

GENERATION
OF ELECTRICAL ENERGY
FROM
SEA WAVES

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GENERATION OF ELECTRICAL ENERGY FROM SEA WAVES

Renewable energy technologies provide alternatives to fossil-fueled power plants for the generation of electricity, an essential step towards reducing a nation's dependence on fossil fuels.

One category of emerging renewable energy technologies relates to **OCEAN ENERGY**.

GENERATION OF ELECTRICAL ENERGY FROM SEA WAVES

Among other types of renewable energy,
oceans contain energy in the form of

- Waves Energy
- Tidal Energy
- Ocean Currents
- Thermal Energy
- Osmotic Energy

GENERATION OF ELECTRICAL ENERGY FROM SEA WAVES

The world wide resource of wave energy is estimated
in excess of 5 TW.

Countries developing Wave Energy Converters are

PORTUGAL

UNITED KINGDOM

SWEDEN

DENMARK

BELGIUM

CANADA

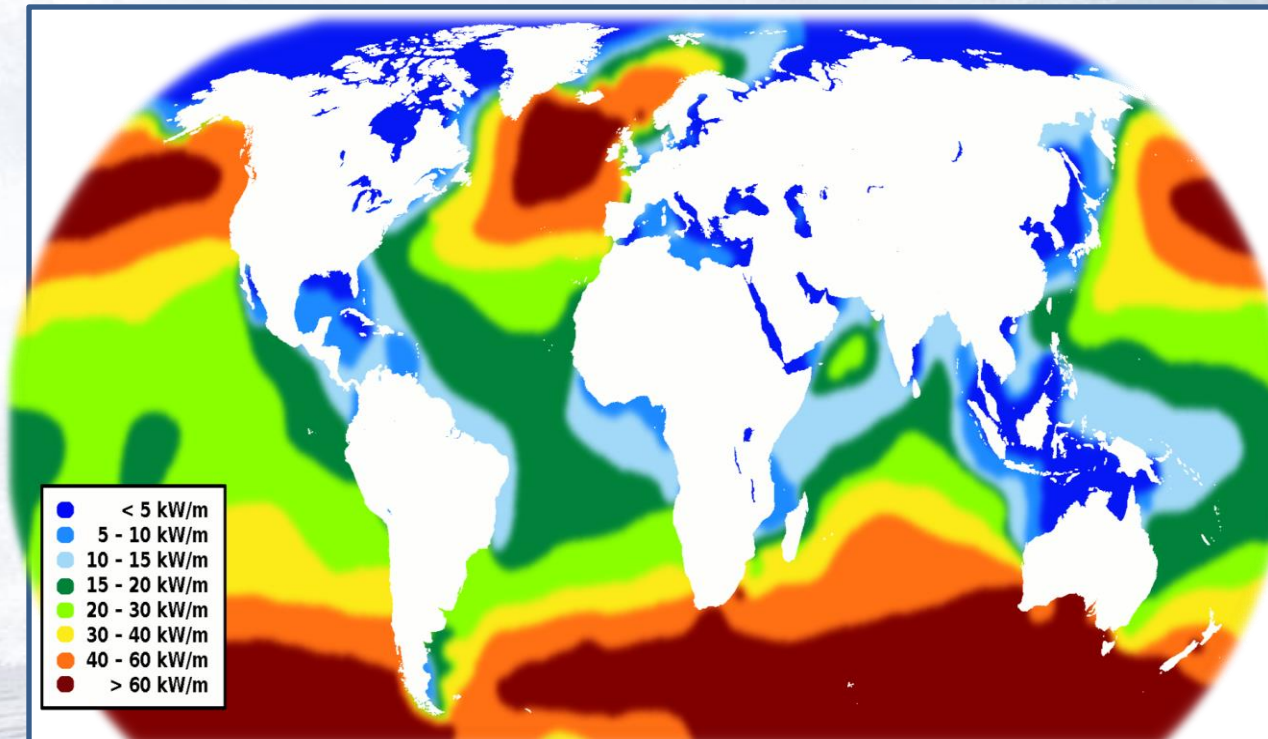
AUSTRALIA

ISREAL

U S A

INDIA

GENERATION OF ELECTRICAL ENERGY FROM SEA WAVES

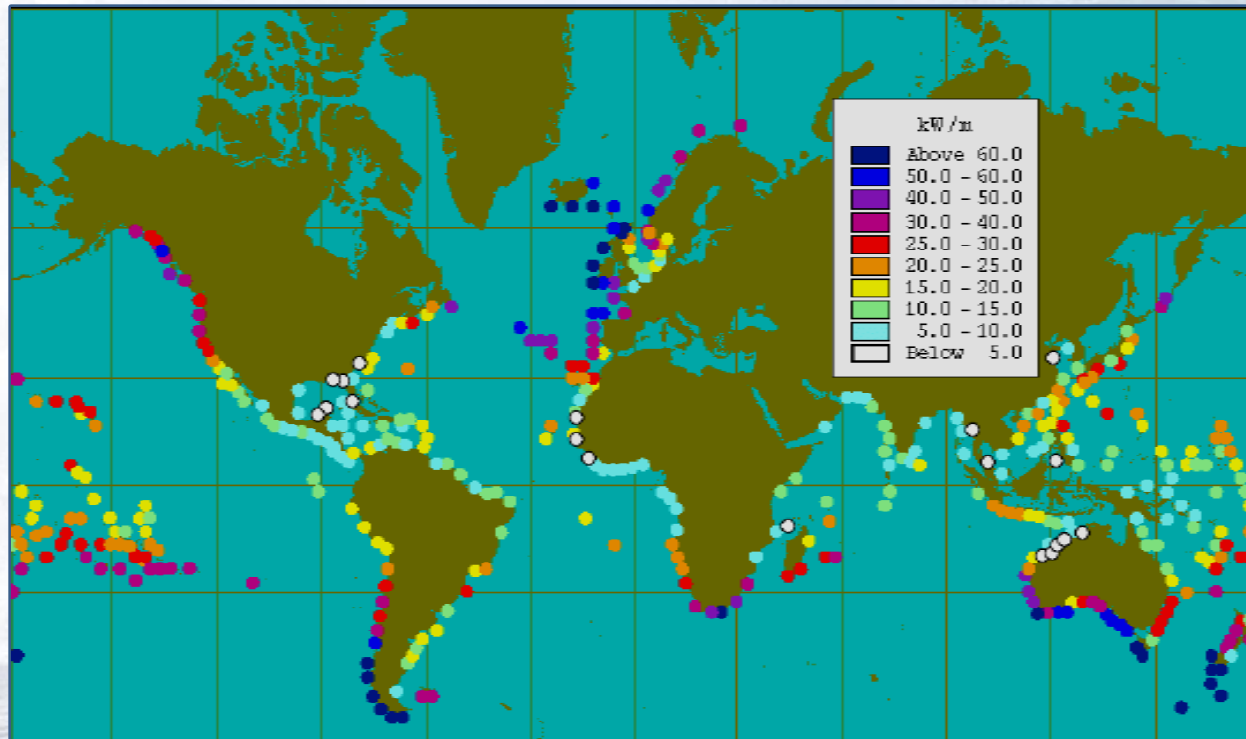


WAVE ENERGY – ESTIMATED POWER 5 TW

GENERATION OF ELECTRICAL ENERGY FROM SEA WAVES

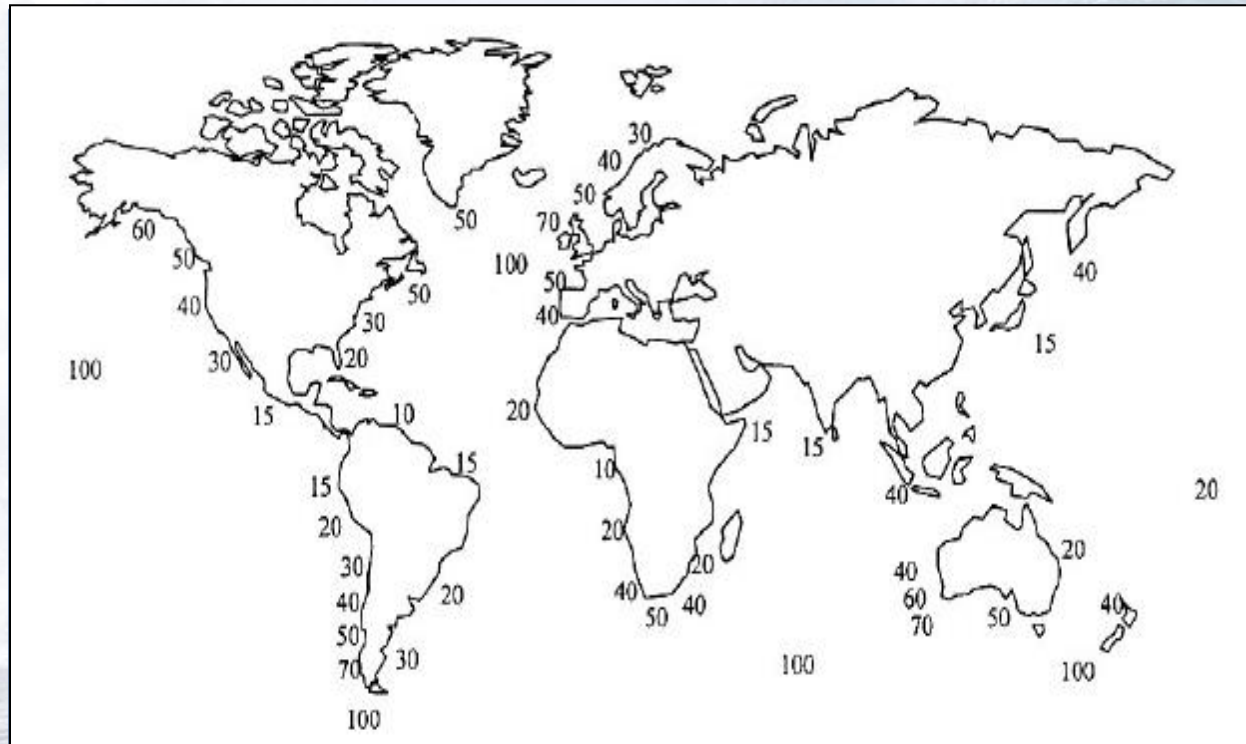
The strongest winds blow between 30° & 60° in latitude.

Western coastlines at these latitudes experience the most powerful waves.



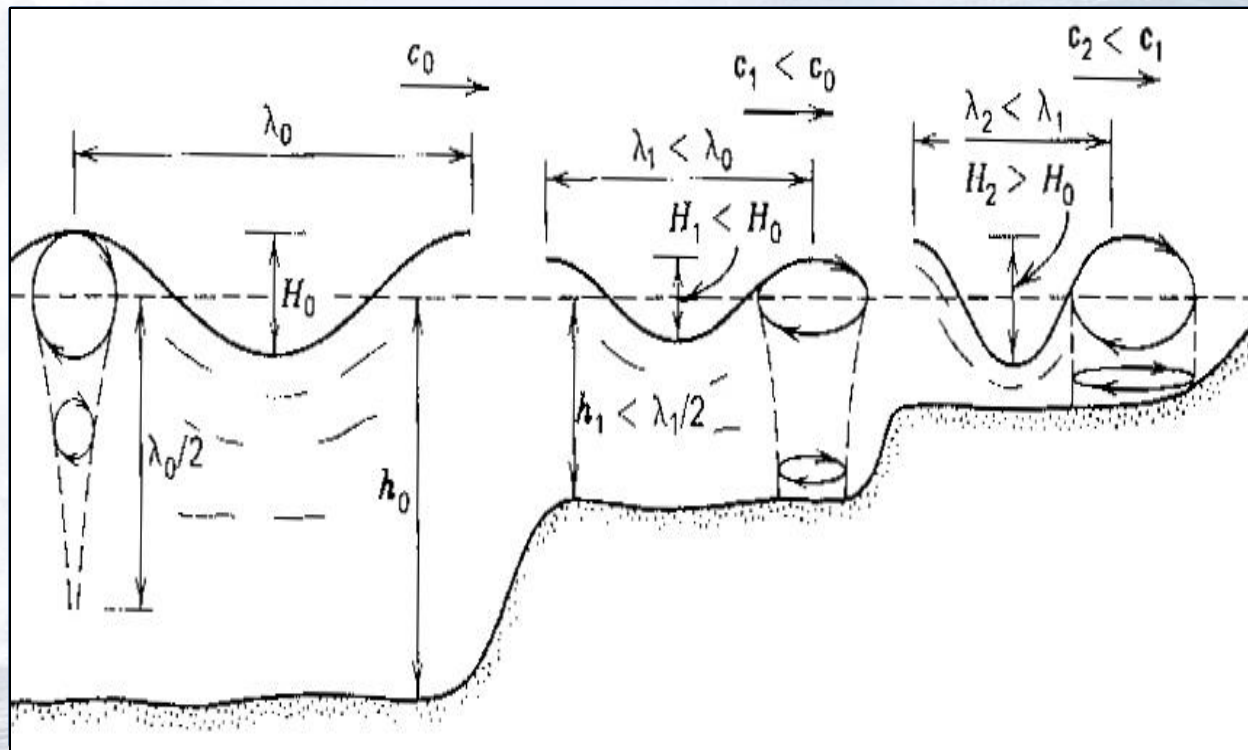
Global Wave Energy Resource Distribution
(measuring the amount of power in KW contained in each linear meter of wave front)

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8,000 – 80,000 TWh/yr or 1 – 10 TW of wave energy in the entire ocean, and on an average, each wave crest transmits 10 – 50 kW per meter. WINTER – 6 TIMES GREATER

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WAVE PATTERN

GENERATION OF ELECTRICAL ENERGY FROM SEA WAVES

Different Types of Wave Energy Converters

OFF SHORE & NEAR SHORE
DIFFERENT TYPES OF TECHNOLOGIES

Point absorber buoy

Surface attenuator

Oscillating water column

Overtopping device

Oscillating wave surge converter

GENERATION OF ELECTRICAL ENERGY FROM SEA WAVES

Major Types of Ocean Energy Converters	Capacity (GW)	Annual Generation (TW-h)	Cause	Limitations
Osmotic Power	20	2,000	Salinity	Close to Estuary
Tidal Energy	90	800	Gravity	Specific Locations
Ocean Thermal Energy	1,000	10,000	Temperature	Nearer to Equator
Marine Current Power	5,000	50,000	Natural Forces	Specific Locations
Wave Energy	1,000 - 9,000	8,000 – 80,000 = 10 – 50 kW/M	Solar & Wind	Preferably Western Coast

THEORETICAL GLOBAL OCEAN ENERGY RESOURCE

GENERATION OF ELECTRICAL ENERGY FROM SEA WAVES

Disadvantages of Existing Technologies

OFF SHORE

Maintenance

Conveying Long Distance

Interference with Shipping Lines

Interference with Fishing Boats

ON SHORE

Mars the Horizon

GENERATION OF ELECTRICAL ENERGY FROM SEA WAVES

AVAILABLE TECHNOLOGIES FOR POWER GENERATION

Conventional Source

- OIL
- Coal
- Hydro
- Nuclear

Renewable Source

- Sun
- Wind
- Tidal
- Waves

GENERATION OF ELECTRICAL ENERGY FROM SEA WAVES

ESTIMATED SUPPLY OF FUEL

Conventional Source

- OIL 250 years
- Coal 1000 years
- Hydro Monsoon
- Nuclear Hazardous

Renewable Source

- Sun Renewable
- Wind Renewable
- Tidal Renewable
- Waves Renewable

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WAVE ENERGY TECHNOLOGY

ADVANTAGES

- ENVIRONMENTAL IMPACT
- SECURITY OF SUPPLY
- SOCIAL CONCERNS
- CARBON CREDITS
- ACCEPTABILITY
- SUSTAINABILITY

BARIERS

- ADAPTATION
- SELECTION OF SITE
- SIMILAR TECHNOLOGIES

GENERATION OF ELECTRICAL ENERGY FROM SEA WAVES

NEED to develop INDIGENOUS Technology

Ever Increasing Demand for Energy

Need to Address Global Warming

Need to reduce Emissions & Effluents

Need to have smaller generating units

Ease to start & stop for maintenance

Need to preserve natural resource

Investment Opportunity

Carbon credits

GENERATION OF ELECTRICAL ENERGY FROM SEA WAVES

ENERGY FROM OCEAN

ADVANTAGES

- 15 – 20 % ENERGY / Sq Mt
- MARINE CURRENTS
- TIDAL CURRENTS
- MORE PREDICTABLE
- UTILIZATION FACTOR
- ENERGY DENSE

CHALLENGES

- DESIGN
- ACCEPTANCE

GENERATION OF ELECTRICAL ENERGY FROM SEA WAVES

AWARD WINNING TECHNOLOGY
INDIA INNOVATION GROWTH PROGRAM -2007
FICCI & LOCKHEED MARTIN (US)

Harnesses Incoming & Outgoing Waves

Inbuilt intelligence – Tide level

Slow Speed – Minimizes Maintenance

Easy to Scale down or Scale Up

No Emissions or Effluents

Adaptable to Agricultural Canals

Cost Efficient

GENERATION OF ELECTRICAL ENERGY FROM SEA WAVES

STAND ALONE UNITS TO SERVE

Small Coastal Villages

Small Harbors

Fishing Hamlets

Lighthouse

Desalination of sea water for DRINKING PURPOSE

Illumination of monuments along the coast

No need for transmission lines and substations

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PROPOSED USAGE
TO SERVE SMALL HAMLETS

05.00 a.m. to 09.00 a.m. **Agricultural Pump Sets**

09.00 a.m. to 06.00 p.m. **Cottage Industries**

06.00 p.m. to 11.00 p.m. **Domestic & Street Lighting**

11.00 p.m. To 05.00 a.m. **Desalination of Water**

GENERATION OF ELECTRICAL ENERGY FROM SEA WAVES

METHODOLOGY PROVEN

At Anna University

Final year students of Anna University (Mechanical Engineering) have proved the above innovative methodology.

A slow speed generator is now ready for testing in a WAVE TANK.

Initially it is proposed to conduct various tests in a WAVE TANK using a dynamo meter to ascertain the energy available in a meter of wave.

Later the Generator will replace the dynamometer to convert the kinetic energy to electrical energy.

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Thank You

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