Challenges and Opportunities of Renewable Energy Projects: Energy Service Agreement and JCM solutions

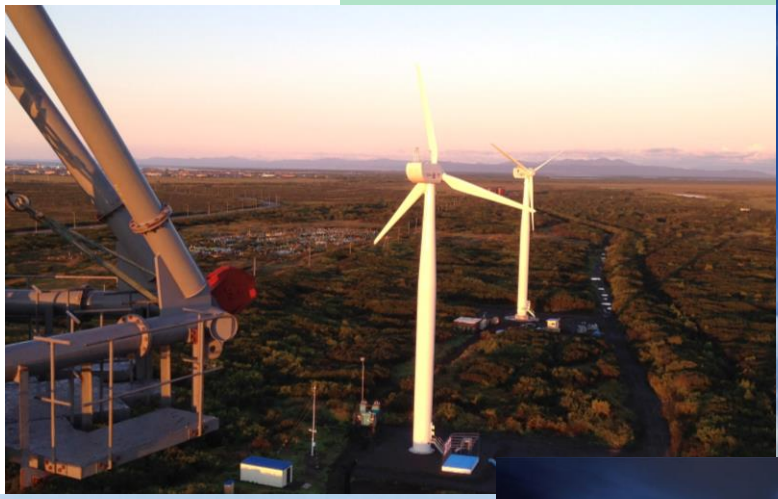
KOMAIHALTEC Inc.

Company Introduction

- **Founded** in **1879**
- More than **100 years** of **experience** in manufacturing of **steel structures**
- **Employees** : approx **650**
- **ISO 9001**, **ISO14001** certified
- **Welding certification** - **S-Grade** Certificate
- **Turnover** (2022) : **49,000 Million JPY** (348 Million €)

Main business:

- Manufacturing of bridge and steel structures
- Started renewable energy business in 2006 (300kW Wind Turbine and structures for sky solar systems)



Global Carbon Neutral Transition Targets

According to world energy transition outlook, global investments across energy transition technologies reached a record high **USD1.3trillion** in **2022**.

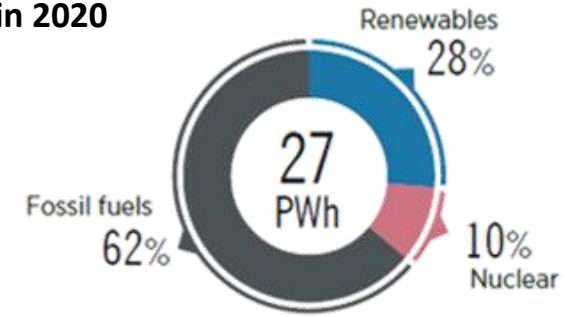
However, **fossil fuel** capital investments remain almost **twice higher** than renewables.

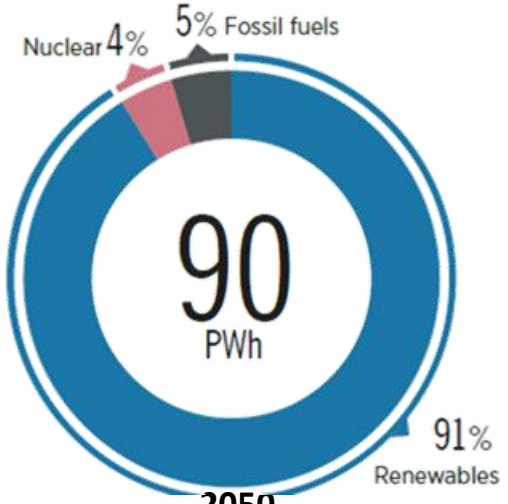
Considering severe impact of COVID-19, the energy crisis and ongoing regional political conflicts, many governments implemented short-term measures to secure energy supplies such as investments in fossil fuel infrastructure.

Consequently, renewable energy investments remain concentrated in a limited number of countries and focused on only a few technologies.

For the Pacific region the energy transition remains a big challenge considering that **more than 50%** of population lives in **remote islands**. In order to achieve the net zero emission goal by 2050, an optimal solution of financing and technology as a whole shall be found.

Gross electricity generation (PWh) in 2020





2050

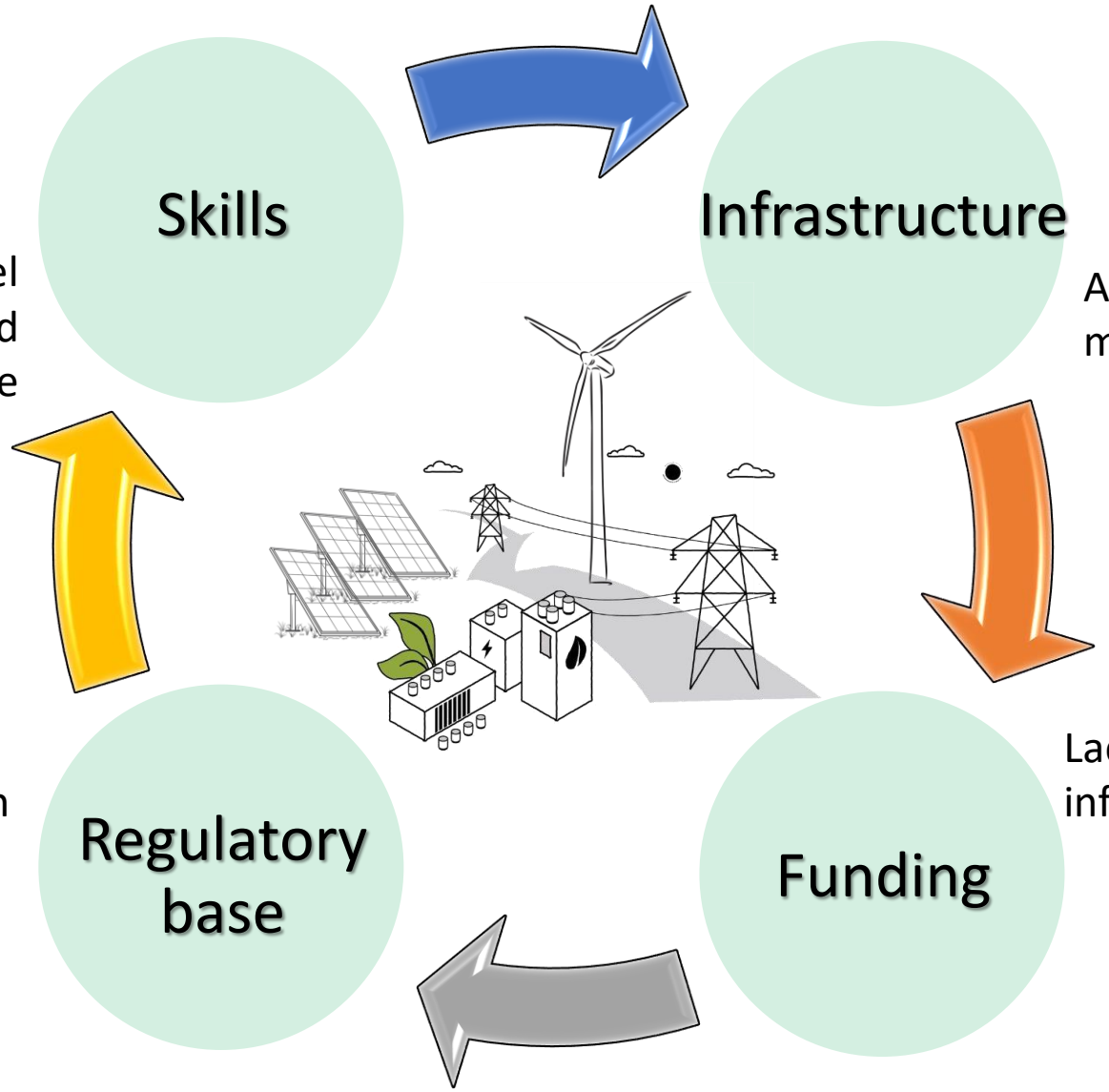
Goal to keep global warming to no more than 1.5°C

Sources: IRENA World energy transition outlook

To secure the outcomes of this scenario, the world will need to reach net-zero emissions in the energy sector by 2050, all end-use sectors will have to use more renewables.

Are we ready for green, sustainable and resilient power system?

Lack of skilled personnel capable to both manage and maintain the renewable infrastructure



A lot of power infrastructure requires modernization which require funding

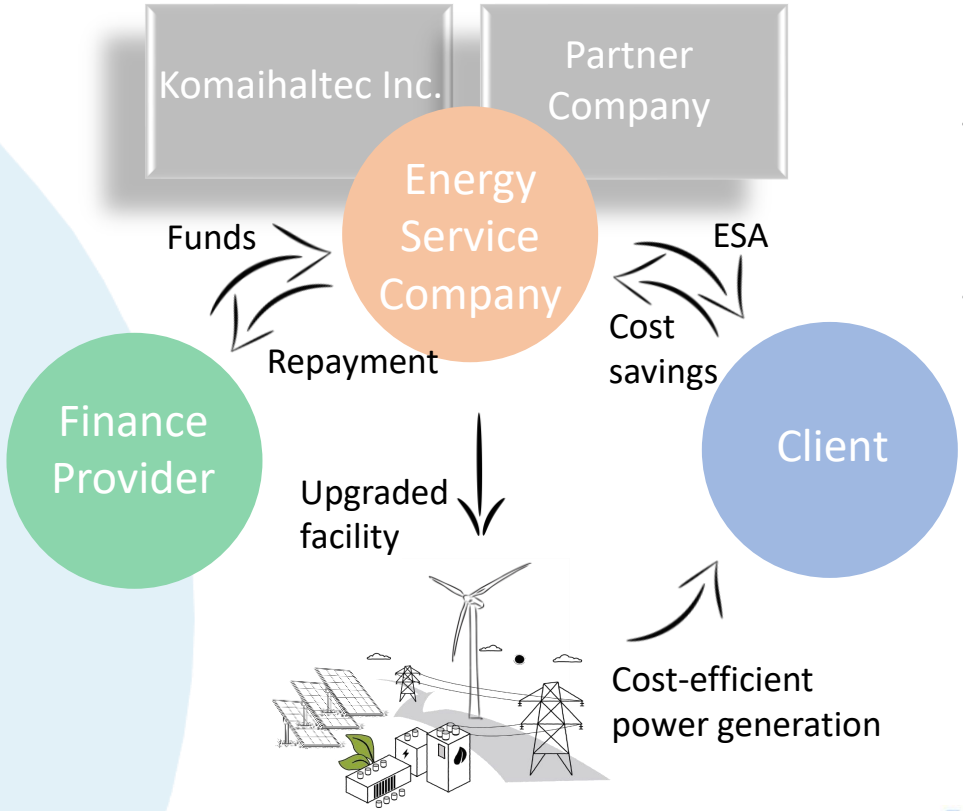
Lack of funding to upgrade the infrastructure

Still geared toward fossil fuels adoption and focus on accelerating the transition

Are we ready for green, sustainable and resilient power system?

Energy Service Agreements (ESAs)

An Energy Service Agreement (ESA) is a unique financing option for energy efficiency projects.
It's neither a loan nor a lease: The service provider pays for the upfront costs of the equipment and performs both routine and emergency maintenance. And the customer pays a fee on agreed terms each month, quarter or other term agreed based of energy efficiency economy after, for example, the facility upgrade from the energy efficiency achieved.



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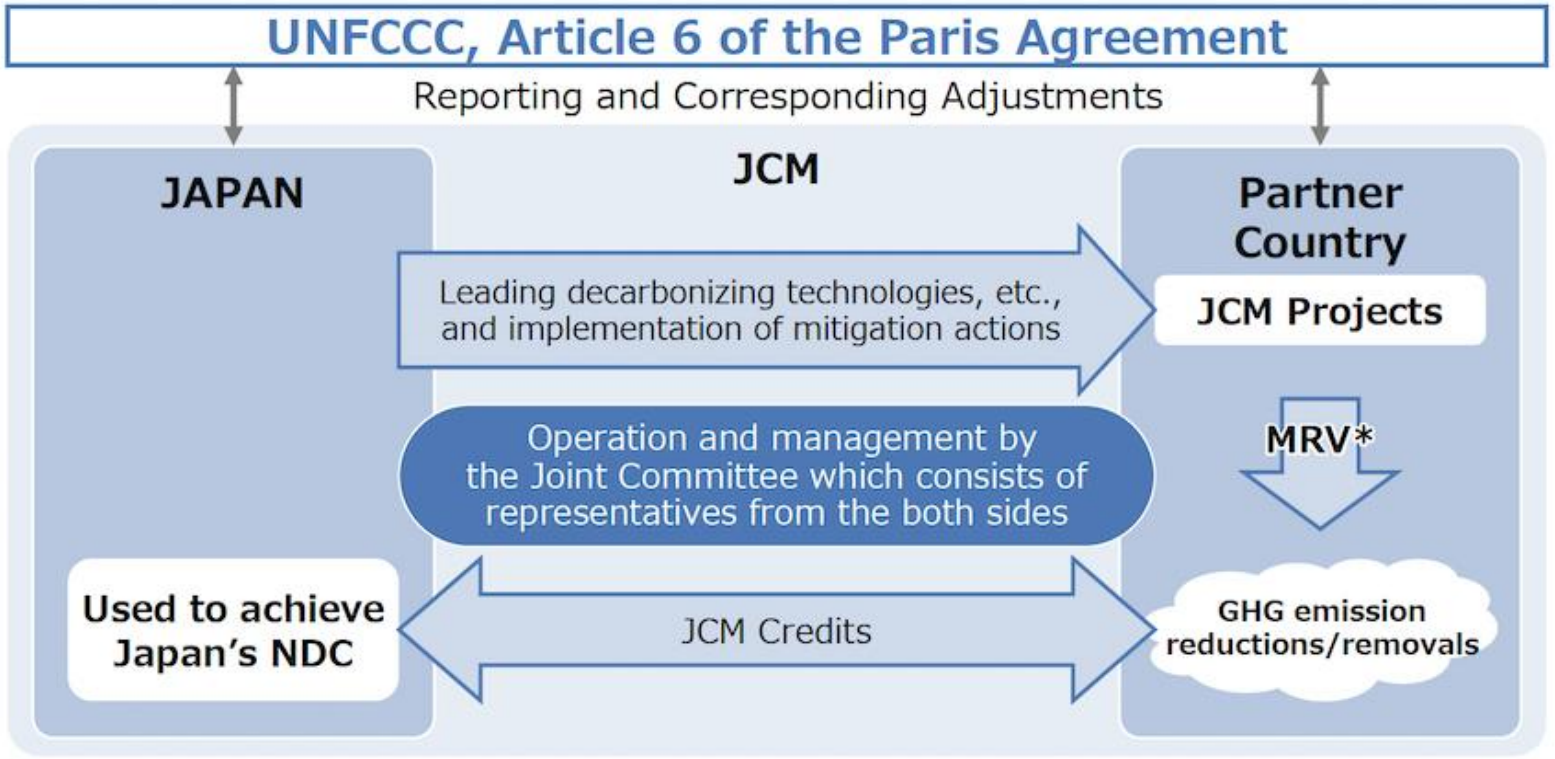
Are we ready for green, sustainable and resilient power system?

Joint Crediting Mechanism (JCM)

JCM is a mechanism allowing implementation of projects with partner countries using investment by Japanese entities to, for example, equipment, and return of such investments through carbon credits achieved after commissioning.
The JCM contributes to the achievement of both countries' contribution by evaluating Japan's contributions in a quantitative manner and acquiring the part of credit.

As of July 2023, JCM partnership document is signed with **27 countries**: Mongolia, Bangladesh, Ethiopia, Kenya, Maldives, Viet Nam, Laos, Indonesia, Costa Rica, **Palau**, Cambodia, Mexico, Saudi Arabia, Chile, Myanmar, Thailand, the Philippines, Senegal, Tunisia, Azerbaijan, Moldova, Georgia, Sri Lanka, Uzbekistan, **Papua New Guinea**, the United Arab Emirates (UAE) and the Kyrgyz Republic.
While JCM rules are decided on the intergovernmental level, Komaihaltec is involved in studies of such projects in several partner countries.



Source: https://www.jcm.go.jp/ (JCM official website)

*measurement, reporting and verification

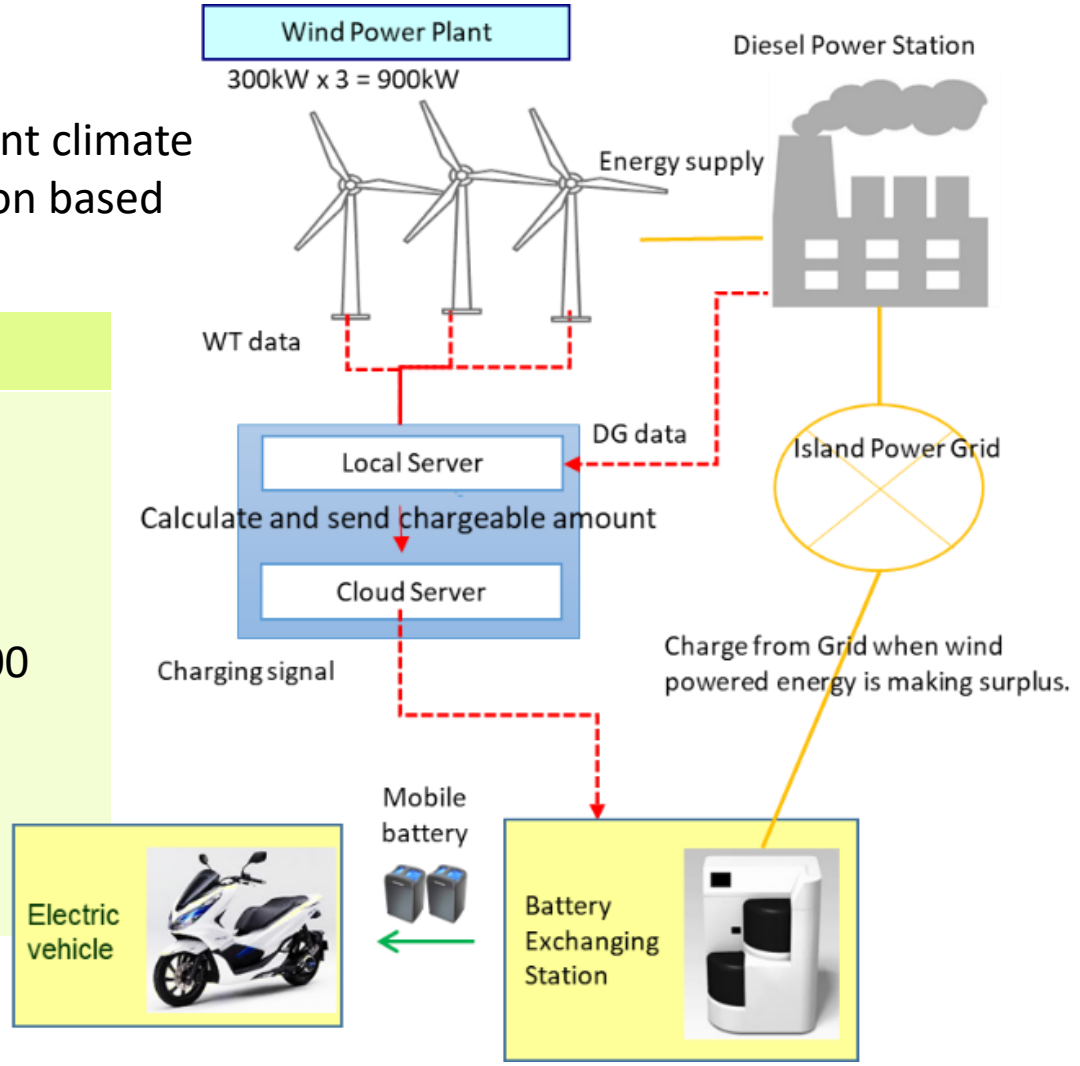
Our Projects

-> Customized solution

- Having experience of system development for remote regions in different climate conditions, including typhoon zoon, we can propose a customized solution based on customer' needs

Example 1. System implemented in Romblon Island, Philippines

- Project Participants: Komaihaltec Inc., Honda Motor Co., Ltd., Romblon Electric Cooperatives
- System Components: 3 units of 300kW wind turbines (Komaihaltec)
- Mobile Power Packs, 17 Battery Charging station units and 100 electric vehicles (Honda Motor)
- Control system for charging surplus energy to battery packs
- Commissioning: February 2019



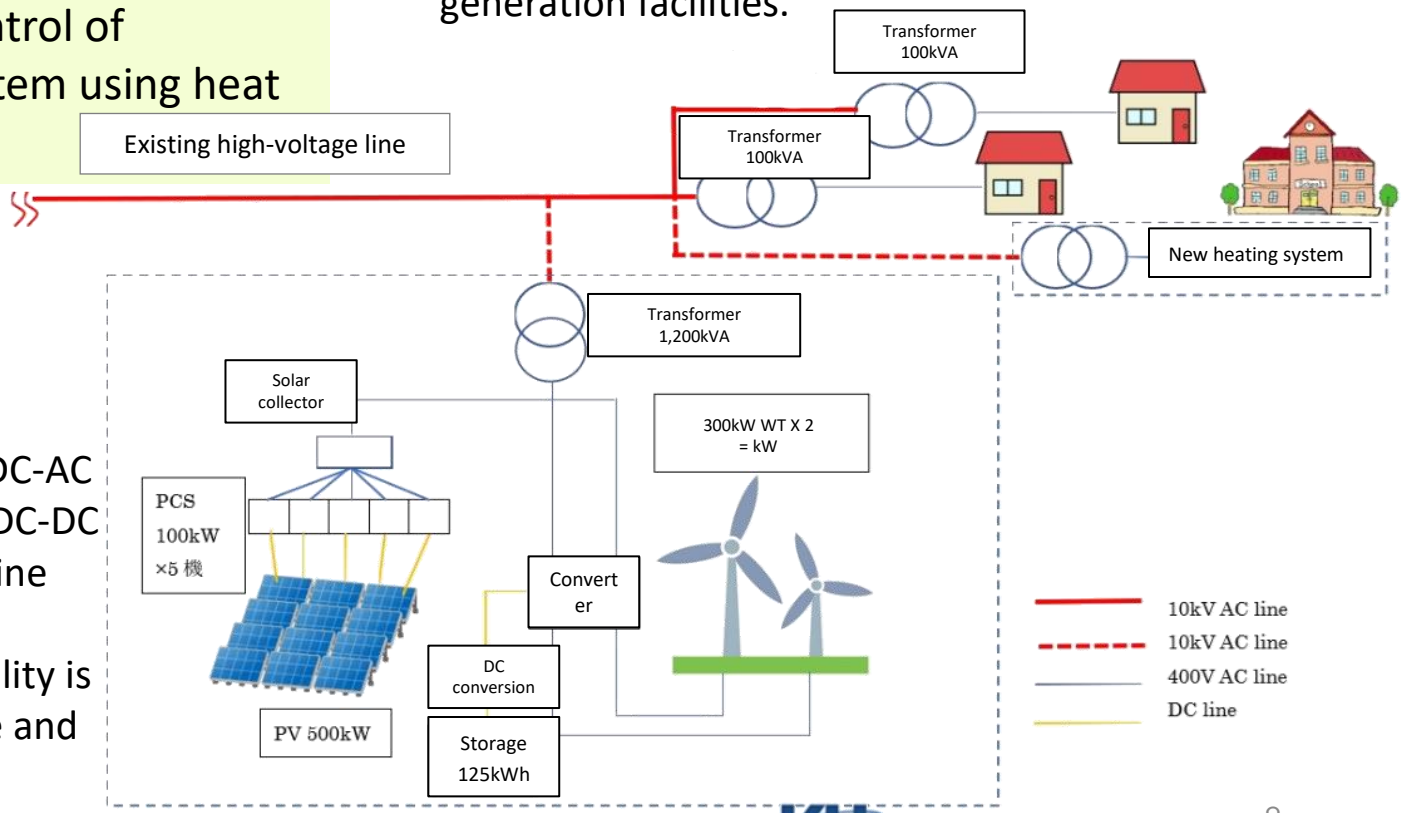
Our Studies

Example 2. System for mountainous area in Azerbaijan

- Project Status: Under pre-FS studies under JCM mechanism
- System Components: 2 units of 300kW wind turbines (Komaihaltec), solar panels (500kW), storage batteries, heating system
- Output stabilizing technology demonstrated with storage batteries in Japan for effective utilization of renewable energy by balancing the entire power system, the system control of renewable energy generation, and the heating system using heat pumps.

❑ **Output control system integrating wind and solar power generation**

- Customized for areas with weak grid by combining wind power generation with small storage batteries and space-utilizing aerial photovoltaic power generation facilities.

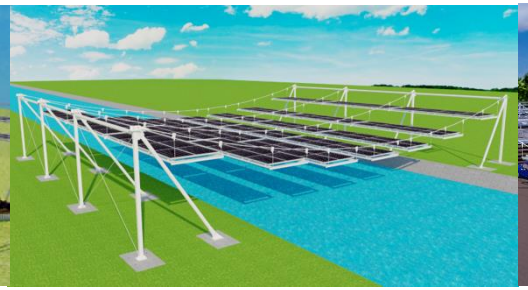


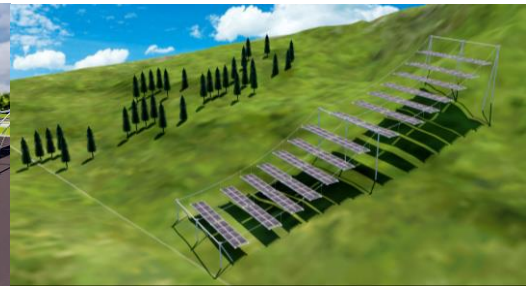
❑ **Wind power generation system incorporating output stabilization technology**

- Short-cycle frequency control system using small storage batteries to provide stable power to the grid.
- A bus is added to the DC portion of the conventional AC-DC-AC converter, and storage batteries are incorporated into the DC-DC link to provide a stabilized output in response to wind turbine fluctuations.
- Reduction of the overall cost of the power generation facility is achieved by sharing the transformer between wind turbine and storage batteries.

What can we offer?

KOMAIHALTEC Inc.



- Develop an optimal technical solution and simulate power generation
- Study possible financing options
- Develop implementation scheme
- Provide wind measurement services

Conduct joint FS

Design, supply, supervise

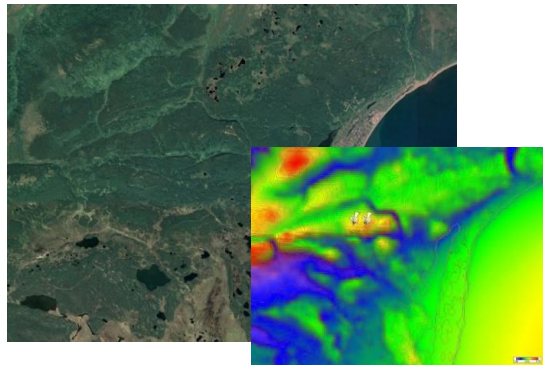
- Our high professional engineering team provides high quality services
- Technical support at each working step

- Maintenance services: stable spare parts supply chain
- Maintenance and consultation

Post-implementation services




Basic Project Development Process



Selection of site

Initial Development

- Site selection
- Wind measurement* and power generation simulation
  *banks (lenders) may require data for one year
- System configuration development

Wind measurement, system configuration

Project finance

- Financial model assessment
- Determination of project finance sources
- Negotiation with financial institutions and suppliers

Financial model assessment

Agreement conclusion

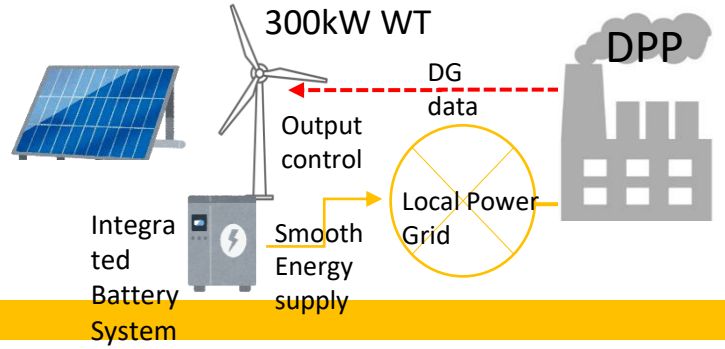
- Conclusion of agreements with project counterparties

Agreement conclusion

Design, supply, construction, commissioning

- Facility design, materials and equipment supply
- Construction of foundation, equipment installation, grid connection
- Commissioning

Implementation stage



Power generation

- Power sales
- Loan/investors repayment
- Maintenance of facilities

Mid-sized Wind Turbine KWT300

- Rated power 300kW
- Blades length 16.0m
- Tower height 41.5m
- Tower weight approx.10t
  (1 block)
- Total height 58.0m
- Nacelle weight approx. 18t
- Survival wind speed 70m/s (Standard Model)
  90m/s (Typhoon Model)

✓ High resistance to wind turbulence
✓ Easy transportation and installation
✓ Low influence on grid

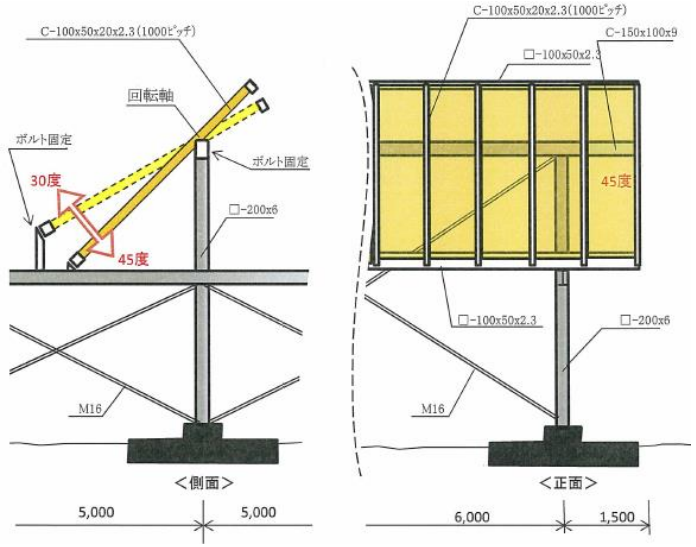
Remark: 1MW WT model is under development
Prototype test is scheduled for 2H 2024

Sky Solar Systems

1 High Pole Sky Solar

Solar panels are installed on high poles at equal intervals through beams

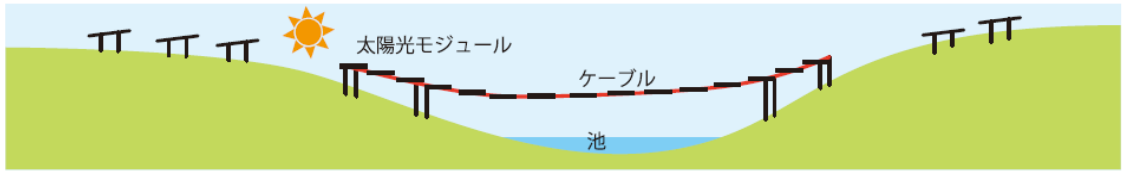
- High pole installation spacing up to 9 x 9 m
- Standard pole height is 3～7 m
- Design and construction are defined based on land use
- Panels are installed at optimal light-receiving angles
- Poles are proposed based on optimal land conditions



2 Cable-Type Sky Solar

Suspended structure with solar panels is installed on cables stretched over high poles

- Maximum span (between poles) of approx. 50m is achieved by using cables for continuous suspension structure.
- Installation overhead not depending on environmental or topographical conditions such as ponds, swamps, farmland, rivers, etc.
- Structure with verified dynamic wind stability
- Design lifetime is 20-25 years
- Optimal design based on the maximum wind velocity according to the construction standards of the installation site
- Pole and cable layouts are designed considering the terrain.



Conceptual and basic design: Tsutomu Nakamura General Planning Dept. Detailed design： Komaihaltec Inc.

Thank you for your attention!

KOMAIHALTEC Inc.

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