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沖縄電力

Distributed Energy on the Remote Islands of Okinawa

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1. Electric Power Industry on the Remote Islands of Okinawa

・Okinawa Electric Power Company supplies electricity to 39 inhabited remote islands lying within an approximately 500km radius, through 12 power systems.


Miyako No.2 Power Station


Tonaki Power Station


Ishigaki No. 2 Power Station

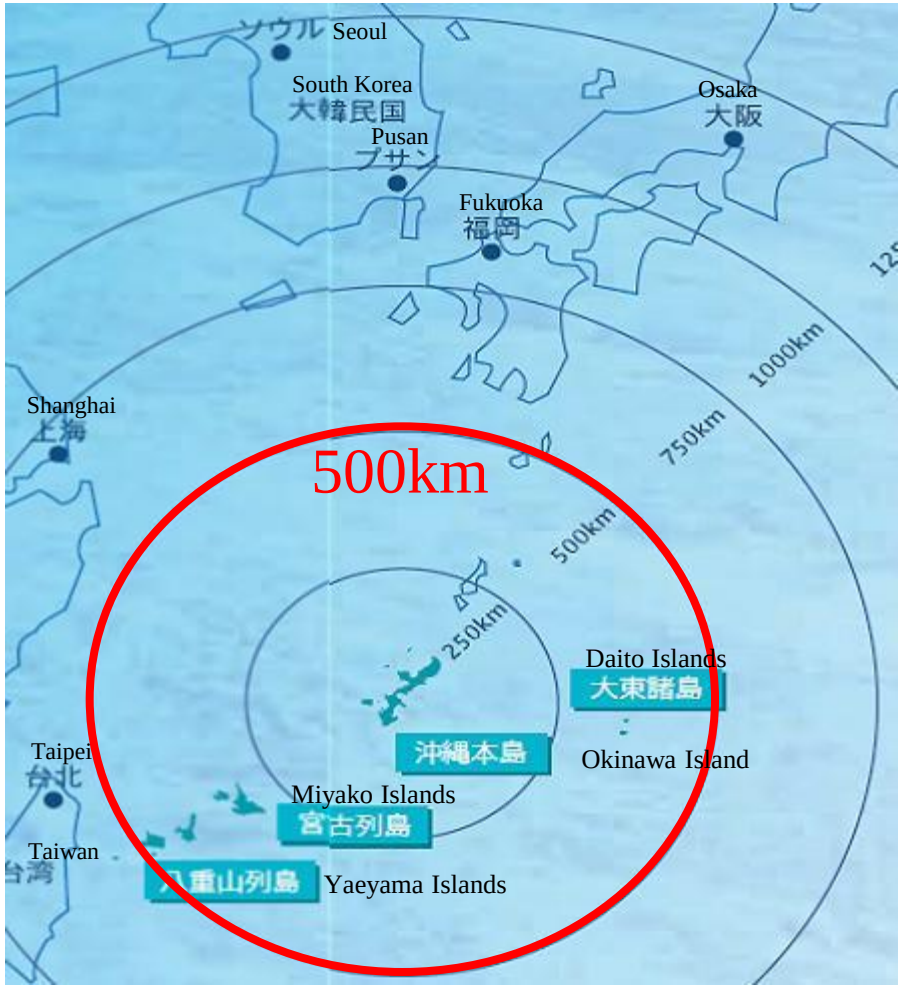

Aguni Power Station


Kumejima Power Station


Minamidaito Power Station


Tokashiki Power Station


Kitadaito Power Station




Makiminato Thermal Power Station

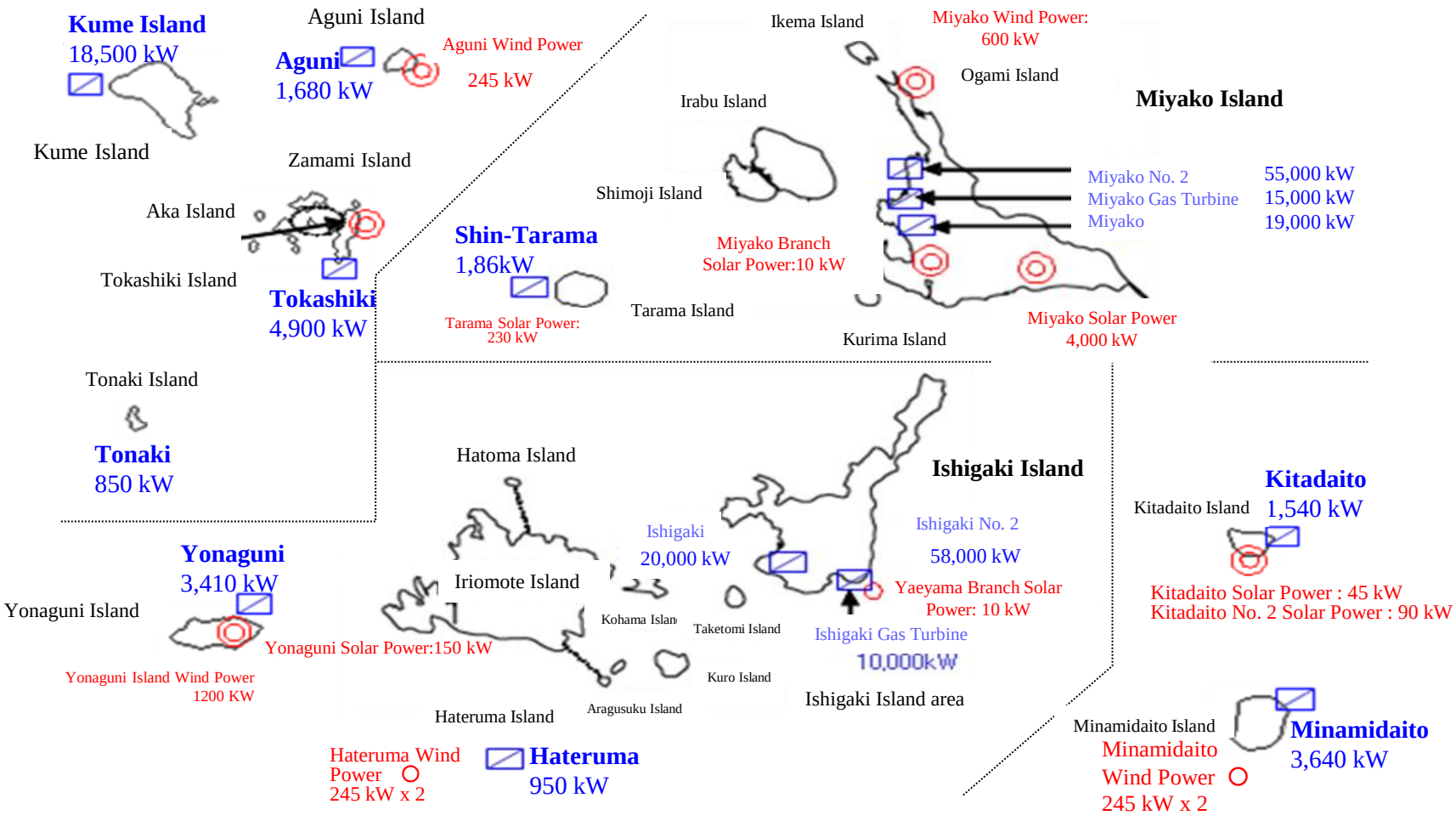

Ishikawa Thermal Power Station


Gushikawa Thermal Power Station


Kin Thermal Power Station

1. Electric Power Industry on the Remote Islands of Okinawa

・Electricity is supplied to each of the remote islands mainly through diesel generators.
Renewable energy such as wind turbines and sunlight are also being introduced.



Challenges for Power Systems on Remote Islands

- Power systems on the remote islands, excluding the main island of Okinawa, are mostly made up of diesel power generators.
  - Significant impact from the hike in fuel prices.
  - Relatively higher power generation costs.
  - High CO_2 emissions per unit.
- The power systems are in classes ranging from several hundred kW to several tens of thousands kW.
  - Frequency variations resulting from variable power, such as wind and solar power generation, are becoming apparent.
- It is difficult to introduce MW-class wind power generators.
  - Due to the scale of the systems, it is difficult to bring in MW-class wind power generators to most of the remote islands.
  - It is difficult to bring in large scale heavy equipment (such as cranes) for construction and maintenance.

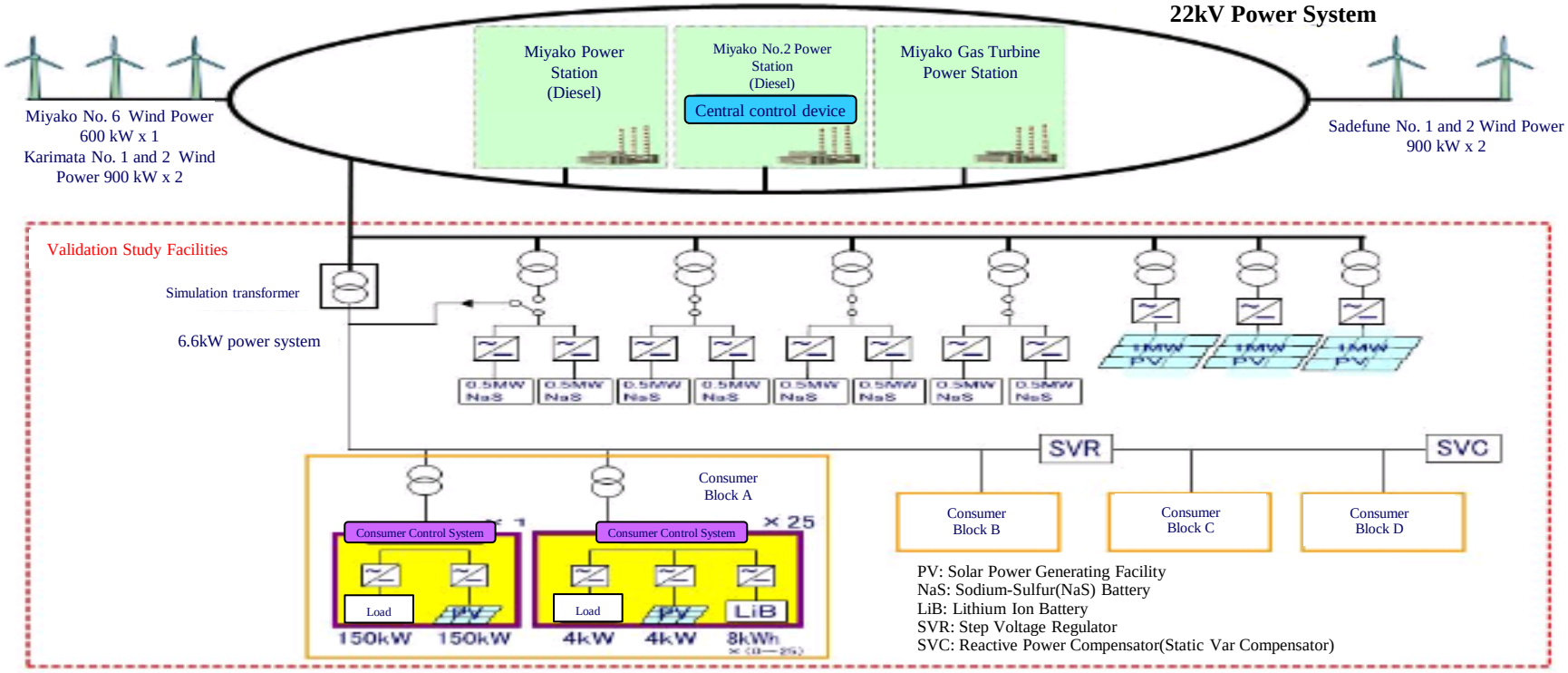
2. Initiatives for Micro Grids for Remote Islands

[Miyako Island Mega-Solar Demonstration Research]

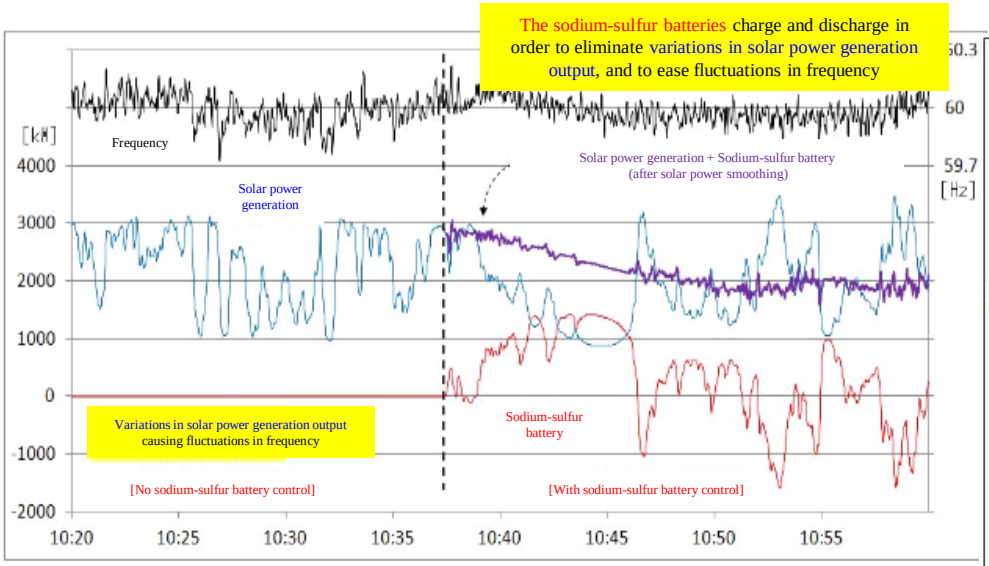
- Maximum electric power on Miyako Island's power systems: Approx. 55,000 kW
- Solar Power Generating Facility: 4,000 kW
- Battery facilities

  NaS batteries: 4,000 kW(28,800 kWh)

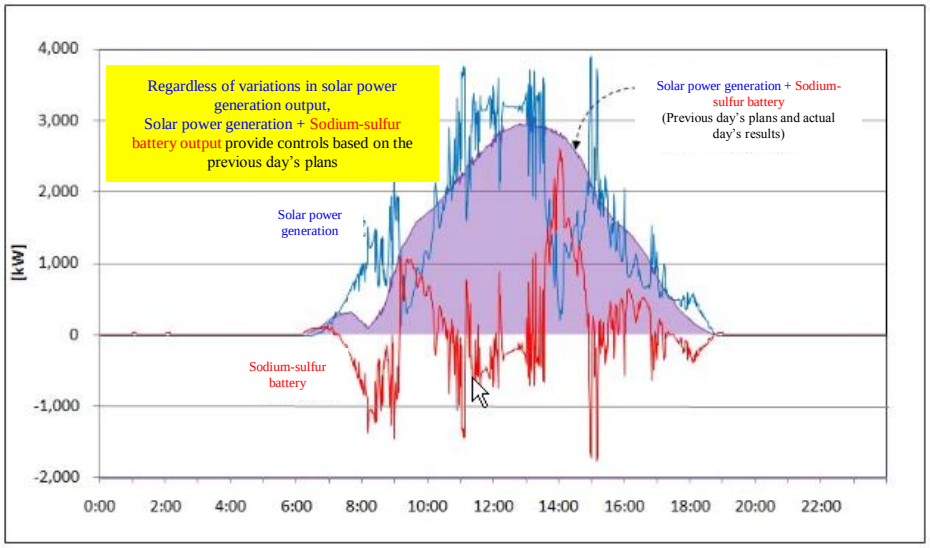
  Lithium-ion batteries: 100 kW(200 kWh)



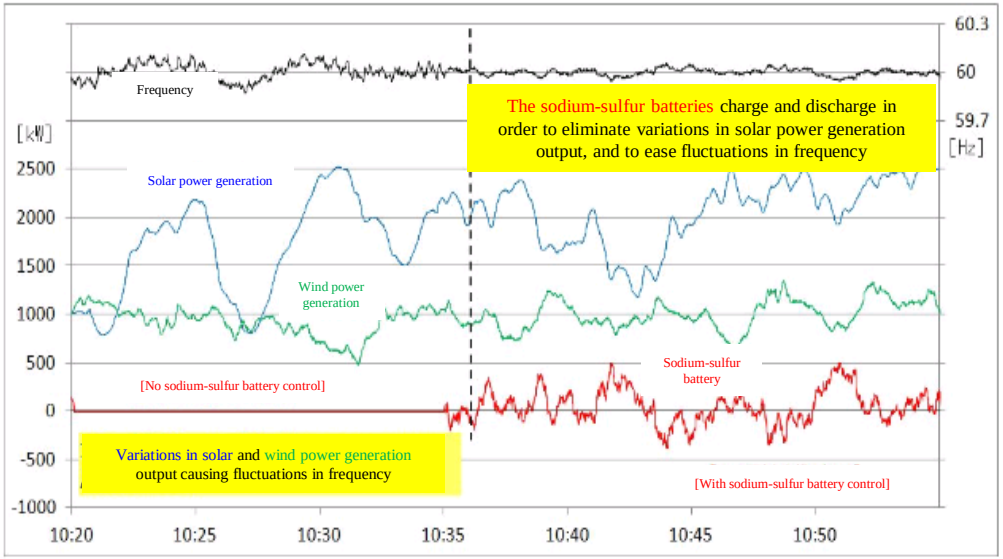
2. Initiatives for Micro Grids for Remote Islands



Validation of the Suppression Effect for Variations in Solar Power Output



Validation of the Scheduled Operation of Solar Power Generation Facilities



Validation of the Suppression Effect for Fluctuations in Frequency

3. Initiatives for Wind Power Generation

It is difficult to introduce wind turbines to the islands.

★Typhoons that are more powerful than before
★Incompatibility with system capacity.
★Variations in wind power generation cannot be adjusted in the power systems. (Need for stabilizing equipment)
★High repair costs such as temporary construction of cranes.
★The time required to deal with defects, breakdowns, etc. reduces capacity utilization, resulting in high costs.

Yonaguni No.1 (Damaged in Typhoon No. 15 in 2007)

Miyakojima Nanamata No.1 (Damaged in Typhoon No. 14 in 2003)

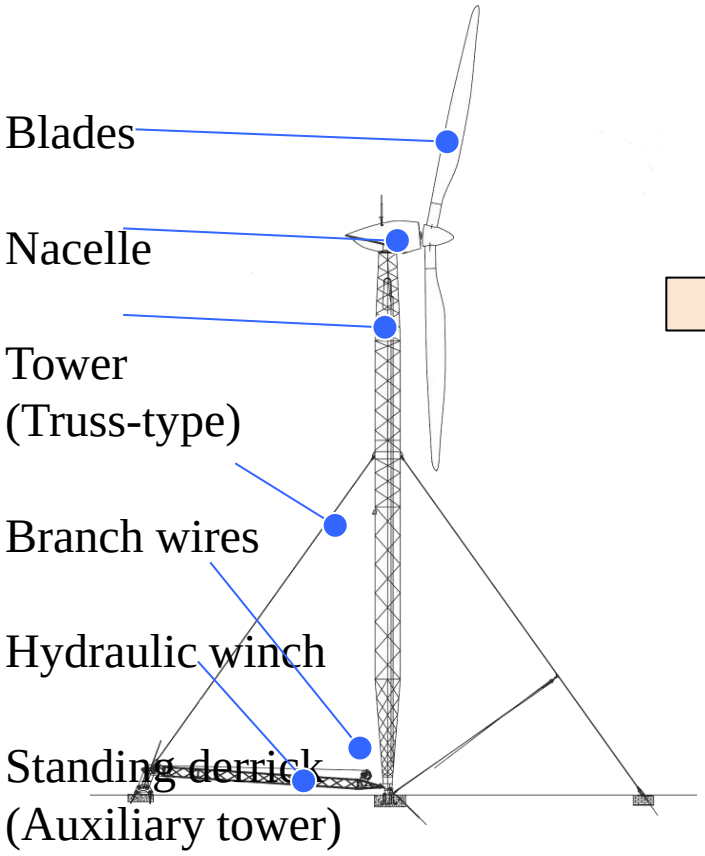
3. Wind Power Generation Initiatives

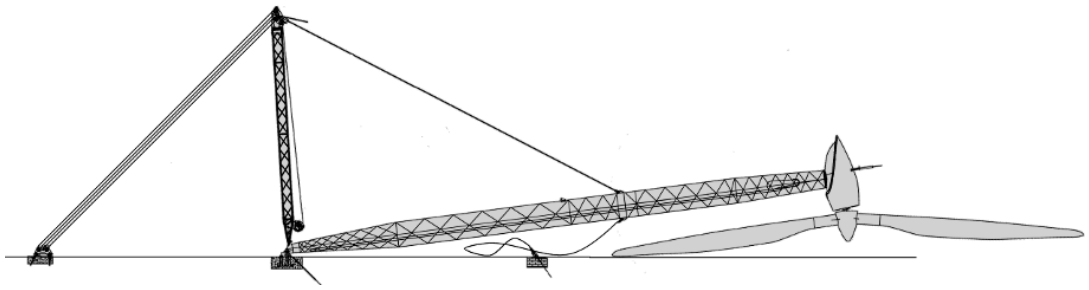
Initiatives for tiltable wind-power generator

Manufacturer/country	Vergnet / France
Rated output	245 kW
Rated wind speed	13 m/s
Start/stop wind speed	4 m/s / 20 m/s
No. of blades	2 blades (downwind type)
Diameter of blades	32 m
Hub height	38 m

[Characteristics of tiltable wind-power generators]

- The wind turbine itself can fall forward by an angle of close to 90 degrees, enabling it to handle strong winds such as typhoons.
- There is no need to use large cranes when building the structure, making it relatively easier to set up on hilly terrain.
- By making the wind turbine fall forward during maintenance,
  it is possible to carry out work on the ground level.



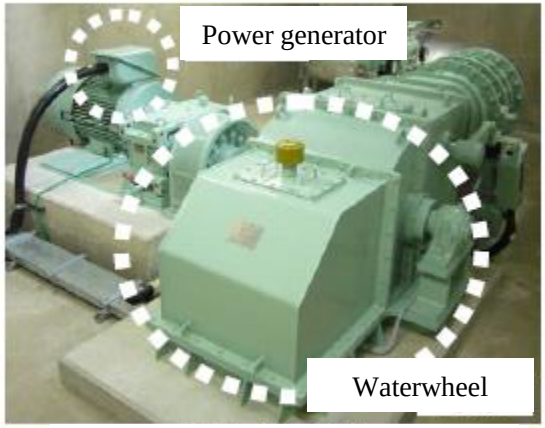


4. Other Initiatives

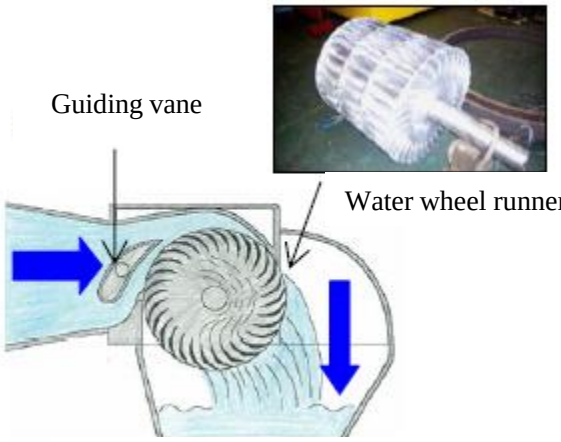
Small hydroelectric generation

Location: Miyako No.2 Power Station
Effective head: Approx. 10 m
Output: 65 kW
Waterwheel: Horizontal cross-flow water turbine

○ Hydroelectricity facility and cross-flow waterwheel



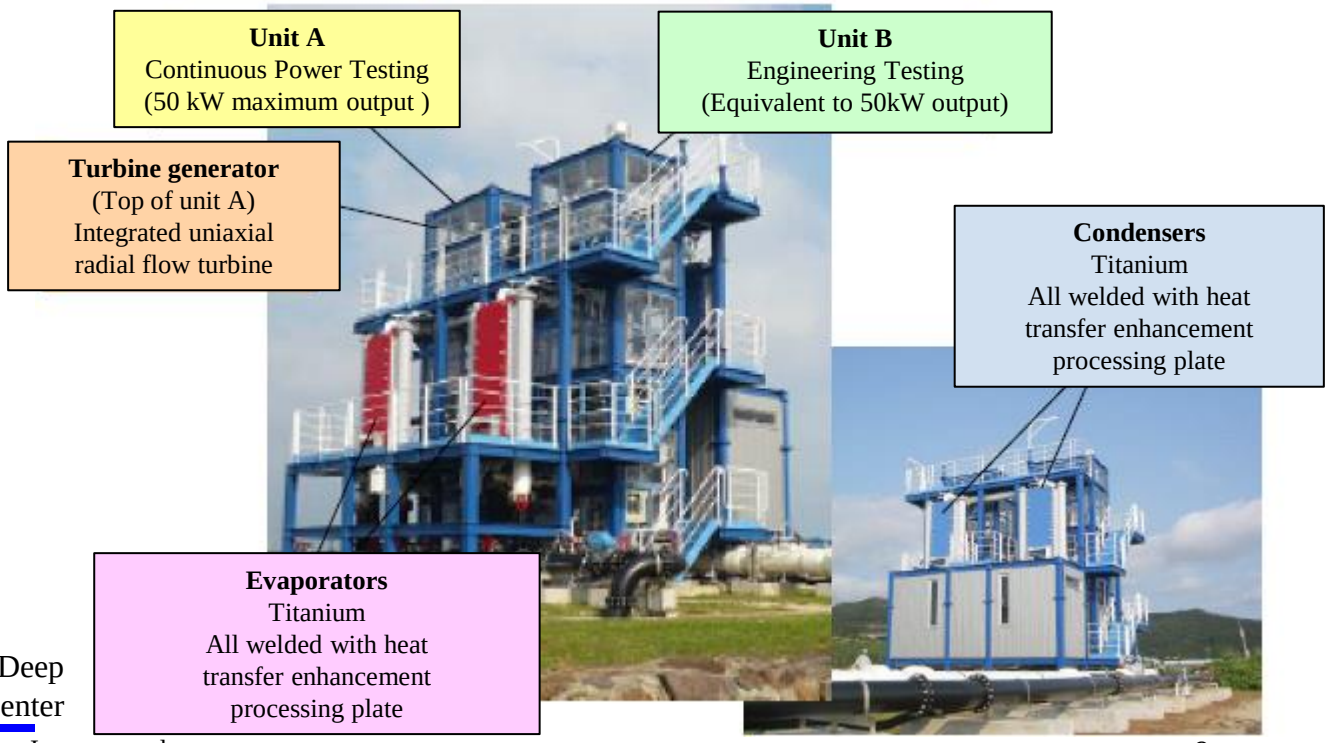
Small hydroelectric generator facility



Cross-flow water wheel

Ocean Thermal Energy Conversion

Location: Kume Island
Output: 50 kW



Source: Website of Okinawa Prefectural Deep Sea Water Research Center

Thank you for your kind attention.