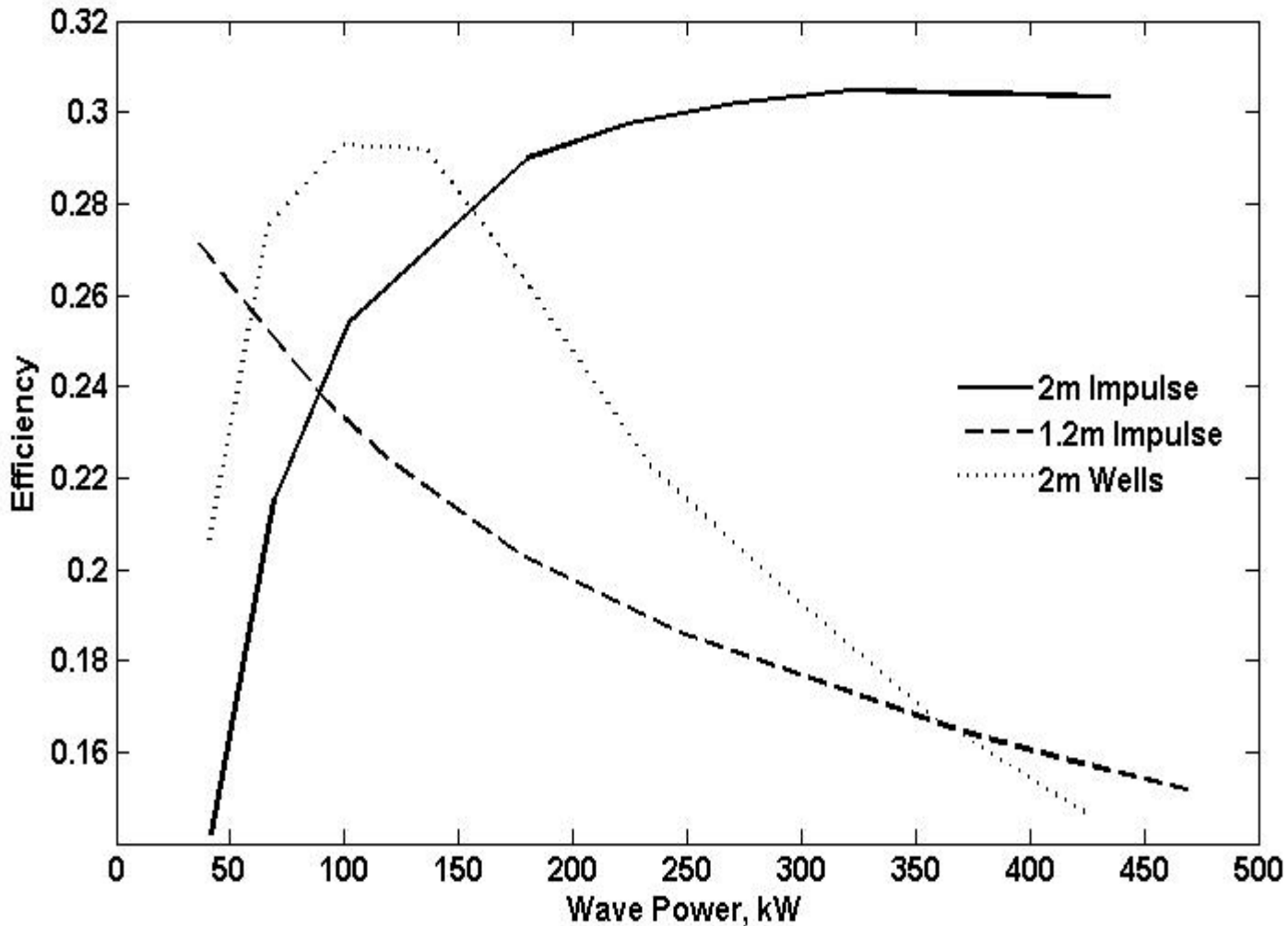
The wave plant with 2 independent machines



Optimized configuration with 1 machine

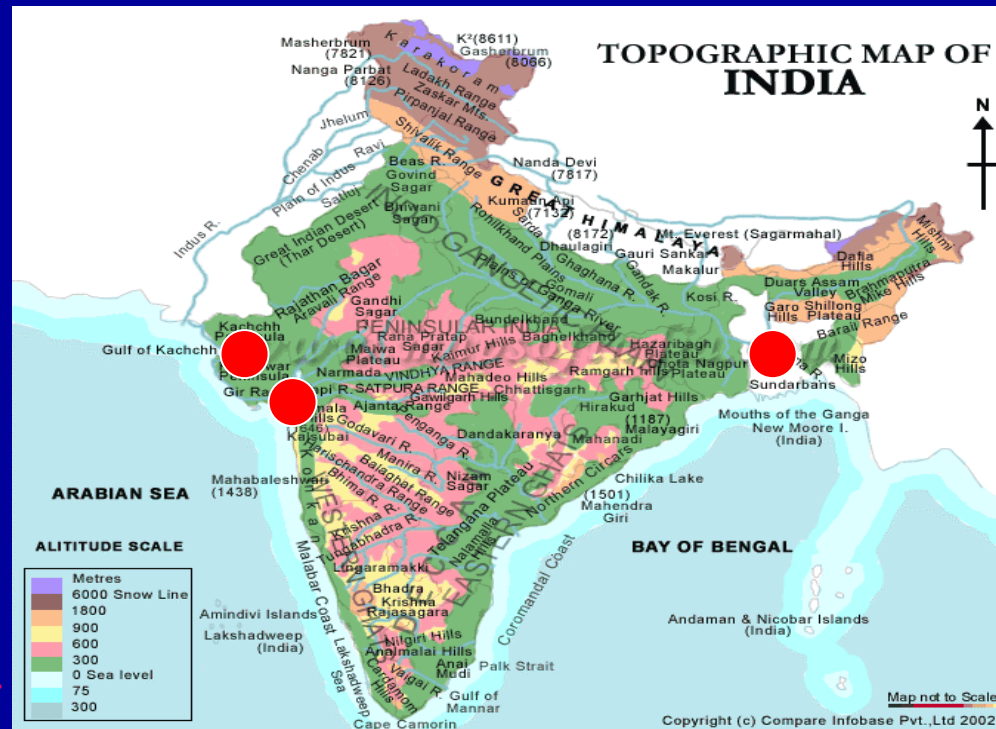


Overall Efficiency of proposed configuration



Tidal Energy Program

- Huge potential.
- Gulf of Cambay and Gulf of Kutch, Delta of Sunderban – potential site.
- Tidal height 5- 7 meters.

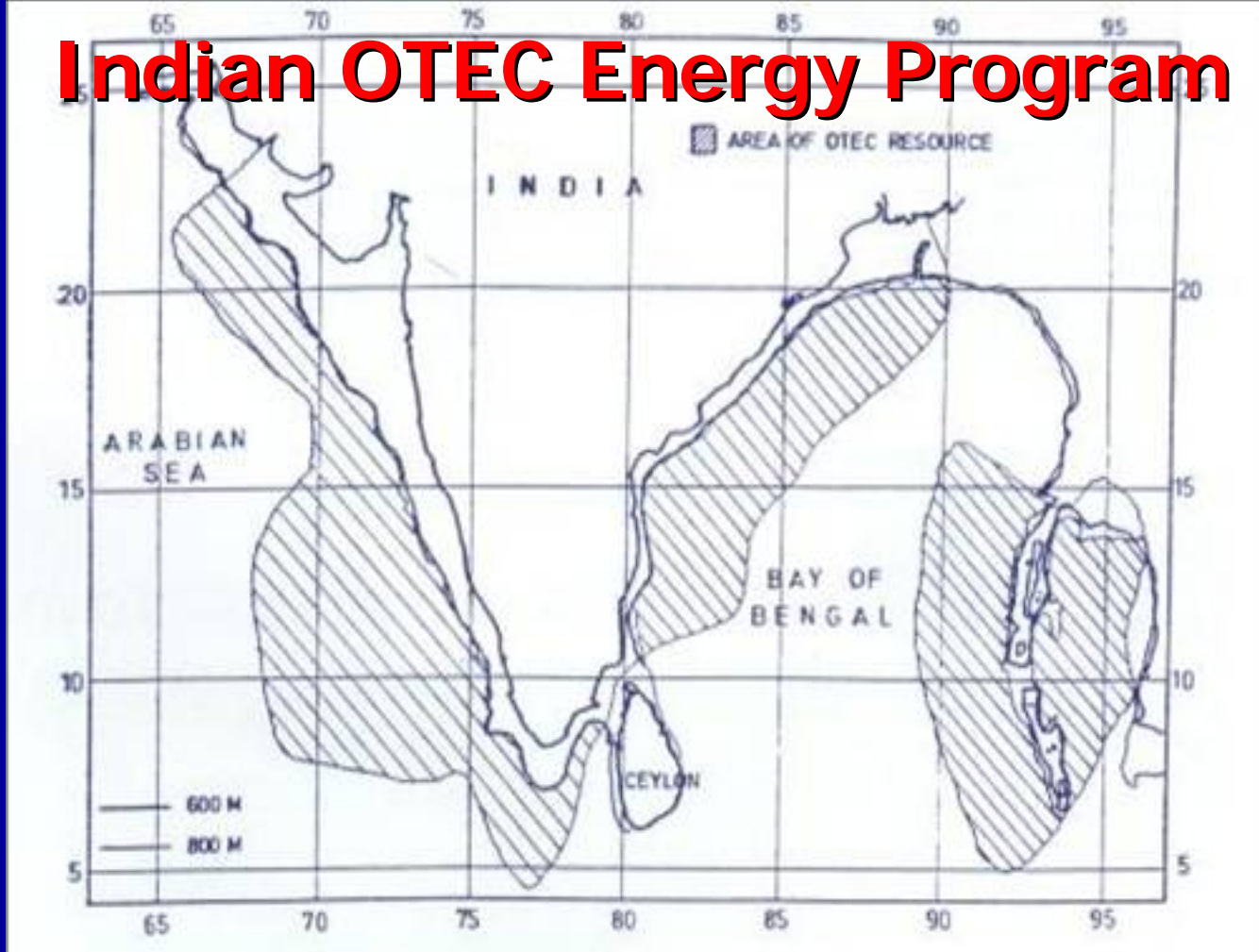


Indian tidal energy

- West Bengal Renewable Energy Development Agency, with MNES assistance, had taken up to prepare DPR.
- **Govt. approval on April 2006.**
- 3.6 MW project worth 10 million US\$ (estimate on 2002)
- **90% cost bear by Union Ministry of Environment and Forest.**
- **Area of tidal basin – 0.743 Sq. Km.**



Indian OTEC Energy Program



- Temperature difference of 20-22 degree at a depth of 1000-1200 m.
- India's first 1MW OTEC plant 60 km off Tuticoran cost on a barge "SAGAR SHAKTHI".
- SAGA University is an Collaborating partner

SAGAR SHAKTHI

- The project was sanctioned in 1998 under the JAI VIGYAN mission to demonstrate OTEC technology.
- Sagar shakthi –Dempo shipbuilders.
- The barge is 68.5 m long, 16 m broad and 4 m deep, and houses the Rankine Cycle based power plant.



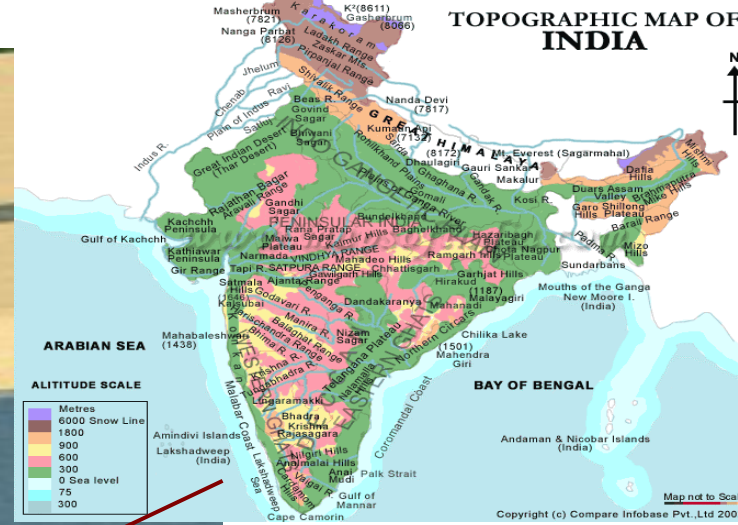
Low Temperature Thermal Desalination Plant



1. Flash Chamber
2. Condenser
3. Trestle
4. Sea Water Sump
5. Output Fresh Water

Location : Kavaratti
 Capacity : 1,00,000 liters/day
 Warm Water Temperature : 28°C
 Cold Water Temperature : 13°C
 Cold Water Intake : 350m depth

■ Warm Water Intake ■ Cold Water Intake
■ Warm Water Outlet ■ Cold Water Outlet



400m contour at 400m distance
 Commissioned on 25th May 2005
 Delivering 1 lakh litre/day

Desalination

2 MW plant > 4320 m³
 water

Island use

Other successful demonstration off Tuitocorin
 1 lakh litre / day
 Floating offshore barge mounted plant

Thanks for your attention...

