



# [ International OTEC Symposium ]



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## The Korean Roadmap to OTEC Industrialization



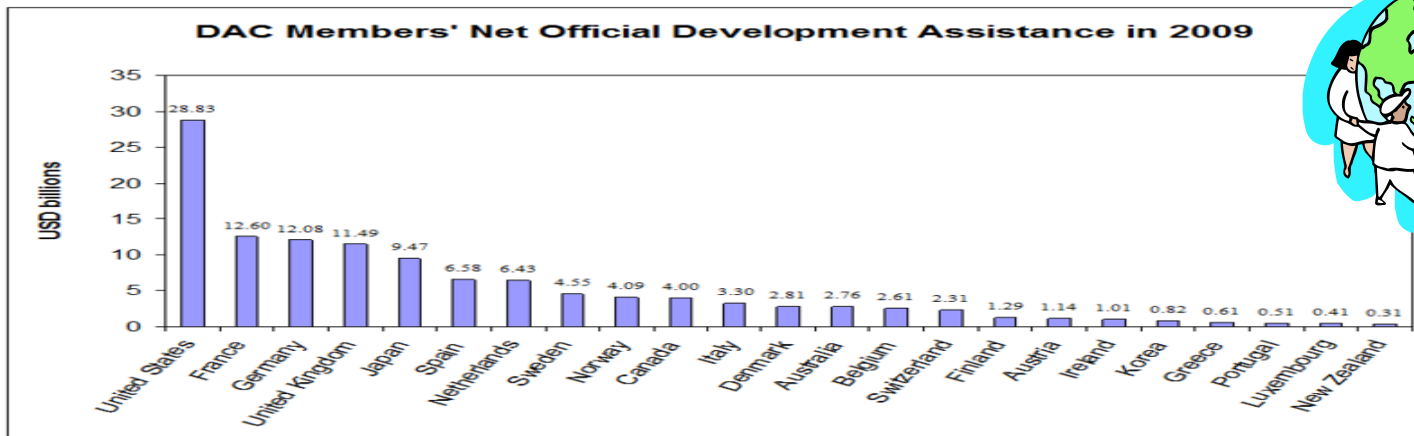
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# Background and Purpose



- Population increase and industrialization based on fossil fuel
  - 1) Shortage of essential resources such as Food, Energy & Water
  - 2) CO<sub>2</sub> emission, Global warming, Climate change, albinism etc.
  
- Requirement of OTEC for global and domestic needs
  - 1) ODA activity as a donor shifted from receiver since 1996 based on experience and technical potential => **Low dT OTEC + SWAC**
  - 2) Alternative energy utilization aims to increase by 11% in 2030 to reduce the dependency on imported fossil fuels => **High dT OTEC + SWAC**



- OTEC roadmap was established to meet such demands on time by contribution of Korea, a leading producer of ships, steel and so on

## [ National Master Plan 2030 of Renewable Energy Utilization ]

- National supply of new & renewable energy in 2030 : 11% of national energy demand
- Development of 80% resources of available ocean energy until 2030
- Early development of tidal barrage power plant

## [ Phased Development Strategy ]

- Classifying ocean energy technologies into tidal barrage, tidal current, wave, ocean thermal energy conversion(OTEC) and hybrid system
- Promotion based on 3 stages (short/mid/long term) of development

Phase 1 (2008~2012)

Building a Technologically Independent basis

- ✓ Supply Goal: 120kTOE/yr
- ✓ Develop core technologies
- ✓ Development of coastal area
- ✓ Government leading

Phase 2 (2013~2020)

Verification / Technology Advancement

- ✓ Supply goal: 900kTOE/yr
- ✓ Utilization of technologies
- ✓ Development of open sea
- ✓ Participation of Industry

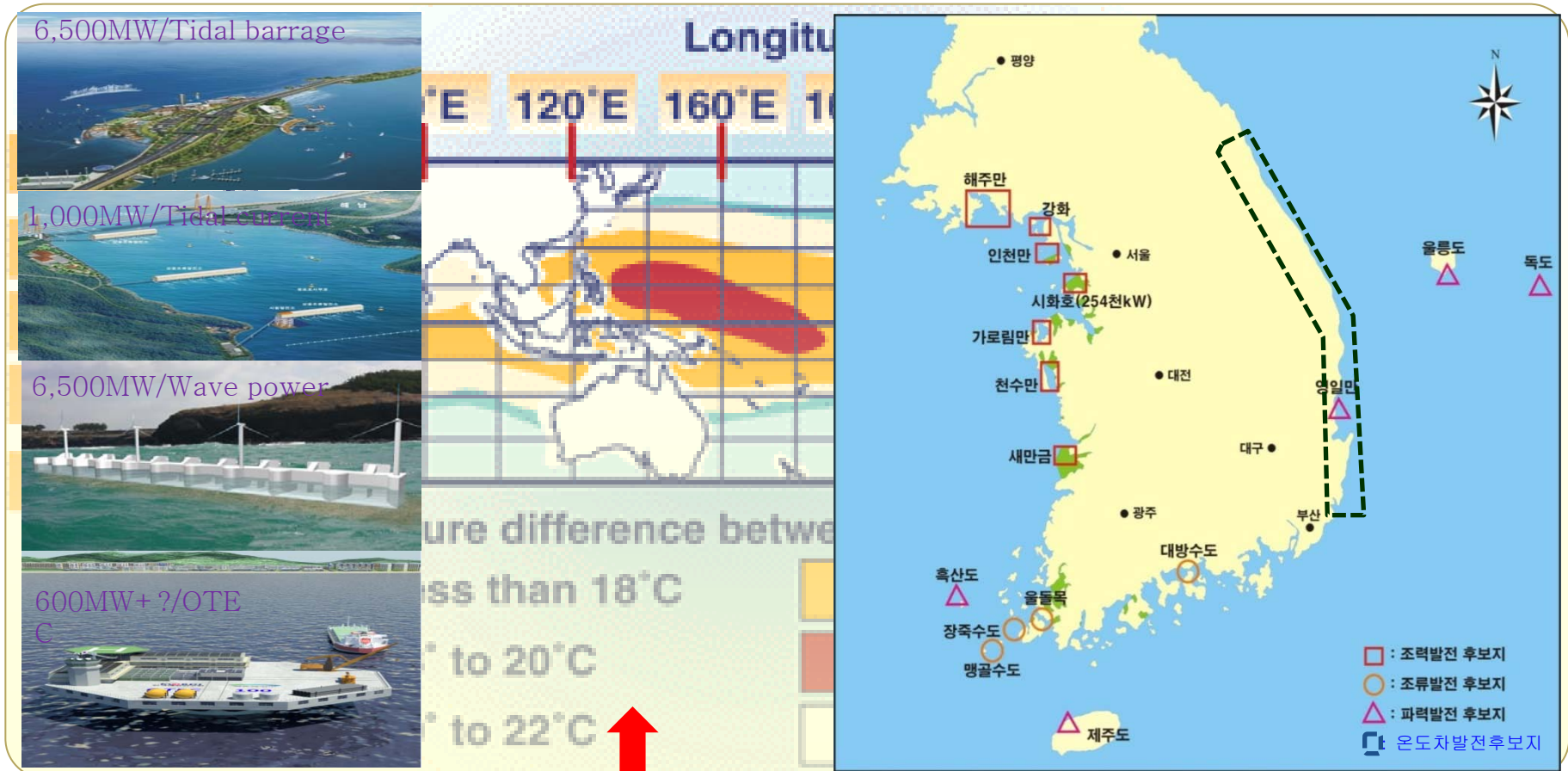
Phase 3 (2021~2030)

High Value-Added Industrialization

- ✓ Supply goal: 1,500kTOE/yr
- ✓ Commercial use
- ✓ Develop Hybrid system
- ✓ Industry leading

# Ocean Energy Potentials in Korea

➤ Estimated ocean energy in Korea : 14,600MW



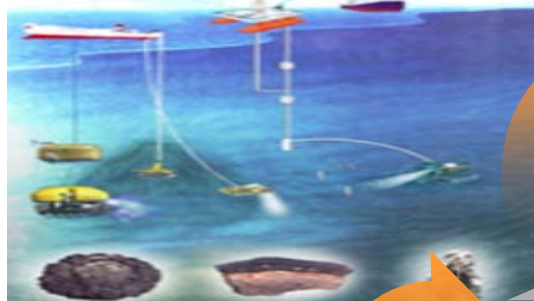
LdT OTEC application of surface and deep layers in tropical seawaters

HdT OTEC utilization using solar/geothermal heat or power plant discharge

# R&D and Industrialization Needs for OTEC

## Phased needs

To meet the needs from R&D, industrial sectors and ODA receiver based on the technological strength of Korea and international cooperation (JPA, ADB, GCF etc.)



2020~2030

50~100MW OTEC plant

- Energy supply for nations populated over 50,000 people

2018~2020

5~20MW OTEC Plant

- Self energy-sufficient offshore bases for fisheries and deep sea mining
- 2<sup>nd</sup> stage ODA in tropical nations

2016~2018

1MW OTEC plant

- 1<sup>st</sup> stage ODA for tropical islands (LdT OTEC)
- Deep sea mining at small mining pilot plants

2014~2016

~0.2MW OTEC plant

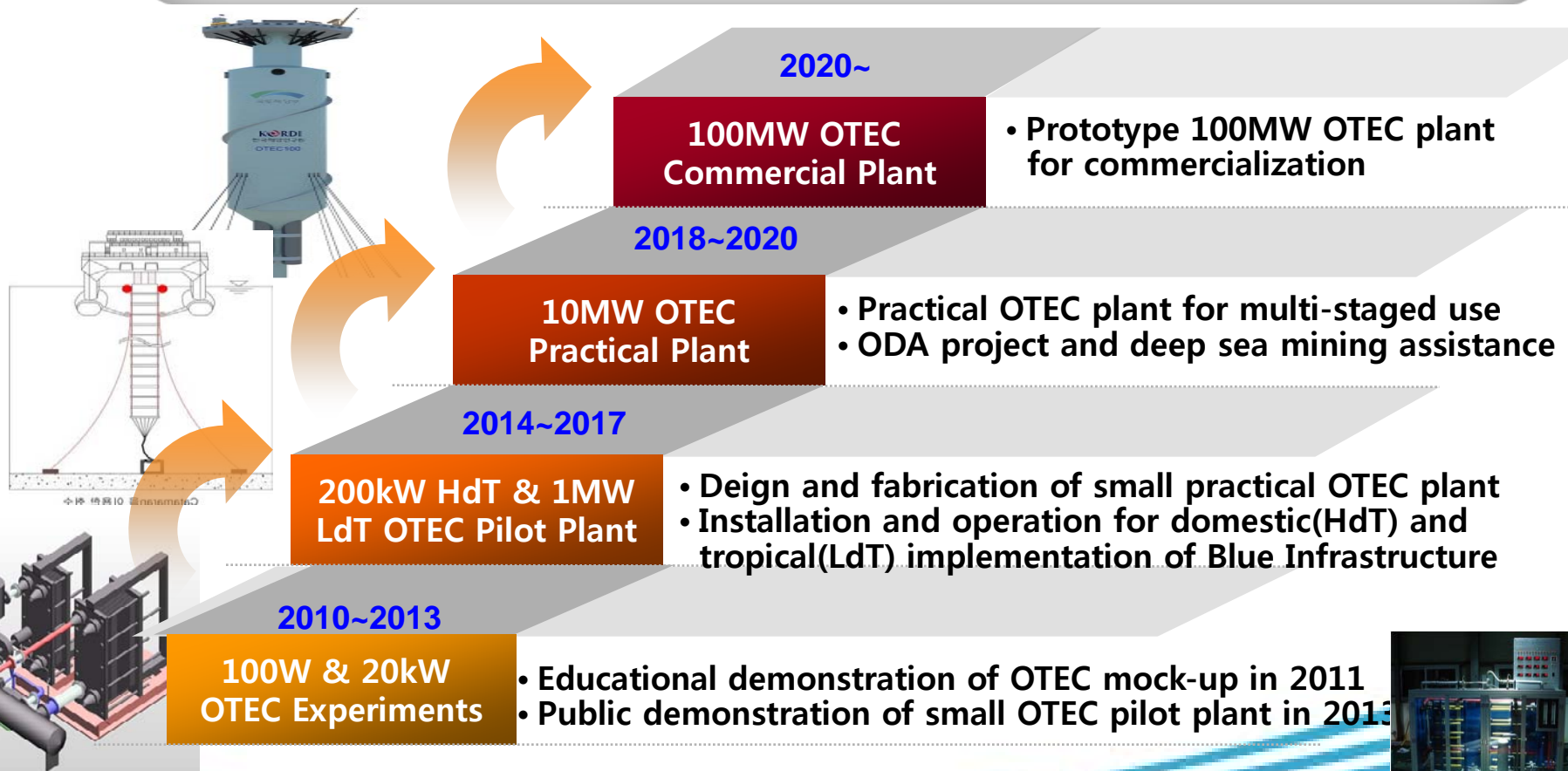
- LdT OTEC plant for cooling power plant
- HdT OTEC plant sourced by multi-heat for practical use in Korea(wood incineration..)



# Final Goals and Approaching Steps

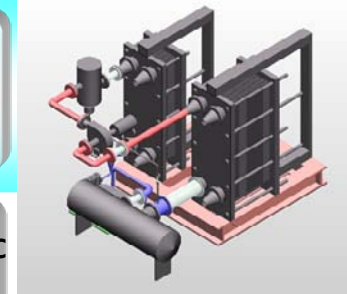
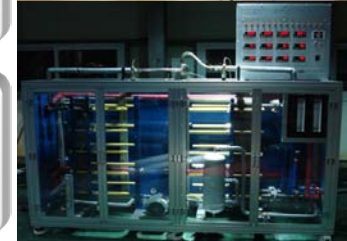
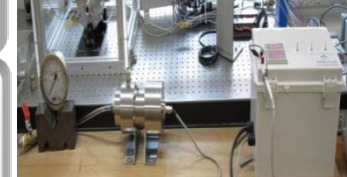
## Final Goals

Design, manufacture, installation and operation of 100MW commercial OTEC plants in tropical waters



# The Annual OTEC R&D Plan in Korea

	Pipe(Riser) & Structure	OTEC	Environment improvement
1 <sup>st</sup> year 2010	<ul style="list-style-type: none"> <li>Design <b>small scale pipe</b></li> <li>Installation skill</li> </ul>	<ul style="list-style-type: none"> <li>Design of turbine concept</li> <li>Mock-up turbine design</li> </ul>	<ul style="list-style-type: none"> <li>Green city Investigation</li> <li>Multipurpose direction</li> </ul>
2 <sup>nd</sup> year 2011	<ul style="list-style-type: none"> <li>Installation simulator</li> <li>Hydraulic model test of deploying pipeline</li> </ul>	<ul style="list-style-type: none"> <li>Develop cycle simulator</li> <li>100W Mock-up design &amp; experiment</li> </ul>	<ul style="list-style-type: none"> <li>Investigate resources around Korean waters</li> <li>Freezing desalination</li> </ul>
3 <sup>rd</sup> year 2012	<ul style="list-style-type: none"> <li>Design of <b>middle scale pipe</b></li> <li>Heat flow simulator</li> </ul>	<ul style="list-style-type: none"> <li>Eco-friendly working fluid</li> <li>OTEC-20kW design &amp; TG manufacture</li> </ul>	<ul style="list-style-type: none"> <li>Freezing desalination after SWAC</li> <li>Survey of target waters</li> </ul>
4 <sup>th</sup> year 2013	<ul style="list-style-type: none"> <li>Self-cleaning system</li> <li>OTEC structure design</li> </ul>	<ul style="list-style-type: none"> <li><b>OTEC-20kW pilot plant</b></li> <li>OTEC-200kW design</li> </ul>	<ul style="list-style-type: none"> <li>Investigate resources at overseas research bases</li> <li>LTD Desalination</li> </ul>
5 <sup>th</sup> year 2014	<ul style="list-style-type: none"> <li>Installation simulator</li> <li>Integrated model test in Ocean Eng. basin</li> </ul>	<ul style="list-style-type: none"> <li><b>OTEC-200kW test-bed</b></li> <li>High efficiency/large scale</li> </ul>	<ul style="list-style-type: none"> <li>Mitigation method for OTEC /SWAC application area</li> <li>Creation of subsea forest</li> </ul>
6 <sup>th</sup> year 2015	<ul style="list-style-type: none"> <li>10/100MW design concept</li> <li><b>Prototype manufacture of large diameter riser</b></li> </ul>	<ul style="list-style-type: none"> <li><b>Design of practical model (1MW)</b></li> <li>10/100MW plant c. design</li> </ul>	<ul style="list-style-type: none"> <li>Management of subsea forest</li> <li><b>Cascade Utilization Model</b></li> </ul>



# OTEC Industrialization with cascade utilization

Multi-purpose utilization before/after OTEC (SWAC, desalting, extraction, aquaculture, agriculture and thalassotherapy etc.) for Blue Infrastructure



[ The OTEC technology and its industrialization will assist not only Korea for supplying clean energy up to 11% of national demand, but also the small islands(tropical nations) for their green growth ]

