

# Introduction to Renewable Microgrid Project in UAE

International Off-Grid Renewable Energy Conference

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# GGGI's Introduction(1)

## Vision and Core Business

### Vision

A world-class international organization dedicated to promoting and disseminating green growth worldwide, grounded upon partnerships between developing and developed countries & public and private sectors

Research

GG Planning & Implementation  
(Country Program)

Public-Private  
Partnership

**GGGI**

Capacity Building  
& Knowledge  
Sharing

# GGGI's Introduction(2)

## Moving forward and Moving fast



**"GGGI will significantly contribute to a variety of UN's activities regarding climate change"**

- *UN Secretary General  
Ban Ki Moon*

**The Creation of GGGI announced by President of Korea at the UNFCCC COP-15**



**GGGI is launched at the East Asia Climate Forum**



**Opening of the Copenhagen Office**



**Opening of GGGI Abu Dhabi Office**

**Copenhagen, Denmark  
December 2009**

**Seoul, Korea  
June 2010**

**Copenhagen, Denmark  
May 2011**

**Abu Dhabi, UAE  
July, 2011**

# GGGI's Introduction(3)

## Moving forward in 2012 and beyond...

*A G20 Priority: Promote sustainable development with focus on infrastructure, energy efficiency, green growth and financing the fight against climate change.*



**RIO+20**  
United Nations Conference  
on Sustainable Development

*Rio+20 Focusing on two themes: (a) a green economy in the context of sustainable development and poverty eradication; and (b) the institutional framework for sustainable development.*



**Green Growth  
Knowledge Platform  
Launch Conference –  
Mexico City 12<sup>th</sup>-13<sup>th</sup>  
January**

**Global Green  
Growth Summit  
May 2012**

**16 countries signed  
the agreement of GGGI  
establishment as an  
Int'l Organization at  
Rio**

**Conversion into an  
International  
Organization**

**Mexico  
January 2012**

**Seoul, Korea  
May 2012**

**Rio, Brazil  
June 2012**

**Seoul, Korea  
Oct. 23 2012**

**\* Chairman : Lars Løkke Rasmussen, Former Prime Minister, Denmark**

**\* Korea selected as host of Green Climate Fund(GCF) secretariat (Oct. 20.2012)**

## GGGI's International Partners

### Countries



### Organizations



### Private Sector



By end 2012 GGGI aims to get fully converted into an international, multi-stakeholder organization.



# UAE Project Overview & Approach



- **Background**

- Masdar Institute of Science and Technology (MI) of the United Arab Emirates proposed an initial idea on the Project to GGGI (Oct. 2010)
- MI an essential link to an industrial Partner within GGGI's partnership network – Research Institute of Industrial Science & Technology (RIST) affiliated with Korea's POSCO group.

- **Project Period:** July 2012 ~ March 2013, 8 Month

- **Project Outcome**

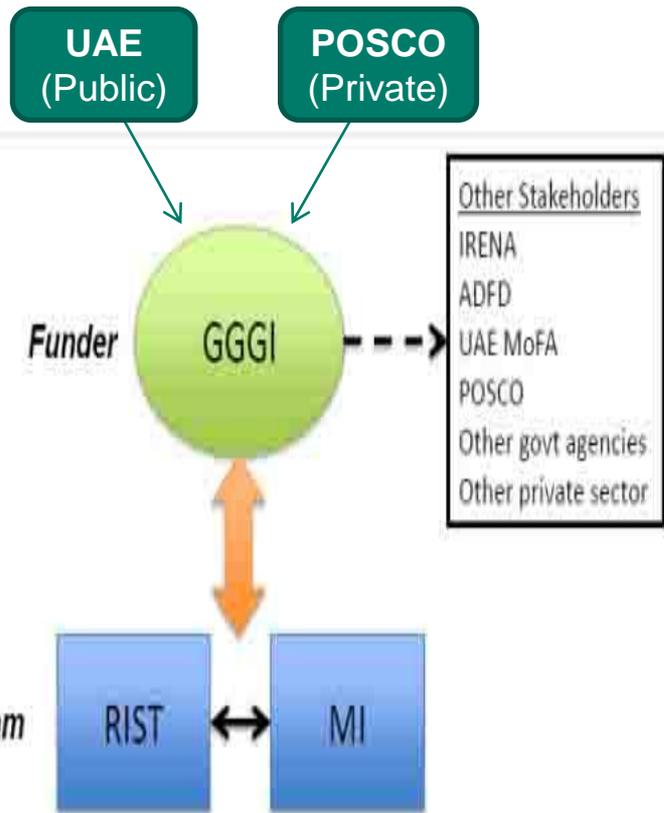
- (i) Detailed design and economical analysis for micro grid demonstration at the selected site in UAE (*Futaisi Island*);
- (ii) An action plan for phase 2 including the project organization, construction plan, cost estimation and financial analysis

- **Project Structure** : co-directed by MI and RIST by a joint management team

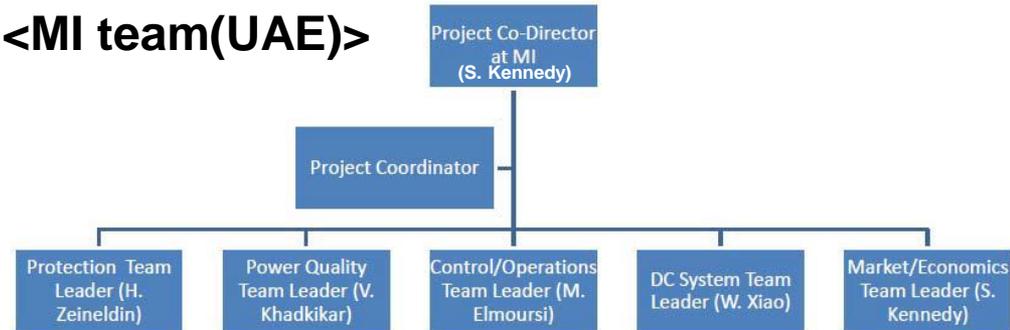
# UAE & Korea Joint Project Team

[R&R]

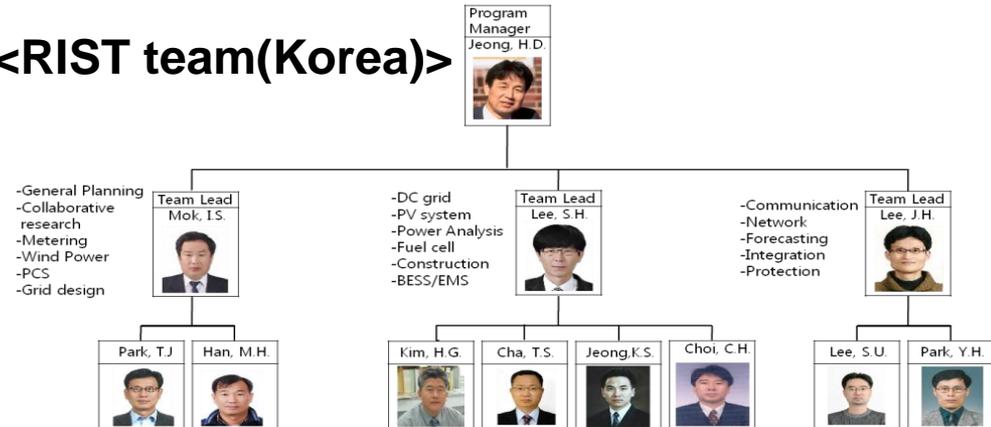
- MI : fundamental technologies research, socio-economic approach and site info.
- RIST : Commercialization technologies based on Jeju island testbed experience



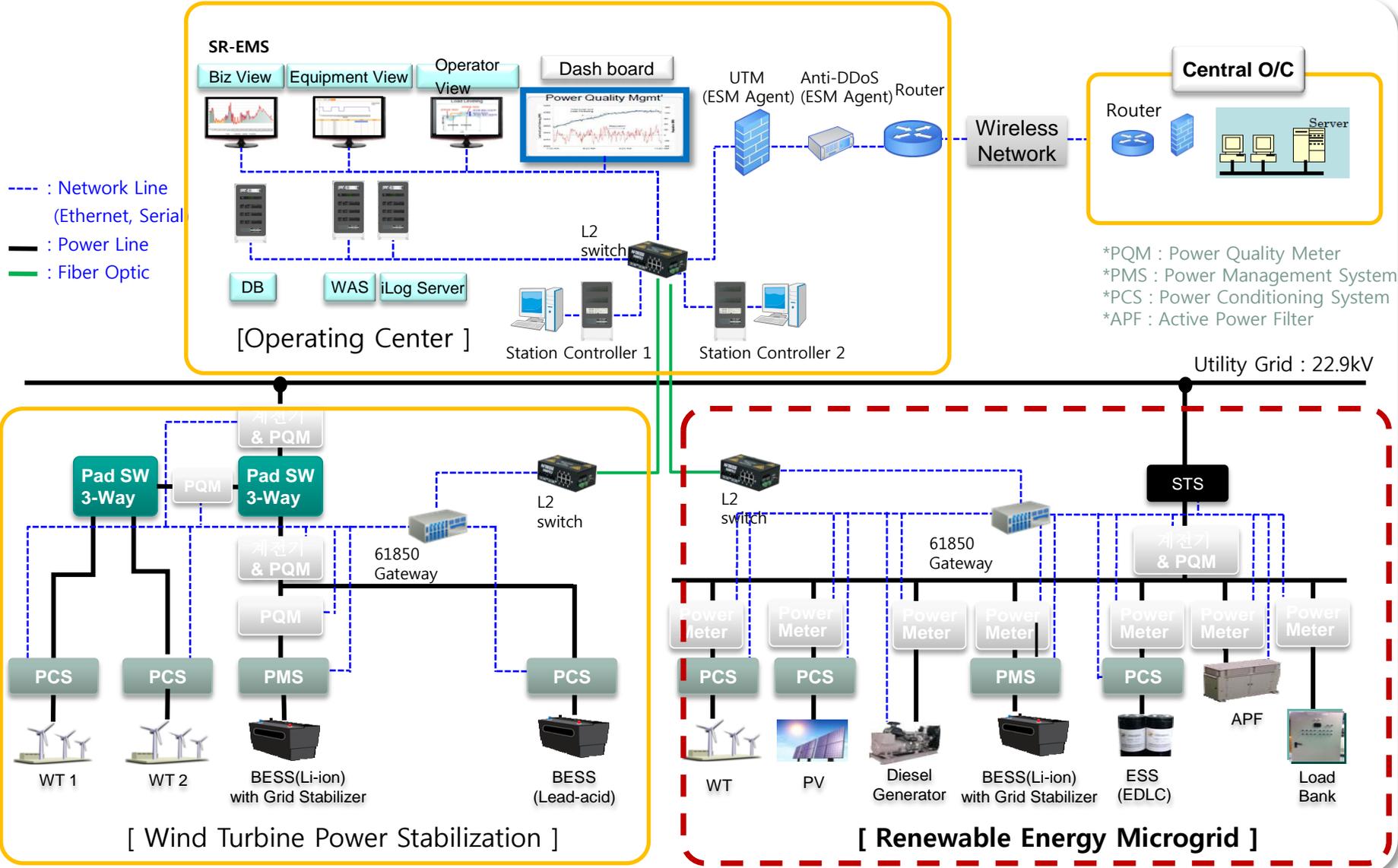
## <MI team(UAE)>



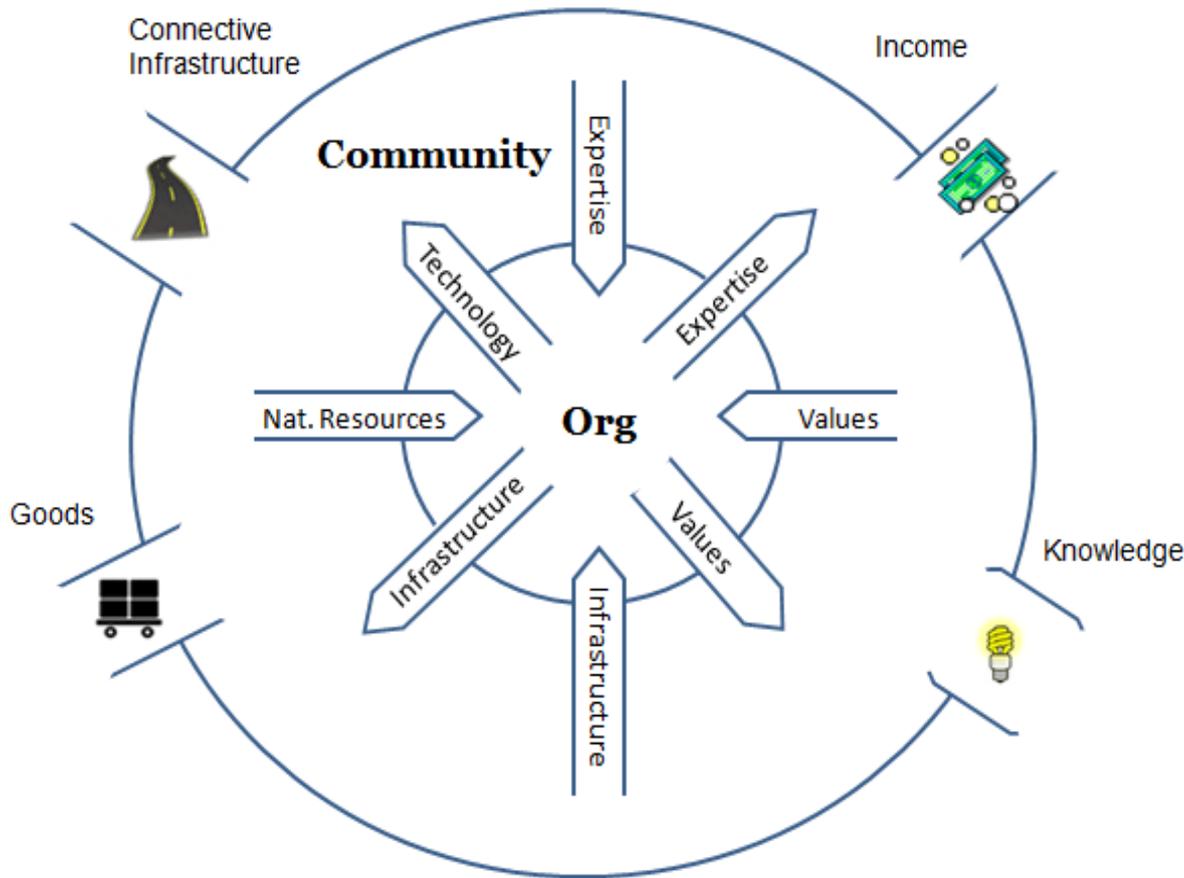
## <RIST team(Korea)>



# \* Jeju island Smart Grid Test bed in Korea (RIST)



## External



- Case studies on non-technical barriers for rural energy programs
- Developed system design and requirements engineering concepts for energy access programs



# UAE Project Design Concept





## **100 % renewable based micro-grid system and Smart Grid**

To assure the high efficiency and reliability.

## **Robust system to cope with any unanticipated problems**

## **Energy storage system for grid stability.**

## **Realization of zero emission transportation**

Electric Vehicle and boat

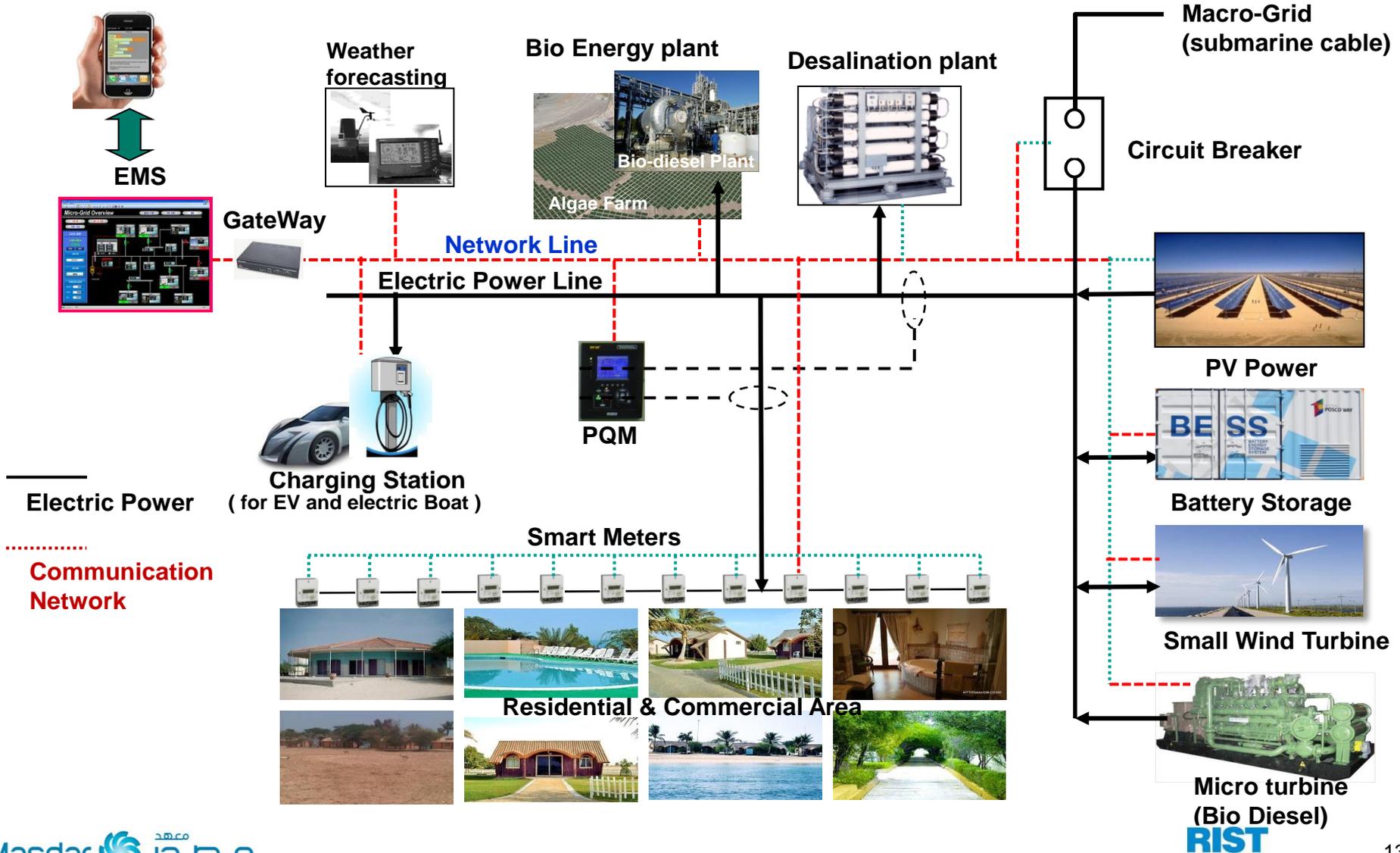
## **Innovative micro-grid model design with AC & DC hybrid grid**

differentiated from conventional System

## **Grafting the research results and experiences obtained from Jeju smart grid test bed, Korea**

# Microgrid Structure

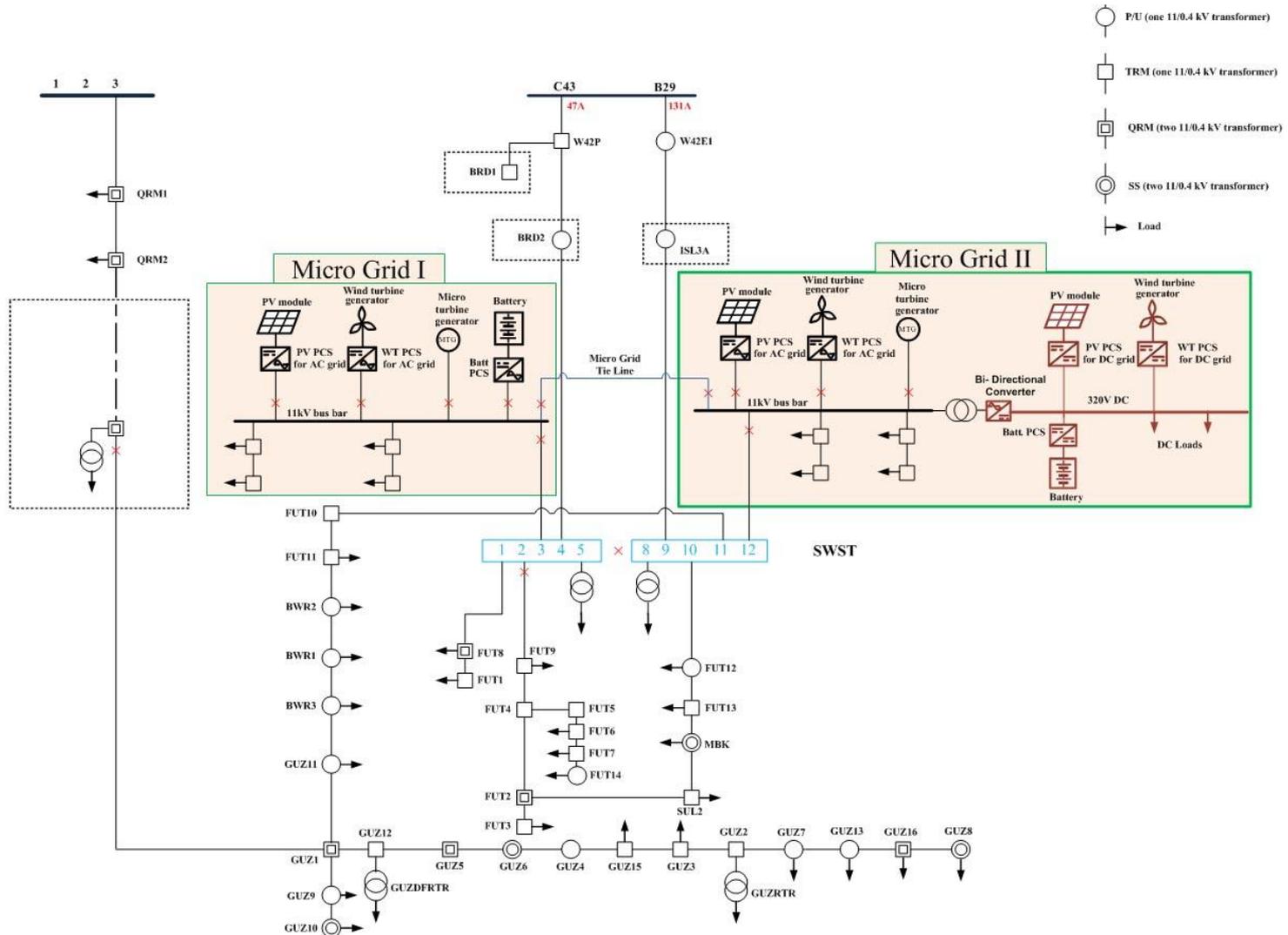
## Basic configuration of smart micro grid systems



# Elements for UAE Microgrid System

Elements		Functions & Remarks
Energy Sources	PV power	<ul style="list-style-type: none"> <li>- Zero emission power source</li> <li>- Consideration of climate and geometric condition</li> </ul>
	Wind power	<ul style="list-style-type: none"> <li>- Small wind power</li> </ul>
	ESS	<ul style="list-style-type: none"> <li>- Night time energy source (Energy storage and grid stabilizing)</li> </ul>
	Micro turbine	<ul style="list-style-type: none"> <li>- Emergency dispatch power source (using bio diesel from Algae farm)</li> </ul>
Smart Meter		<ul style="list-style-type: none"> <li>- Real-time remote metering</li> <li>- Bi-directional information exchange and consumer load control</li> </ul>
EV Charging Station		<ul style="list-style-type: none"> <li>- zero emission vehicle and Boat</li> </ul>
Energy Management System (EMS)		<ul style="list-style-type: none"> <li>- Macro grid connection control</li> <li>- Consumer demand monitoring and demand response control</li> <li>- Weather information based demand prediction</li> <li>- Grid operation optimization and stabilization</li> <li>- Battery storage control (charge and discharge control)</li> <li>- Desalination plant operation using surplus energy</li> </ul>
Network & Security		<ul style="list-style-type: none"> <li>- Full connectivity for each unit (information &amp; control network)</li> <li>- Economic and expandable network configuration</li> </ul>
Desalination plant		<ul style="list-style-type: none"> <li>- To use surplus energy efficiently</li> <li>- Water storage</li> </ul>
Bio energy plant		<ul style="list-style-type: none"> <li>- Algae farm and Bio-fuel production</li> </ul>

# \* Example configuration of Microgrid systems



## Phase 3 : Actual Projects in Developing Countries

- Selective Tech. from Phase 2
- Robust, Cost minimizing
- Various options for funding

## Phase 2 : UAE Microgrid

- Middle East Optimizing Robust Renewable Microgrid
- Various Options (DC Distribution, Desalination, Bio fuel, etc.)
- Design PPP scheme

## Phase 1 : Jeju Island R&D

- Developing Technology of Renewable Microgrid
- Basic option of Renewable Off grid system
- R&D Project (Government/Private matching)

## Type of Grid Connection

### Strong Grid

- **Motivation:** High reliability, visibility of renewables
- **Applications:** Data centers, hospitals, campuses
- **Requirements:** Energy storage, rapid islanding

### Weak Grid

- **Motivation:** Frequent power backup, clean & green supply
- **Applications:** Commercial/residential centers, industry parks
- **Requirements:** Islanding, local generation, power conditioning

### Off-Grid

- **Motivation:** Full-time power, clean & green supply
- **Applications:** Village power, islands, military camps
- **Requirements:** Local generation, energy storage, demand management

➔ It's essential to develop robust commercial renewable microgrid technology for commercializing weak and off-grid package.

# Thank You

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