

# Outline of FREA, Fukushima Renewable Energy Institute, AIST

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Yoshiro OWADANO  
FREA

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Missions (based on the government's announcement, July 2011)

- International R&D base for renewable energy
- New industry promotion in damaged area

Location, area

Koriyama, Fukushima, 5.5ha

Schedule

2013, Oct. organization founded  
2014, Apr. opened in Koriyama

Funding, scale

10 billion yen for start up  
(land, buildings, equipment)  
2 billion yen/y, 260 people



# Total View of FREA



# Demonstration Field

2014.11.13



# Research Subjects of FREIA

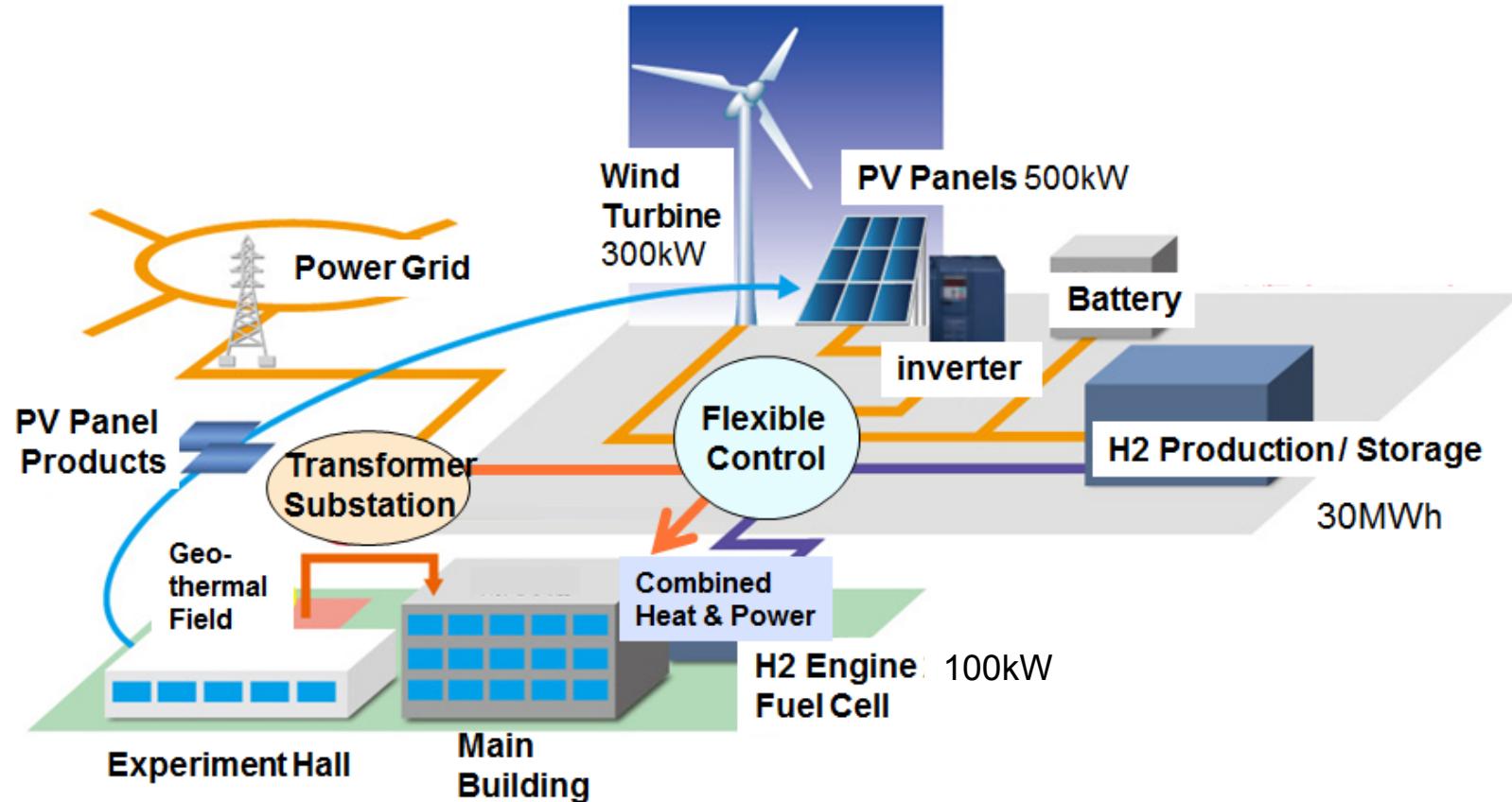
For high penetration of renewable energy

- System integration
  - Renewable energy network / Invertor testing facility
  - Hydrogen carrier production / storage/ application
- Further cost down
  - Next generation PV module development
  - Wind power turbine control / monitoring
- Data base for proper development and deployment
  - geothermal power generation
  - geothermal heat pump system

# Renewable Energy Network

System R&D for high penetration of renewable energies

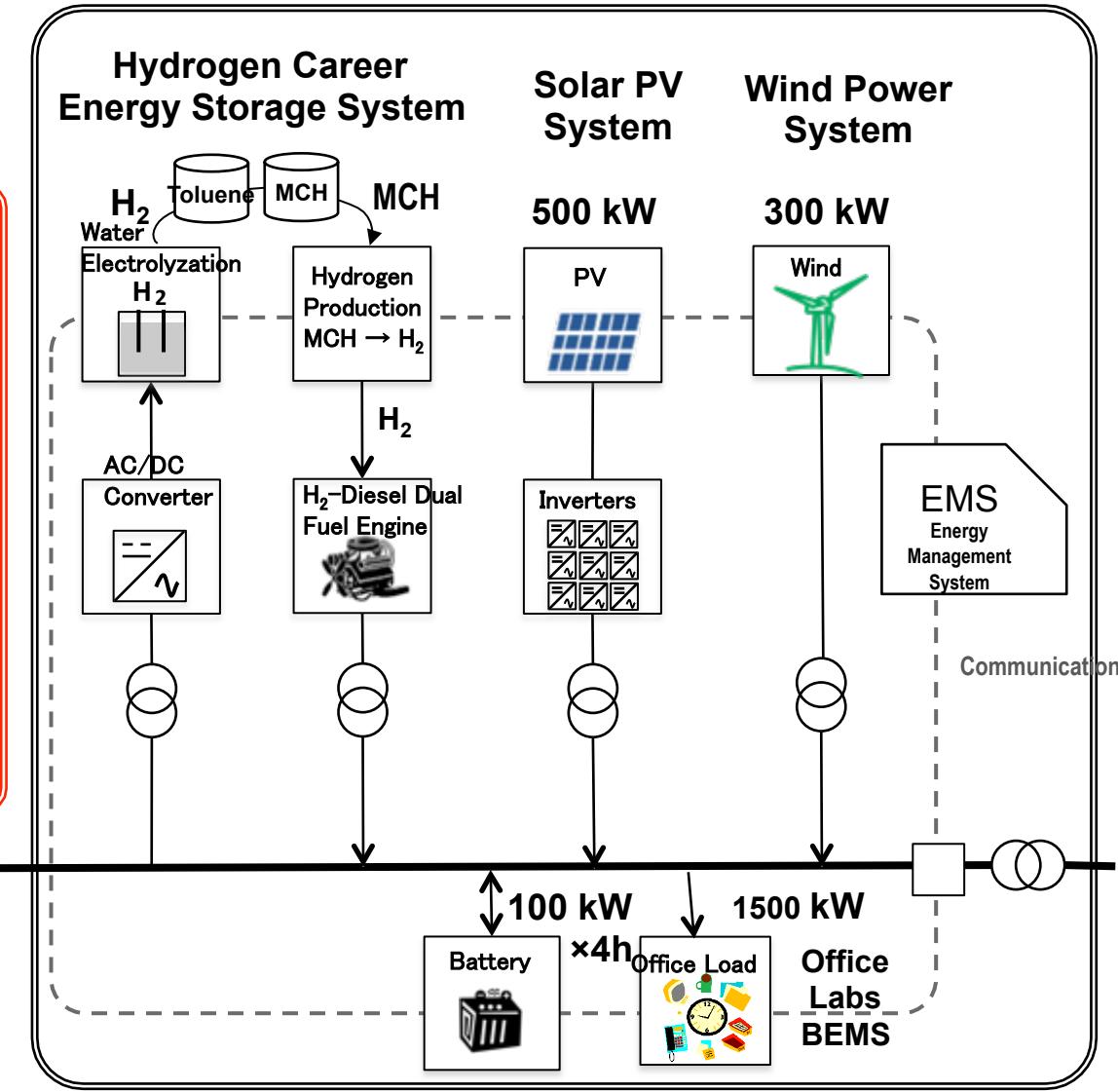
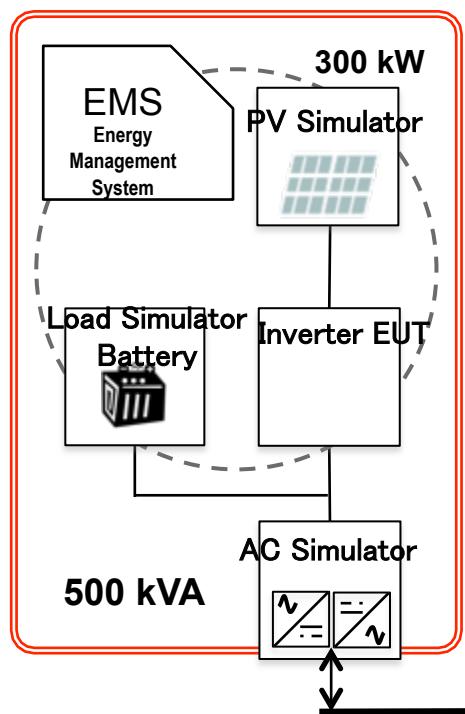
- MW PV, wind power integration with storage (batteries, hydrogen)
- ICT network for power generation forecast and system control
- Test bed for new technology (power electronics etc.), demonstration
- Grid connection test, international standardization



# Renewable Energy Network and Grid Connection Test Facility

2014 May

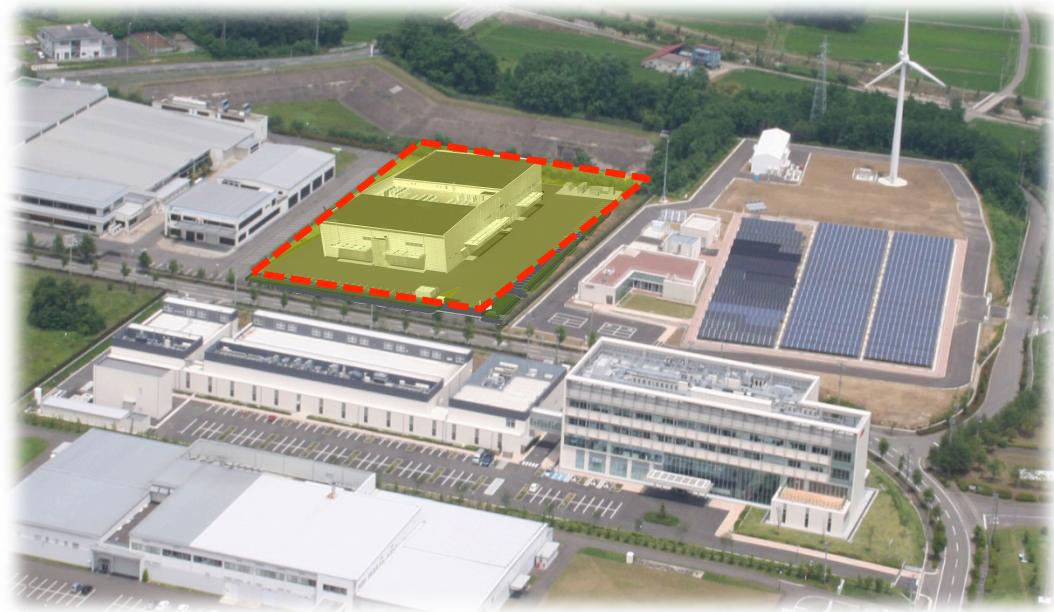
## Grid Connection Test Facility



# Expansion of Grid Connection Test Facility

EMC Test (Radio-wave Darkroom)		
AC Simulators	Grid Interconnection Test 1	
PV Simulators	Grid Interconnection Test 2	
Other Equipment	System Integration Test	Environmental Reliability Test (Chamber)

Total Floor Area: 5000 m<sup>2</sup>

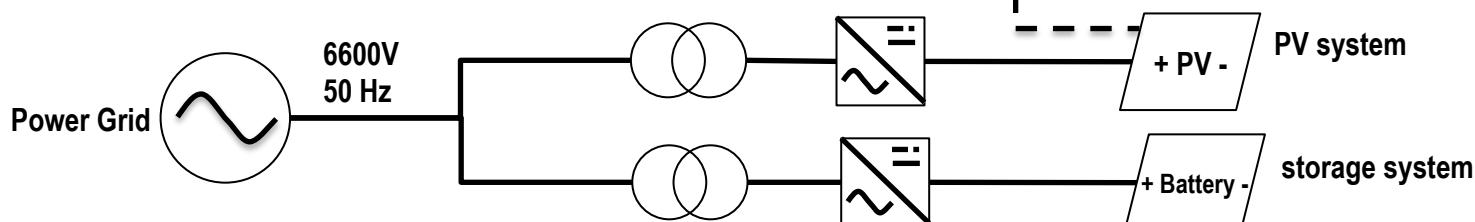
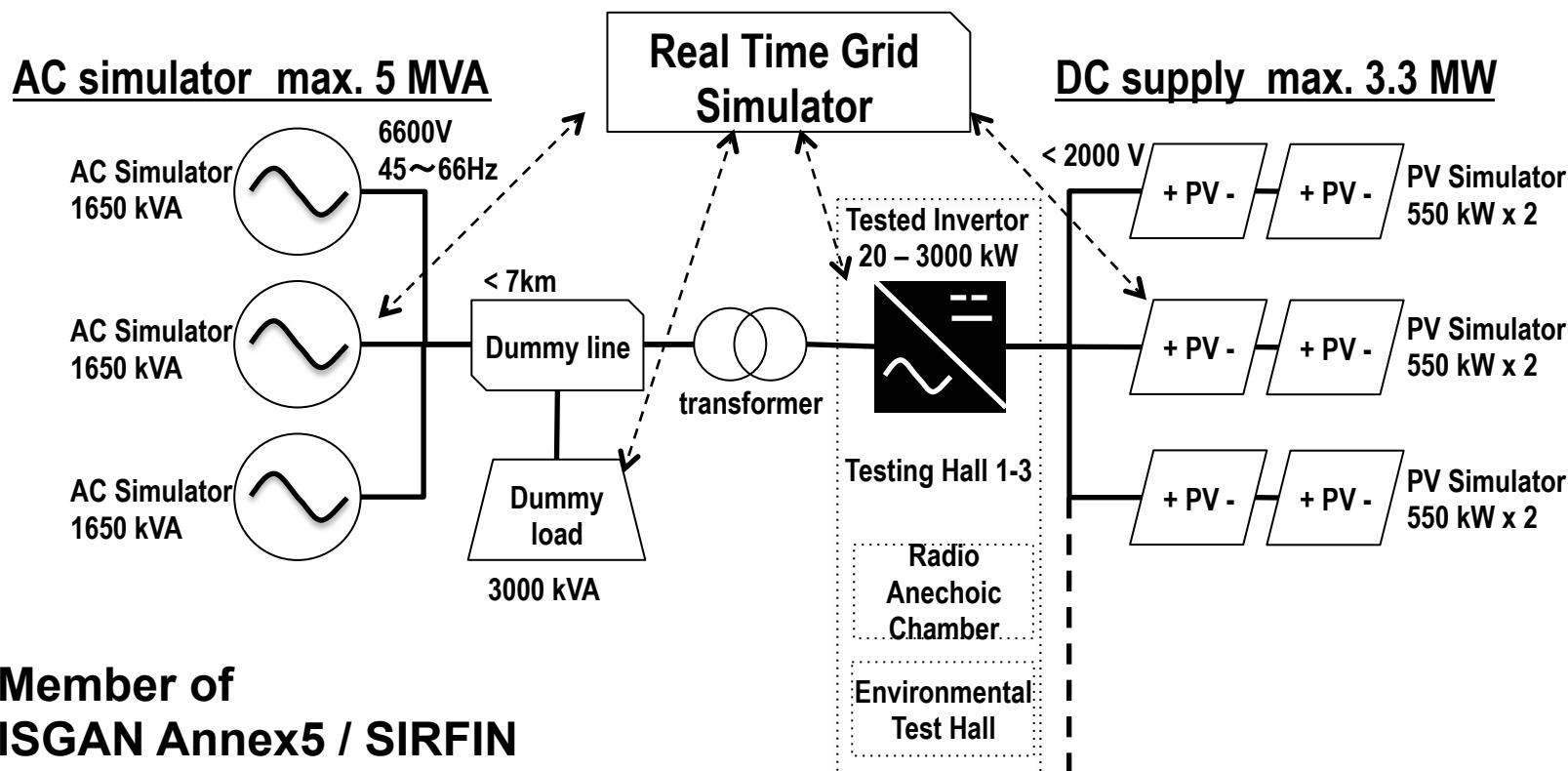


# 3MW Grid Connection Test Facility

1. Grid Interconnection
3. Environmental Reliability

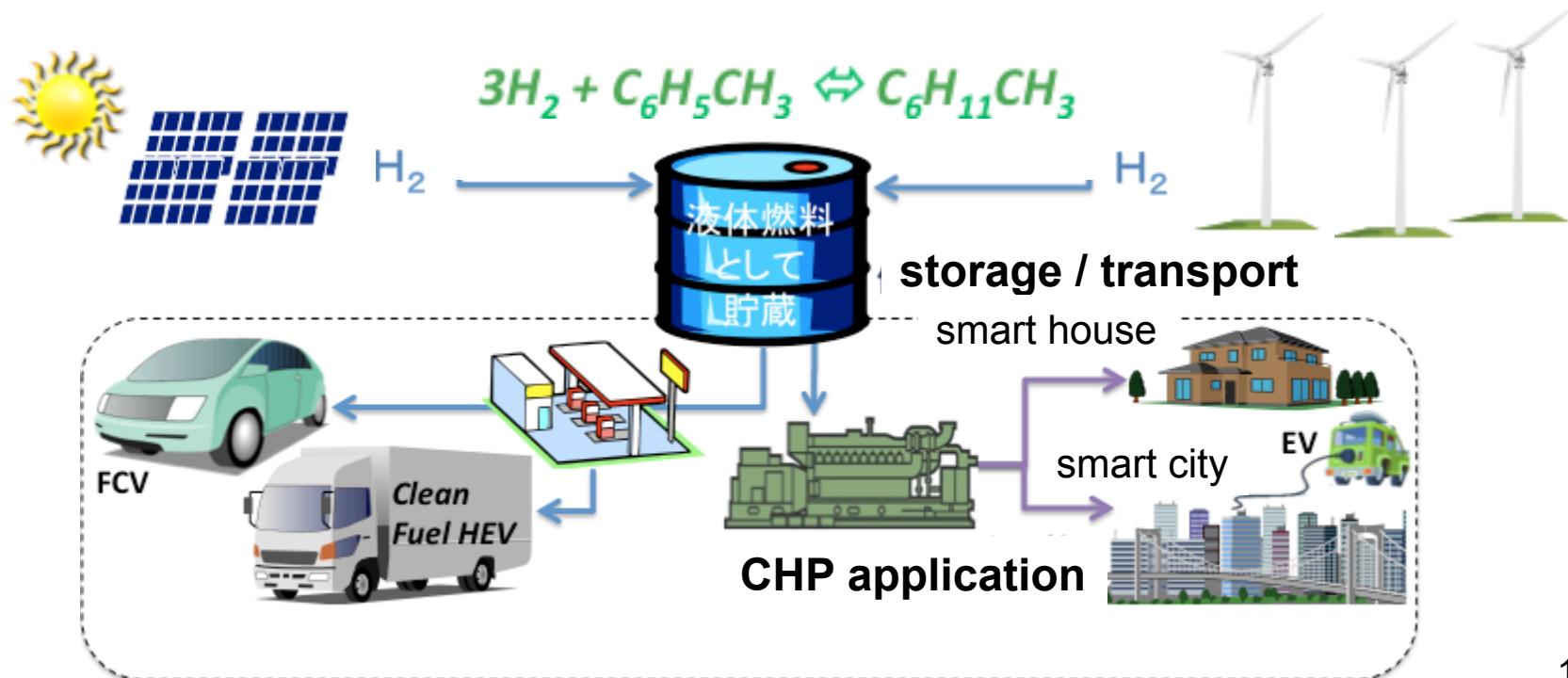
2. System Integration
4. EMC (Electromagnetic Compatibility)

2016 March



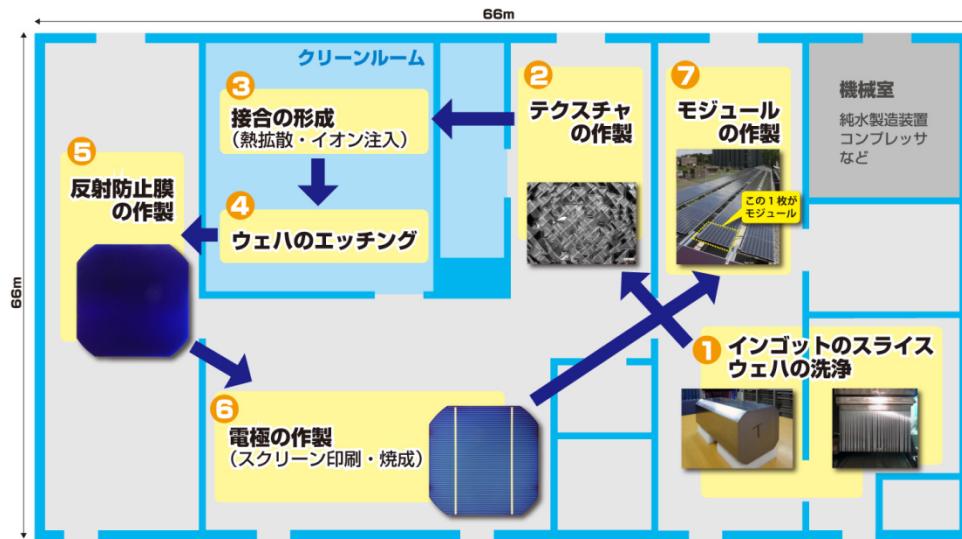
# Hydrogen Carrier Production / Application

- Hydrogen production from PV, wind turbine output
- Conversion to organic-hydrate (liquid at room temperature), large scale storage at high density
- $3H_2 + C_6H_5CH_3 \leftrightarrow C_6H_{11}CH_3$  (methyl-cyclohexane)
  - Hydrogenation / dehydrogenation by catalytic reaction
- Combined heat and power application by engine / fuel cell

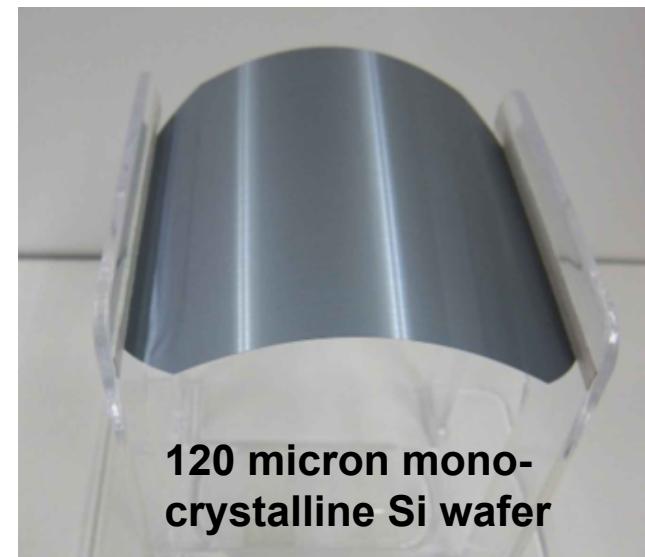


# New PV Module Development

- Thin wafer c-Si module production R&D for cost reduction
  - 100 micron crystalline Si wafer, light weight, low cost module
  - 23 companies consortium
- Next generation Si cell R&D (Fukushima, Tohoku Univ.)
- “Future-PV Innovation” Project (JST, nano-wire Si cell)

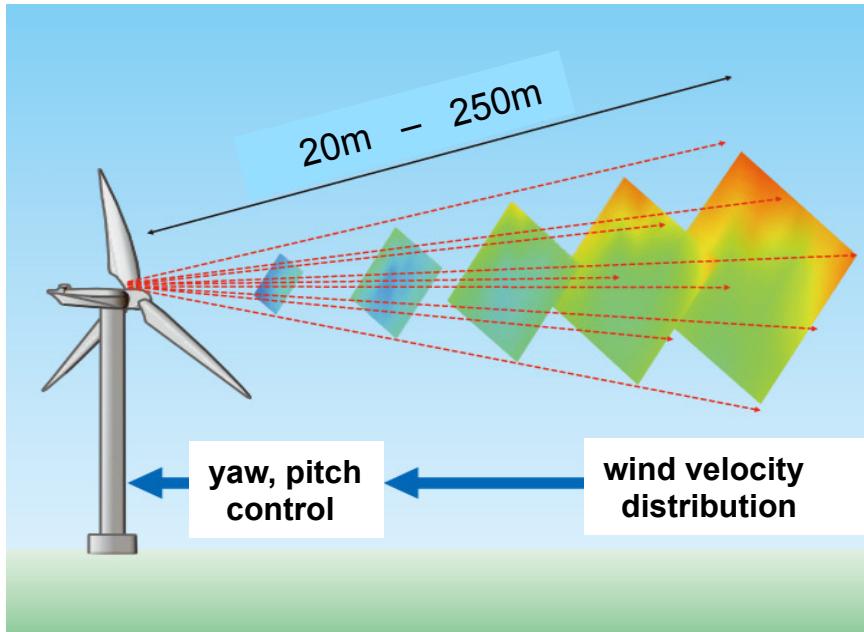


Model mass production line for  
100 micron wafer PV module



# Advanced Wind Turbine Control /monitoring

- Advanced wind turbine control
  - Application of LIDAR for better control and performance
- Turbine and sound monitoring and power generation forecast technology



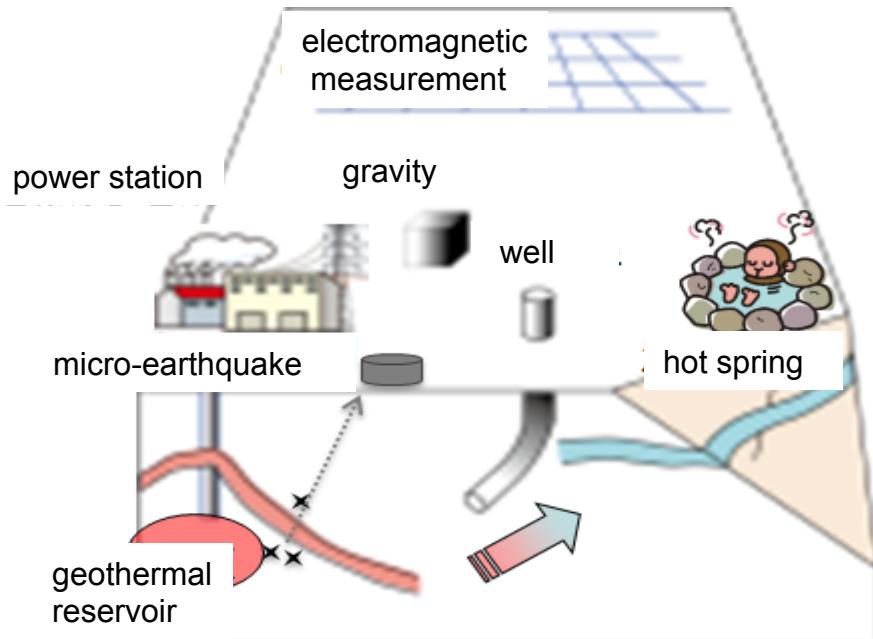
LIDAR application



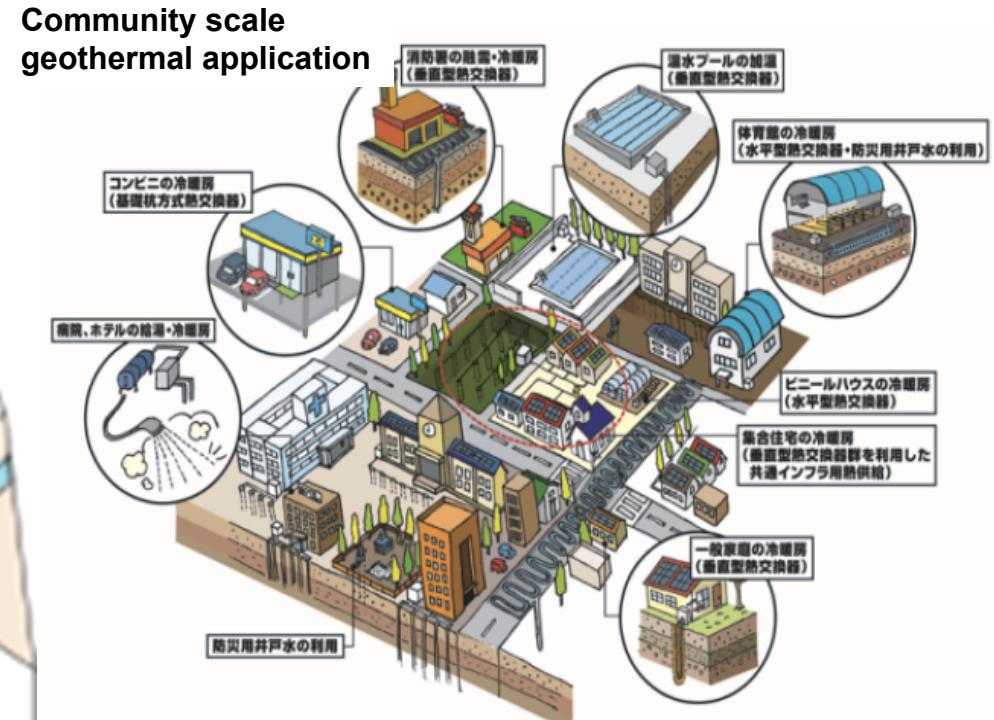
Sound monitoring system

# Geothermal Energy Application

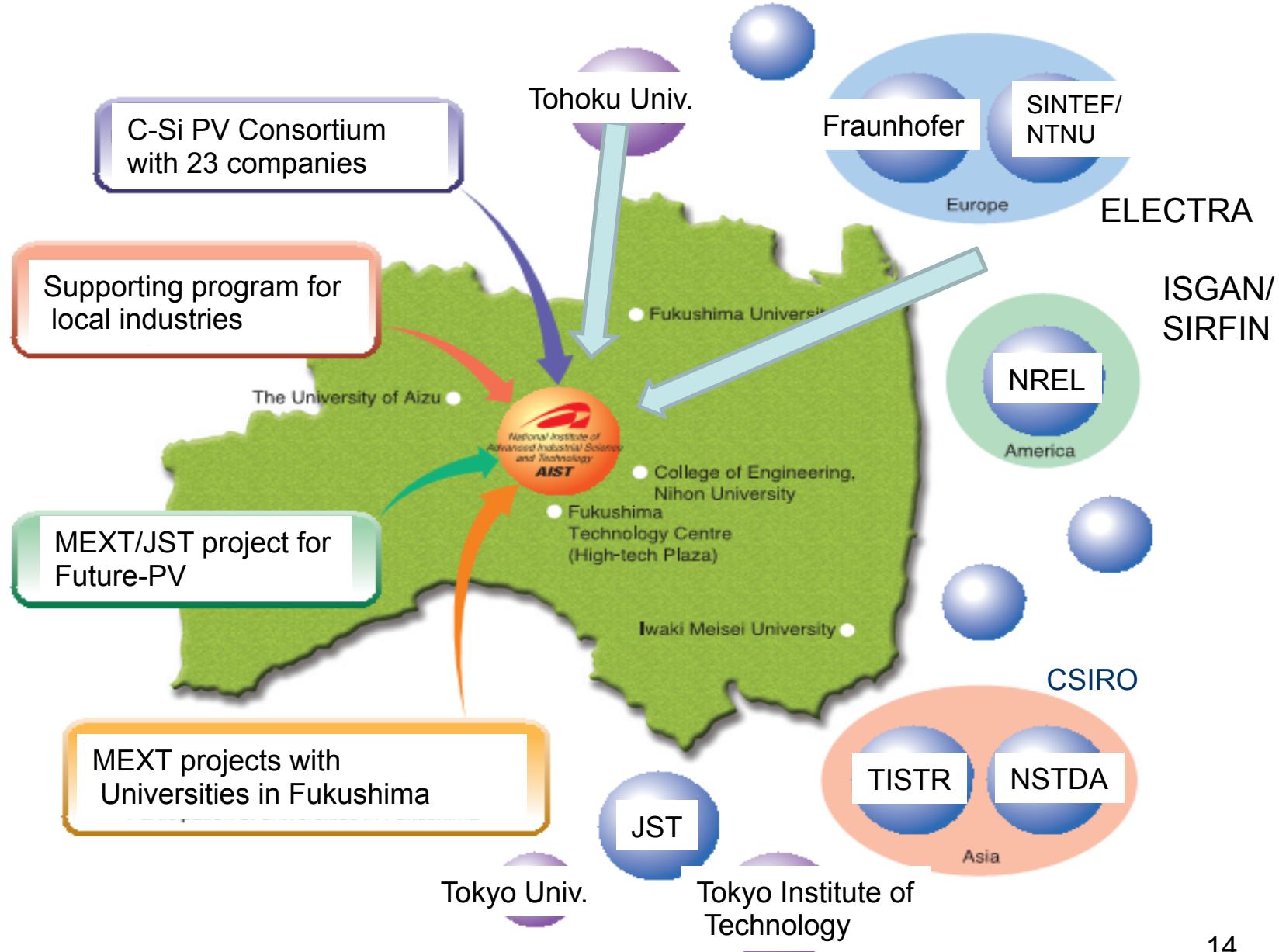
- Geothermal reservoir monitoring technology
  - Acoustic, gravitational, electromagnetic etc.
  - For proper development of power plant, coexistence with hot-spring



- Heat exchange potential map for proper geothermal heat pump system design
- Community scale geothermal heat pump system development



# Active Collaborations



# Summary

- Fukushima renewable energy institute works
  - as international R&D hub for renewable energy
  - with industry, universities, research institutes
  - 260 people working / 1000 visitors / month
- Contributes to
  - realize high rate introduction of renewable energy for future sustainability
  - promote new industry especially in damaged area through R&D and education



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Advanced Industrial Science  
and Technology

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