

OES-Environmental Analyst Meeting - Asia and Australia

# Marine Renewable Energy Development in Japan



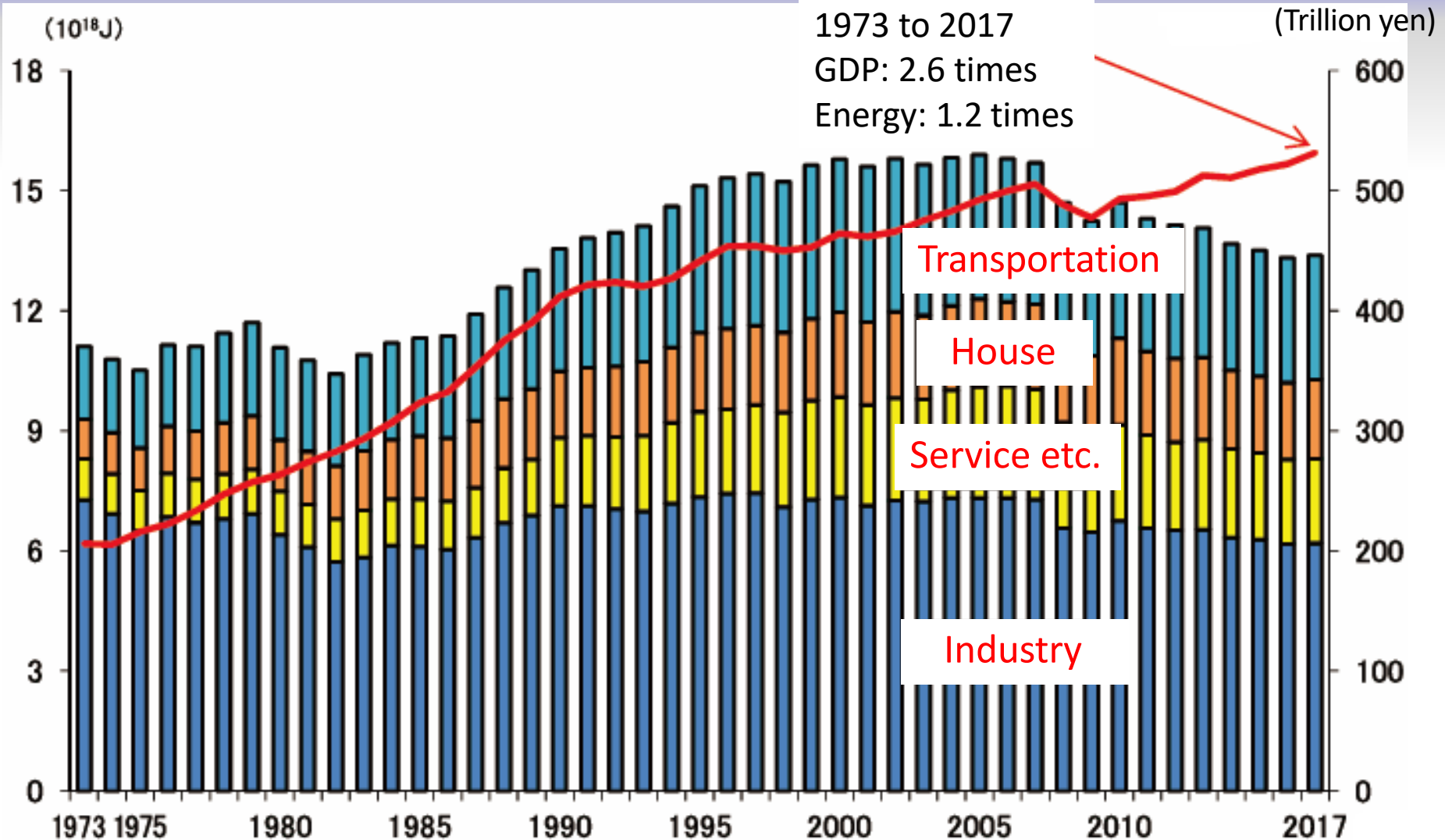
October 8th, 2019, 17:00

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# Energy Demand in Japan



(<https://www.enecho.meti.go.jp/about/whitepaper/2019html/2-1-1.html>)

# Energy Mix in 2030 (METI, 2015)

METI: Ministry of Economy, Trade and Industry

Electricity demand

Economic growth  
(1.7% / year)

Energy saving  
196.1 billion  
kWh

Loss etc.

1.278  
trillion  
kWh  
Electricity source

1.065  
trillion  
kWh

Geothermal  
1.0-1.1

Biomass 3.7-4.6

Wind 1.7

Solar 7.0

Hydraulic: 8.8-9.2

Energy  
Saving: 17

Renewable

19-20

Nuclear

17-18

LNG

22

27

Coal

22

26

Oil

2

3

966.6  
billion  
kWh

980.8  
billion  
kWh

2013

2030

2030

(actual value)

Marine energy is NOT  
included in energy mix.

(modified from [https://www.enecho.meti.go.jp/committee/council/basic\\_policy\\_subcommittee/025/pdf](https://www.enecho.meti.go.jp/committee/council/basic_policy_subcommittee/025/pdf))

# Basic Plan on Ocean Policy

<Structure for Implementation of Ocean Policy>

Basic Act on Ocean Policy enacted on April 20, 2007

First Basic Plan on Ocean Policy  
(Cabinet decision March 2008)  
Second Basic Plan on Ocean Policy  
(Cabinet decision April 2013)

Revised almost every 5 years

Advisory Council/Councilors' Meeting for  
National Headquarters for Ocean Policy  
(experts appointed by the Prime Minister)

Cabinet

Headquarters for Ocean Policy

Director-General: Prime Minister  
Vice Director-General: Chief Cabinet Secretary,  
Minister for Ocean Policy  
Members: All ministers of state except the  
Director-General and Vice Director-General  
• Formulate and implement the Basic Plan for  
Ocean Policy  
• Overall policy coordination with relevant  
government institutions

National Ocean Policy Secretariat

Formulating the Third Basic Plan  
on Ocean Policy  
\*FY2018

[https://www8.cao.go.jp/ocean/english/plan/pdf/plan03\\_gaiyou\\_e.pdf](https://www8.cao.go.jp/ocean/english/plan/pdf/plan03_gaiyou_e.pdf)



# Renewable Energy in the Plan

## Framework of policy making for utilization of offshore renewable energy in Japan

### “Basic Plan on Ocean Policy”

(Cabinet decision in March 2008)

Chapter 2. Measures that the Government Should Take Comprehensively and Systematically with Regard to the Sea

1. Promotion of the development and use of marine resources
- (2) Promotion of the development of energy and mineral resources
  - d. Research and development of other resources

“Regarding natural energy that exists within Japan’s jurisdictional marine zones and is likely to be an energy source in the future, necessary measures should be discussed and taken, as one of the countermeasures against global warming.

With respect to wind-power generation on the sea, efforts should be made to reduce costs for establishment, resolve technological problems for increasing durability, and establish methods to assess environmental impacts. Concerning wave-power generation and tidal-power generation, while grasping international trends including those in countries where such generation has been put into practice, basic research for improving efficiency and economic potential should be promoted with due consideration to special features of seas around Japan.”

Around spring 2012, Headquarters for Ocean Policy will define an “Action Plan for the Promotion and Utilization of Offshore Renewable Energy” (provisional title)

- Establish **Demonstration Site** areas
- Ways of

FY 2012~: Feasible study and selection of “demonstration sites in the real sea areas” for offshore renewable energy in Japan

FY 2013~: Start of construction of facilities in “demonstration sites in the real sea areas”

### Discussion structure

**Headquarters for Ocean Policy**  
(all ministers)

**Senior Officials meeting**  
(attended by Directors-General from all ministries, chaired by Deputy Chief Cabinet Secretary for administrative affairs)

\*Newly established

**Advisory Panel** (external experts)

- Academic experts (mechanics, fisheries, environment, energy, economics, etc.)
- Industrial experts (economic organizations, wind power, electricity, ocean, fisheries, etc.)

**Study Committee** (Directors from relevant bureaus in each ministry)

- Director-General for Science, Technology and Innovation Policy, Cabinet Office
- International Legal Affairs Bureau, MOFA
- Research and Development Bureau, MEXT
- Food Industry Affairs Bureau, MAFF
- Fisheries Infrastructure Department / Fisheries Policy Planning Department, Fisheries Agency, MAFF
- Energy Conservation and Renewable Energy Department / Natural Resources and Fuel Department, ANRE, METI
- Policy Bureau / Water and Disaster Management Bureau / Maritime Bureau / Ports and Harbours Bureau, MLIT
- Maritime Traffic Department / Hydrographic and Oceanographic Department, Japan Coast Guard
- Global Environment Bureau, MOE

Cabinet  
Office  
(2012)

# Demonstration Sites



8 sites in 6 areas were selected as a demonstration site.

How are demonstration sites developed?

# Potential of Ocean Energy in Japan

Potential within 30 km from shore-line and shallow than 100 m

		Wind	Wave	OTEC	Oceanic Current	Tidal Current	Tide
Maximal Energy Production [TWh/year]	Current Technology	524	19	47	10	6	0.38
	Near Future Technology	723	87	156	10	6	0.38

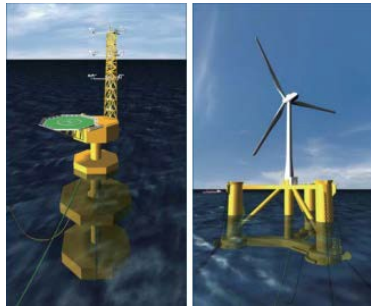
Total Japan electricity demand ~ 1,000

(NEDO, 2010)

NEDO: New Energy and Industrial Technology Development Organization



# Onshore and Offshore Wind Turbine



## Toward a commercial stage

Ongoing (65 MW)

- Setana (1.2 MW)
- Fukushima (14 MW)
- Kashima (30 MW)
- Choshi (2.4 MW)
- Akita (3 MW)
- Sakata (10 MW)
- Kitakyusyu (2 MW)
- Goto (2 MW)

Planning (5,043 MW)

(Japan Wind Power Association, 2018)



# Marine Energy (Wave)

Project	Location	Company
Multiple Resonances Unit OWC (Oscillating Water Column) Wave Power Device (NEDO)	Sakata, Yamagata	MM Bridge Co., Ltd., etc.
Blow Hole Wave Energy Conversion System (Ministry of Environment)	Echizen, Fukui	The University of Tokyo, etc.
Wave Power Generation System on the Coast (Ministry of Environment)	Oarai, Ibaraki	Mitsui Engineering & Shipbuilding Co., Ltd.
Pendulum Type Wave Energy Converter (Ministry of Education, Culture, Sports, Science and Technology)	Kuji, Iwate	The University of Tokyo, etc.
Point Absorber (modified from Powerbuoy) (NEDO)	Kouzushima, Tokyo	Mitsui Engineering & Shipbuilding Co., Ltd.
Overtopping Type Wave Energy Converter (NEDO)	Omaezaki, Shizuoka	Ichikawa Doboku, Co., Ltd., etc.
Pendulum Type Wave Energy Converter (Ministry of Environment)	Hiratsuka, Kanagawa	The University of Tokyo, etc.

# Marine Energy (Tidal Current)

Project	Location	Company
Savonius Keel & Wind Turbine Darrieus (NEDO)	Kabeshima, Saga	MODEC Inc.
Interior Permanent Magnet Type Vertical Axis Turbine (NEDO)	Yobikonoseto, Nagasaki	Oshima Shipbuilding Co., Ltd., etc.
Pier Utilized Turbine (NEDO)	Obatakeseto, Yamaguchi	The Chugoku Electric Power Co., Inc., etc.
Contra-Rotating Propeller Type Turbine (NEDO)		Kyowa Engineering Consultants, Co., Ltd., etc.
Double Rotor & Twin Nacelle Turbine (NEDO)	Goto, Nagasaki	Sasebo Heavy Industries Co., Ltd., etc.
Vertical Axis Turbine (Ministry of Education, Culture, Sports, Science and Technology)	Sabusawa, Miyagi	The University of Tokyo, etc.
Horizontal Axis Turbine (Ministry of Environment)	Goto, Nagasaki	Toa Corporation, etc.
TBD (Ministry of Environment)	Awaji, Hyogo	Mitsubishi Heavy Industries Ltd
<b>TBD (Ministry of Environment)</b>	<b>Goto, Nagasaki</b>	<b>Kyuden Mirai Energy</b>

# Marine Energy (Oceanic Current / OTEC)

In a stage of development (Ocean Current)

Project	Location	Company
A Floating Type Turbine (NEDO)	Kuchinoshima Kagoshima	IHI Corporation, etc.
A Floating Type Turbine (NEDO)		Mitshubishi Heavy Industries Ltd.
Field Test of Ocean Thermal Energy Conversion (NEDO)	Kumejima, Okinawa	Japan Marine United Corporation, Saga University

In a stage of field test (OTEC)

# Ongoing Project (Oceanic Current)



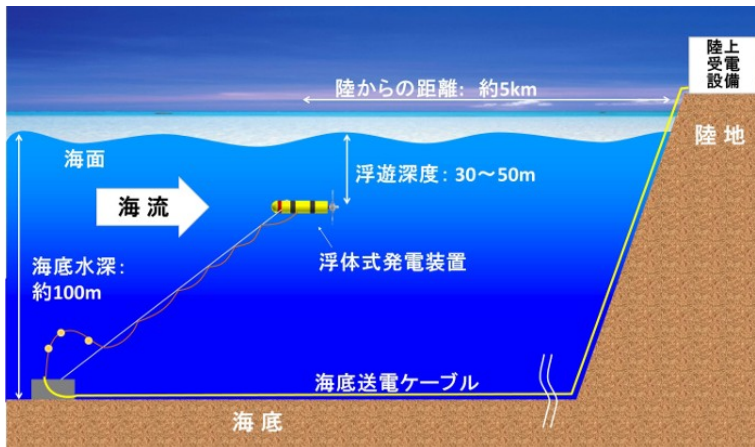
## Ocean current energy

IHI, Funded by NEDO  
(2018-2020)

- 100kW (50kW × 2)
- Diameter of turbine: 11m

Kuchino island, Kagoshima

One year operation in 2019



[https://www.ihico.jp/ihico/all\\_news/2019/technology/2019-7-25/index.html](https://www.ihico.jp/ihico/all_news/2019/technology/2019-7-25/index.html)



# Ongoing Project (Wave)

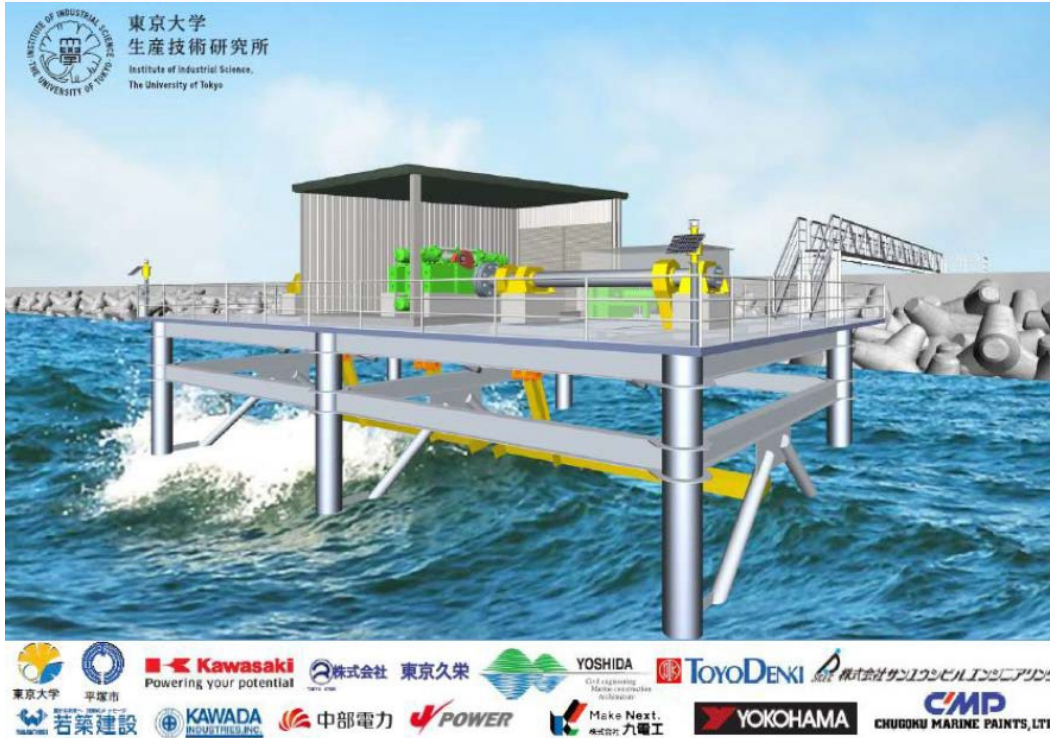
## Wave energy

Univ. of Tokyo  
Funded by Ministry of  
Env. (2019-2021)

▪ 150kW (50kW × 3)

Hiratsuka, Kanagawa

One year operation in  
2020



# Ongoing Project (Tidal Current)



## Tidal energy

NaMICPA and Kyuden  
Mirai Energy  
Funded by Ministry of  
Env. (2019)

Goto island, Nagasaki

Openhydro was planed.

<http://namicpa.jp/>





# Environmental Impact Assessment

## History of EIA

- 1993: Enactment of the “Basic Environment Law”
- 1997: Enactment of the “Environmental Impact Assessment Law”
- 1999: Implementation of “Environmental Impact Assessment Law”

The environmental impacts of the following projects must be assessed.

1. Road, 2. River, 3. Railway, 4. Airport, 5. Power plant, 6. Waste disposal site,
7. Landfill and reclamation, 8. Land readjustment project,
9. New residential area development project, 10. Industrial estate development project,
11. New town infrastructure development project,
12. Distribution center complex development project,
13. Residential or industrial land development by specific organizations

✓ EIA is required for **the specific project.**

✓ EIA is always required / the necessity of EIA is judged by project **based on the scale of the project.**

(Ministry of Environment)

# EIA of Power Plant

Hydraulic power plant	Output: 30,000kw or over	Output: 22,500 – 30,000kw
Thermal power plant	Output: 150,000kw or over	Output: 112,500 – 150,000kw
Geothermal power plant	Output: 10,000kw or over	Output: 7,500 – 10,000kw
Nuclear power plant	All	
Wind power plant	Output: 10,000kw or over	Output: 7,500 – 10,000kw

From **October, 2012** (Ministry of Environment)

**Marine energy is NOT included as the project in the Environmental Impact Assessment Law.**

However, the environmental impacts should be assessed independently, preparing for the future revision of the Environmental Impact Assessment Law in order to include marine energy plant.



# Permission of the Use of Sea Areas

Wide Variety of Fisheries

Permitted by Cabinet Minister  
(Tuna, a Pacific saury, etc., 18 fisheries)

Navigation

Recreation

Permitted by Prefectural governor  
(Gill net, etc., 26 fisheries)

Fishery rights (many)

Land

a few km

Fisheries Adjustment Committee

# Promoting Utilization of Sea Areas



[Home](#) ▶ [News Releases](#) ▶ [Back Issues](#) ▶ [March FY2019](#) ▶ Cabinet Orders concerning the Act of Promoting Utilization of Sea Areas in Development of Power Generation Facilities Using Maritime Renewable Energy Resources Approved

Japanese

 Print

## Cabinet Orders concerning the Act of Promoting Utilization of Sea Areas in Development of Power Generation Facilities Using Maritime Renewable Energy Resources Approved

March 15, 2019

▶ Energy and Environment Policy

On March 15, 2019, the Cabinet approved the Cabinet Order and the Enforcement Order for specifying the effective date of the Act of Promoting Utilization of Sea Areas in Development of Power Generation Facilities Using Maritime Renewable Energy Resources (Act No. 89 of 2018, hereinafter referred to as the "Act").

[https://www.meti.go.jp/english/press/2019/0315\\_003.html](https://www.meti.go.jp/english/press/2019/0315_003.html)

# Current Issues for MRE Development

1. Technological development
2. High efficiency and low cost
3. EIA & Social acceptance
4. Utilization for isolated islands
5. Large scale / Array