Smart Renewable

Jeju island Pilot Project

KEPCO

CONTENTS

I. Jeju island SG Pilot Project

JEJU SG Pilot Projects

For the Technical Verification of SG, and Business Model Development

SG Road Map

VISION Foundation for Low-Carbon Green Growth based on Smart Grid

PHASE

1st Phase(2013)	2nd Phase(~2020)	3rd Phase(~2030)
Field Test in JEJU	Application in Wide Area (SG City Project)	Nationwide Application

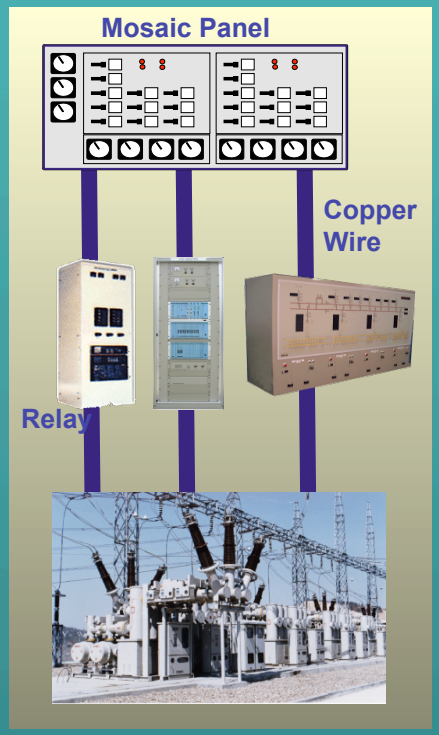
Main 5 Sectors

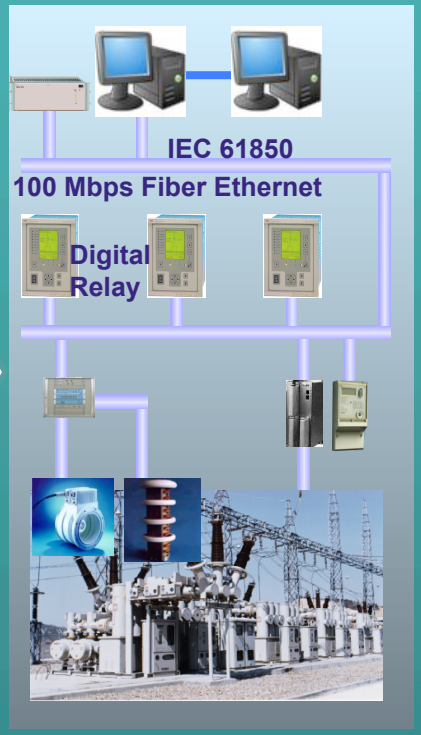
- Smart Power Grid
- Smart Place
- Smart Renewable
- Smart Transportation
- Smart Elec. Service

I-1. Smart Power Grid

Targets New Intelligent Power Grid Management System with “Smart” Functions based on IT technology

Benefits Labor Cost and Time Saving, Reliability & Efficiency Improvement





Contents

- Two 154kV Substations and Feeders will be digitalized based on IEC 61850
- Fault Prediction System with Intelligent sensors
- Intelligent Distribution Management System

※ DAS installation completed on 2004

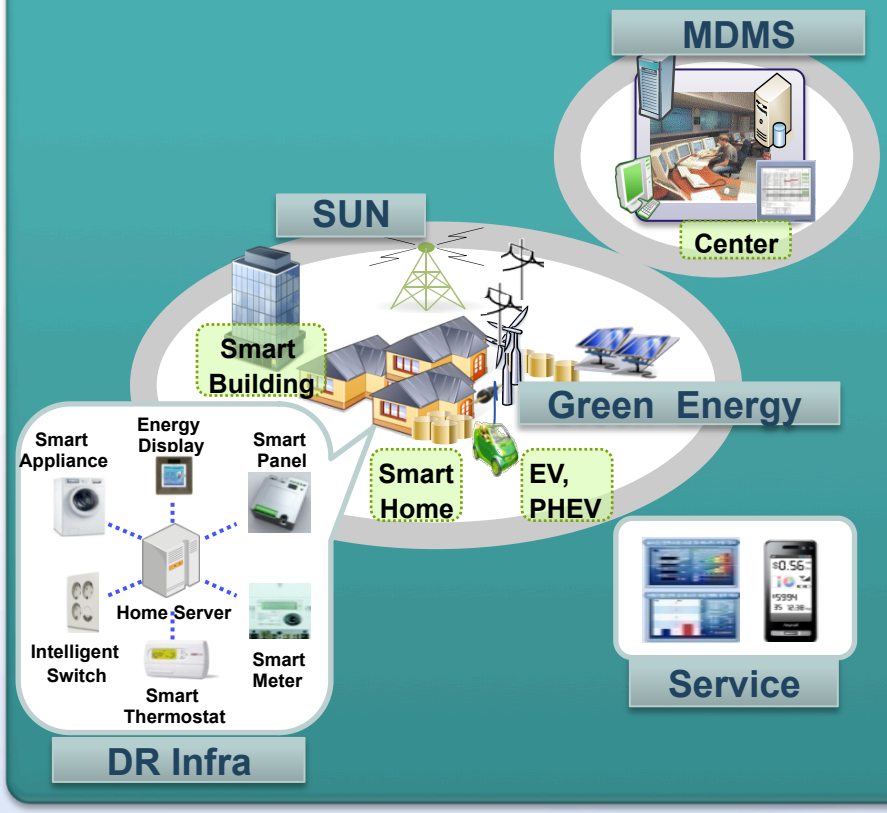
Schedule

- 1st (2010. 6~2011. 5) : Device installation
- 2nd~4th (2010. 1~ 2013.11) : Device test , Operation and Assessment

I-2. Smart Place

Targets Load Management by Demand Response under AMI environment

Benefits Load Leveling, Energy Efficiency Improvement, Cutting Electric Charge



Contents

- Smart Meters / MDMS
- Integrated Metering System /Energy Portal
- Two-way Power Exchange / Other Services

※MDMS – Metering Data Management System

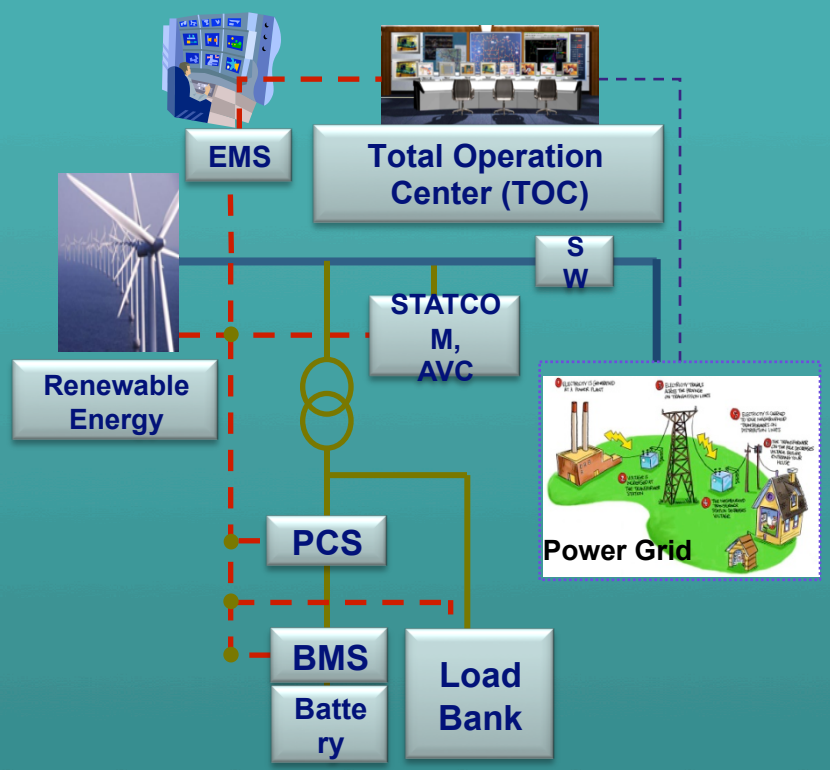
Schedule

- 1st(2009.12~2010.5): Planning & Field Survey
- 2nd(2010.6~2011.5): Service Models & Solutions
- 3rd(2011.6~2012.5): Field Test
- 4th(2012.6~2013.5): Conclusion

I-3. Smart Renewable

Targets Stabilization of unstable power from renewable energy sources

Benefits DGs' stable interconnection with Network



Contents

- 4 Types of System Configurations
- 3 Types of Power Stabilization Mode, including control Algorithm

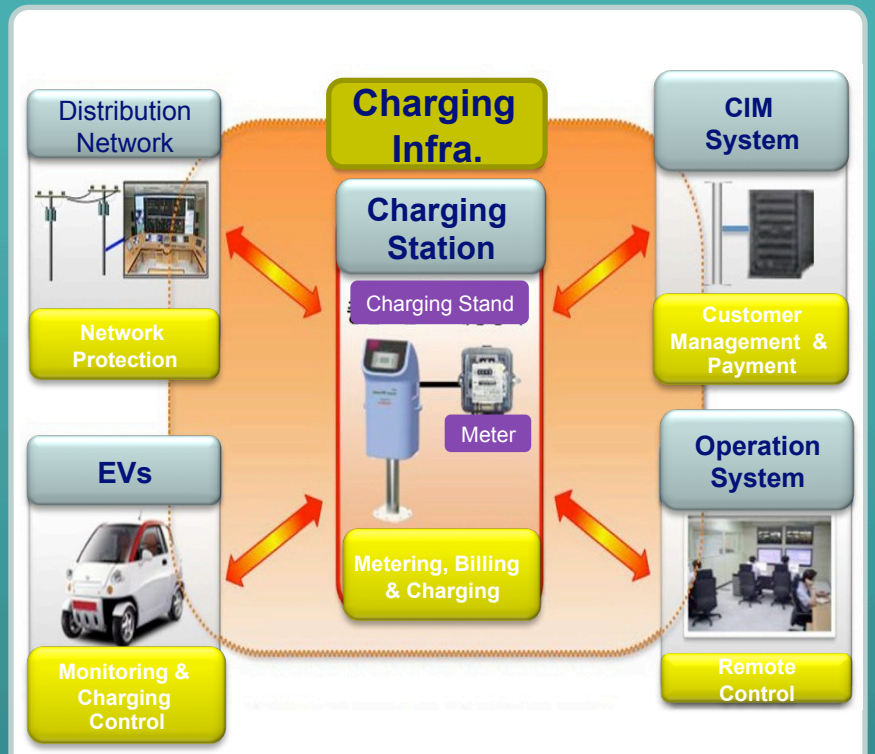
Schedule

- 1st(2009.12~2010.5): Designing
- 2nd(2010.6~2011.5): Device Production
- 3rd(2011.6~2012.5): Field Test
- 4th(2012.6~2013.5): Conclusion

I-4. Smart Transportation

Targets Preparation for EVs Charging Infrastructure

Benefits Contribution for EV's fast spread, Power Sales Increment



* CIM : Customer Information Management

Contents

- Various charging stands by case
  - Quick, Slow, Inductive, High Capacity Storage
- Operation System for Charging Station / / Information Security / Other services
- Standardization of Charging Interface

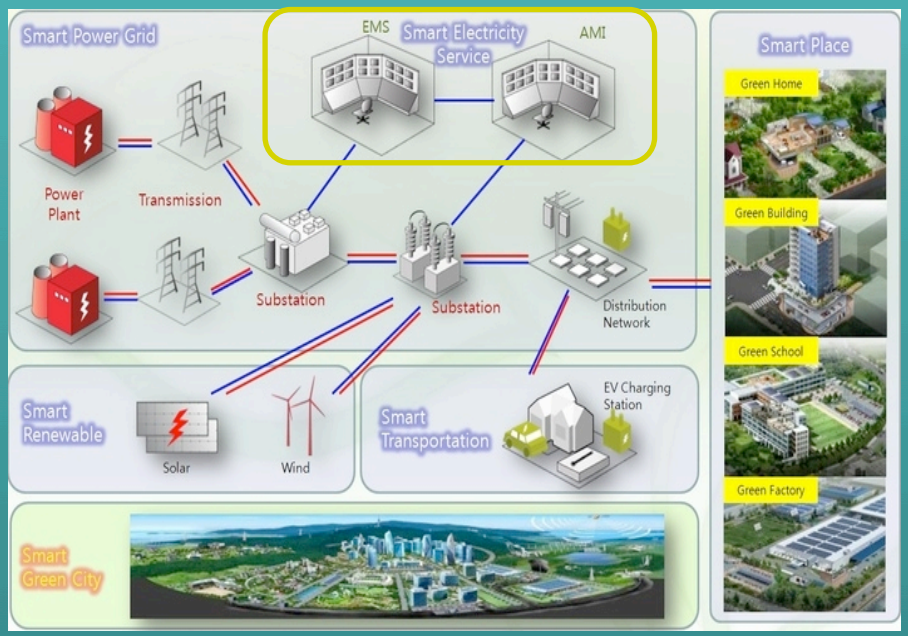
Schedule

- 1st(2009.12~2010.5): Designing
- 2nd(2010.6~2011.5): Infra. Construction
- 3rd(2011.6~2012.5): EV operation & Test
- 4th(2012.6~2013.5): Assessment

I-5. Smart Electric Service

Targets Support of Power Trade on RTP market, and integrated Operation Center

Benefits Business platform Development in the future



Contents

- Virtual Power Market Operation System (EMS)
- Real-time Tariff Test,
- Energy Information Portal

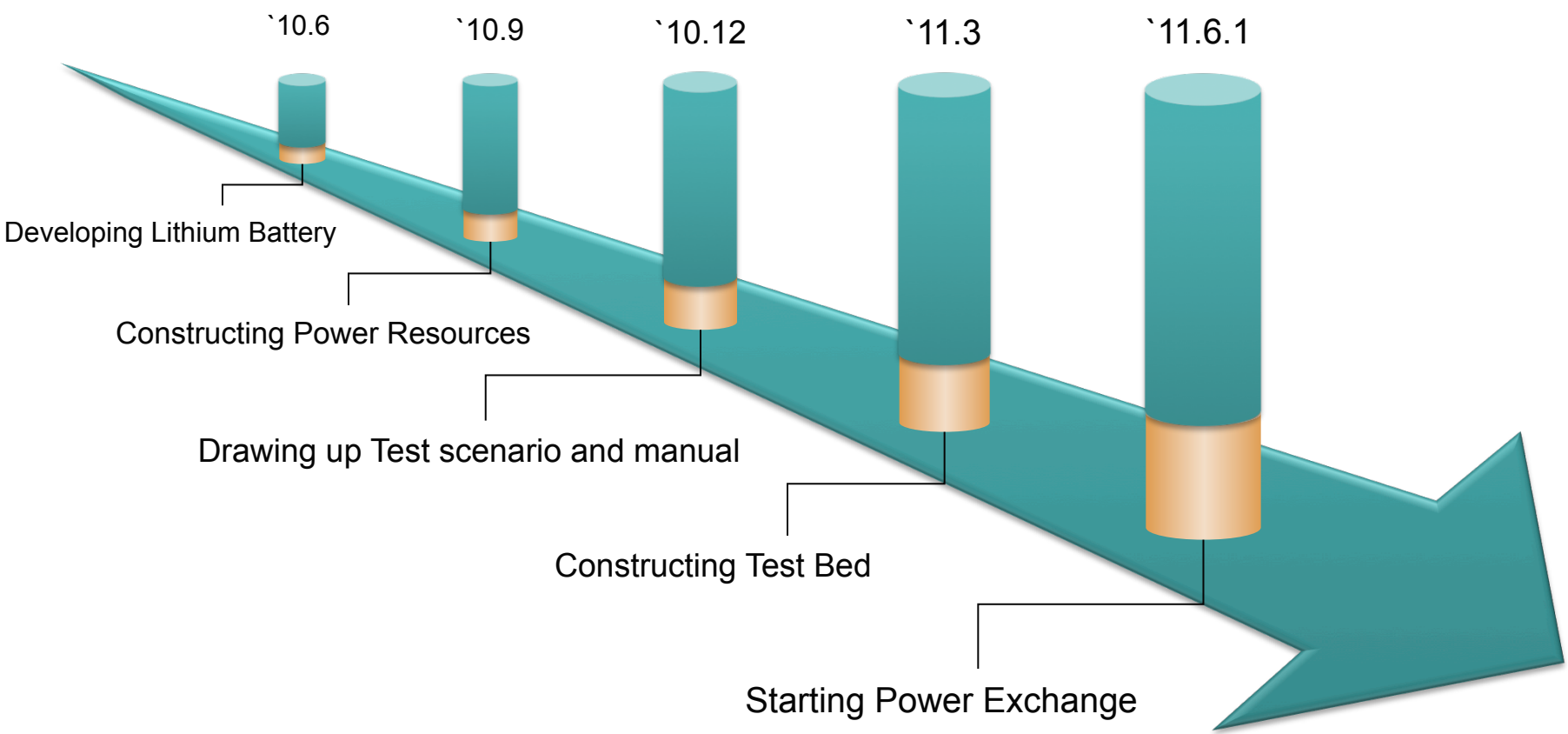
Schedule

- 1st(2009.12~2010.5): Designing
- 2nd(2010.6~2011.5): Installation & Pilot test
- 3rd~4th (2011.6~2013.5): Integrated Field Test, Assessment

II. SR Test-Bed Project

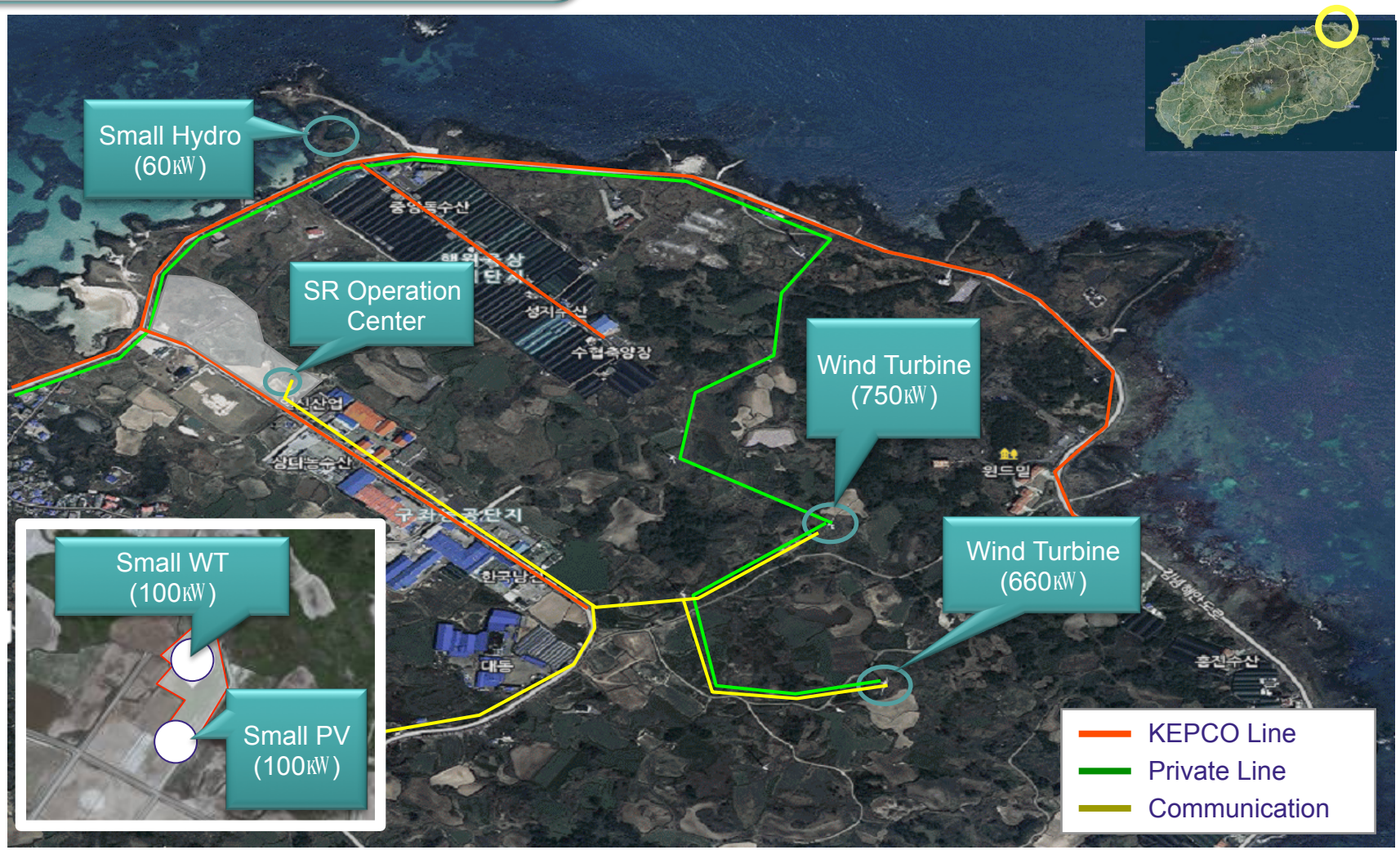
Road Map

1st(2009.12~2010.5)	2nd(2010.6~2011.5)	3rd(2011.6~2012.5)	4th(2012.6~2013.5)
Designing	Devices Production	Field Test	Analysis & Commercialization



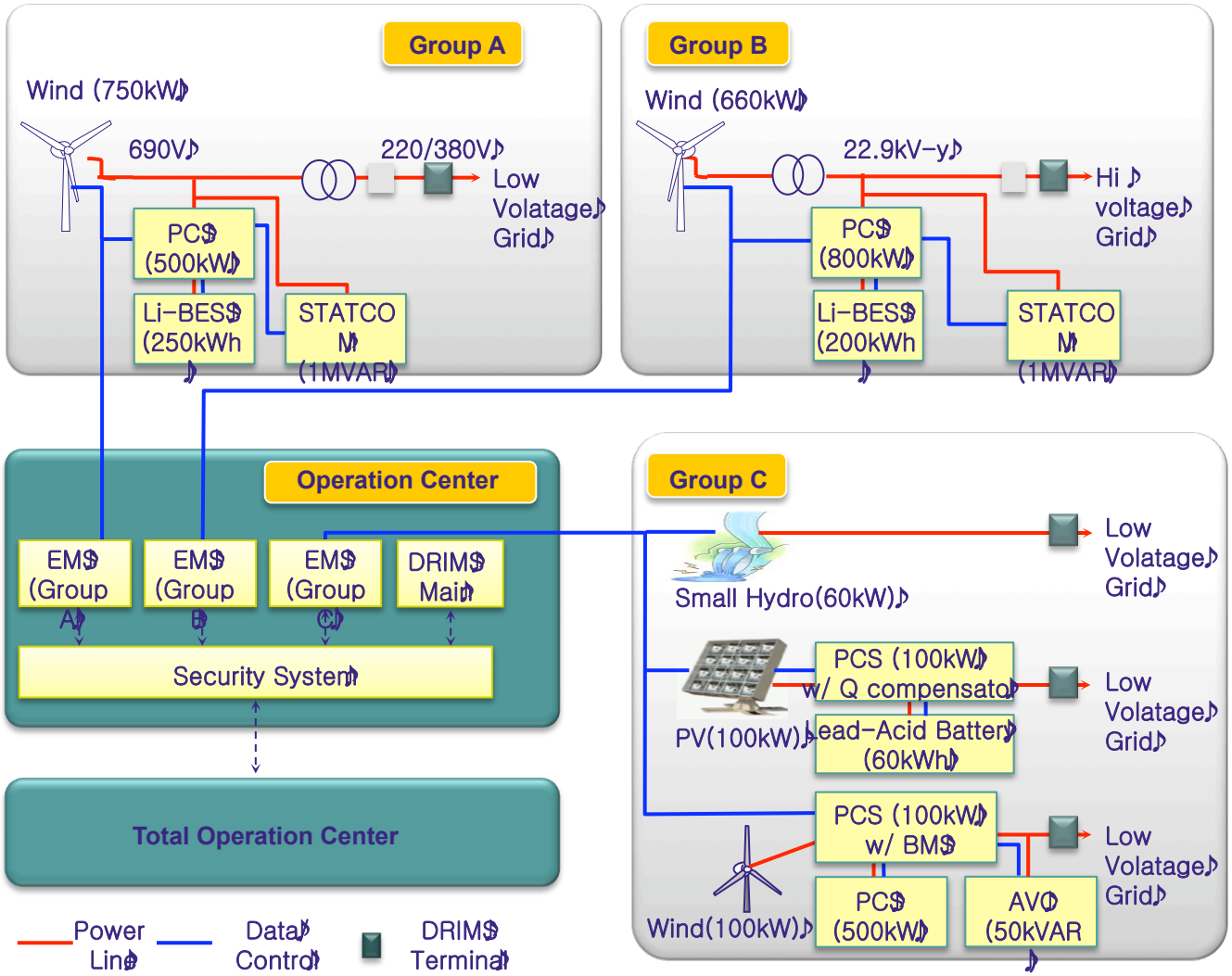
II. SR Test-Bed Project

Sky View of SR Test Bed



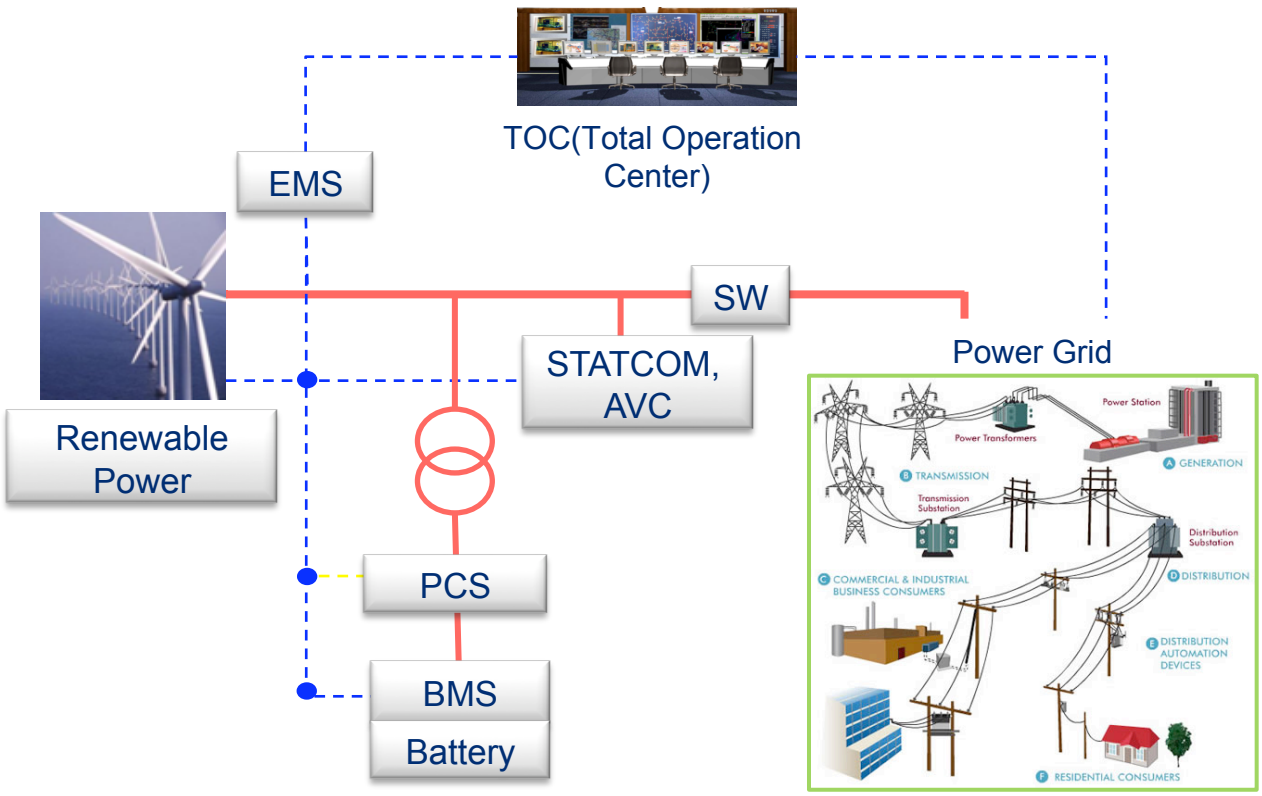
II. SR Test-Bed Project

Test-Bed Outline



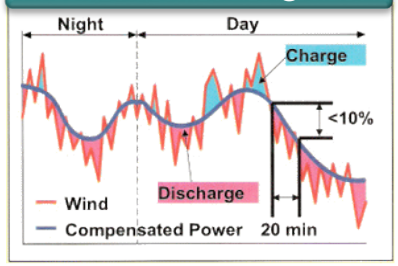
II. SR Test-Bed Project

System Configuration

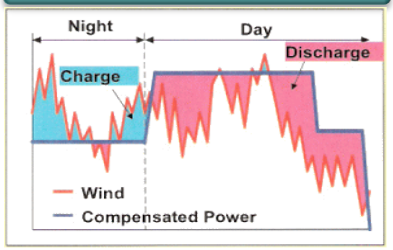


- EMS [Energy Management System]
- PCS [Power Conditioning System]
- AVC : Automatic Var Compensator
- BMS[Battery Management System]
- STATCOM [STATic synchronous COMpensator]

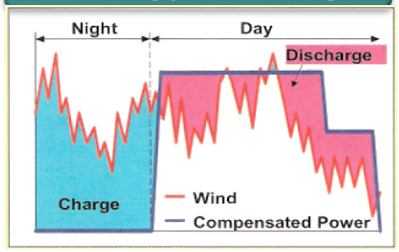
Smoothing



Constant Power



Energy Shifting



III. Output of SR Project

Energy Storage

Power		Capacity	Developer	Feature
Wind	660kW	Li 250kWh	LG Chem	45Wh/cell (energy density)
	750kW	Li 200kWh	SAMSUNG SDI	50Ah (cell capacitor)
PV		VRLA 60 kWh	ATLAS BX	7.5 years (life time)
Small Wind		Li 72 kWh	KOCAM	2,500times (life time)

☞ **V**alve **R**egulated **L**ead **A**cid

Power Conditioning System

Power		Capacity	Developer	Conversion Efficiency
Wind	660kW	500kW	LSIS	95%
	750kW	800kW	HYOSUNG	95%
PV		100kW	Intech FA	93%
Small Wind		100kW	EN Technology	93%

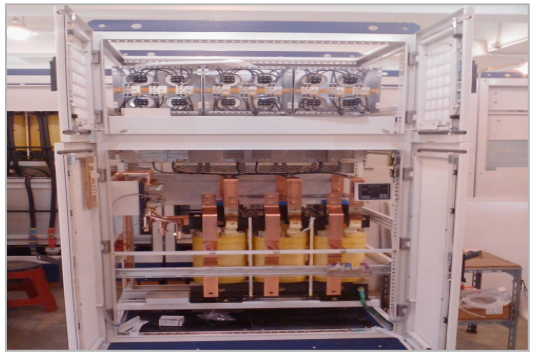
[PCS Producting]

III. Output of SR Project

PQ Compensator

- STATCOM (STATic synchronous COMpensator)

Power		Capacity	Developer	Reaction time
Wind	660kW	1MVAR	LSIS	34ms→17ms
	750kW	1MVAR	HYOSUNG	34ms→17ms



[STATCOM Producting]

- Distributed Resource Interconnection Management System (DRIMS)

Composition	Developer
Main, Terminal	KEPCO, KDN

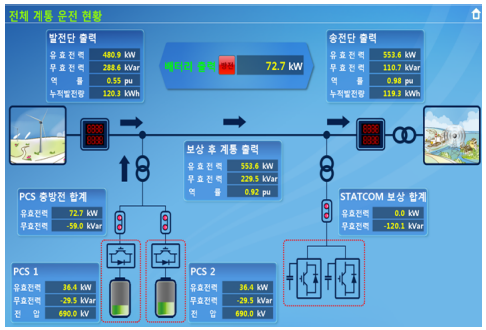
[DRIMS screen view]

III. Output of SR Project

Power Exchange

Energy Management System (EMS)

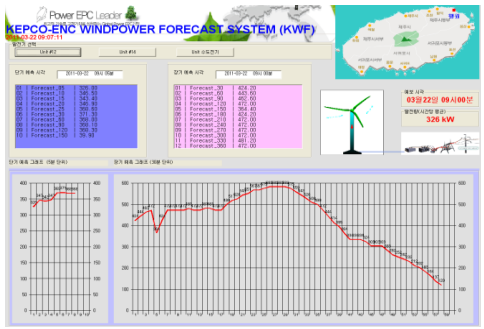
Power		Controlling Point	Developer
Wind	660kW	20,000	LSIS
	750kW	5,000	HYOSUNG
PV		1,000	KDN
Small Wind			



[Monitoring]

Wind Power Forcasting System

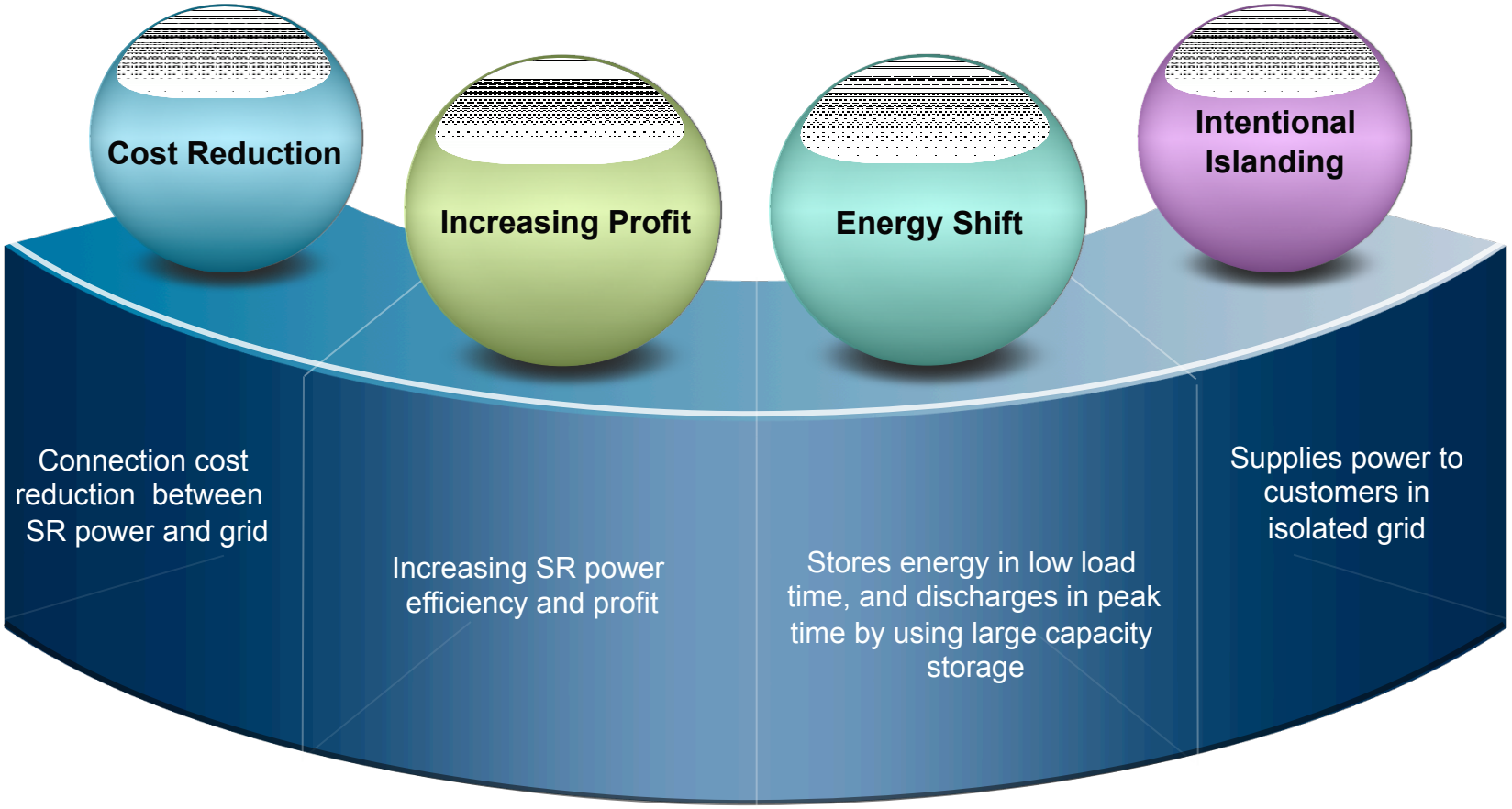
Fuction	Developer	Accuracy		Algorithm
Short & Short term Forcasting	KEPCO-E&C	Short term (2.5h)	85%	ARIMA statistic model
		Long term (38h)	80%	Meteorological model



[screen view]

IV. Business Models

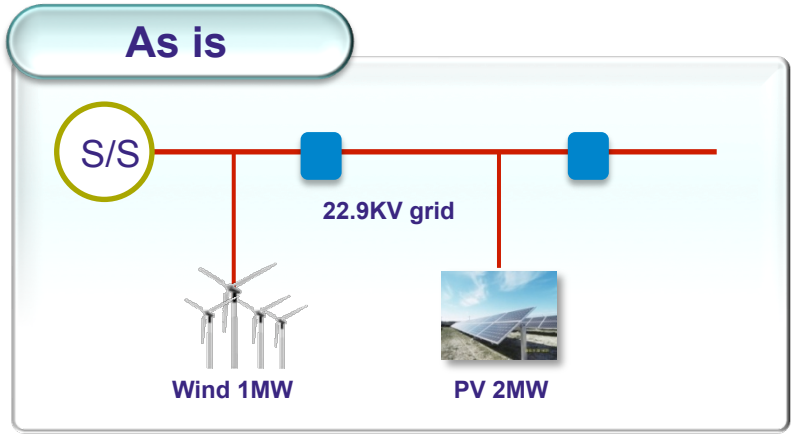
Business Model

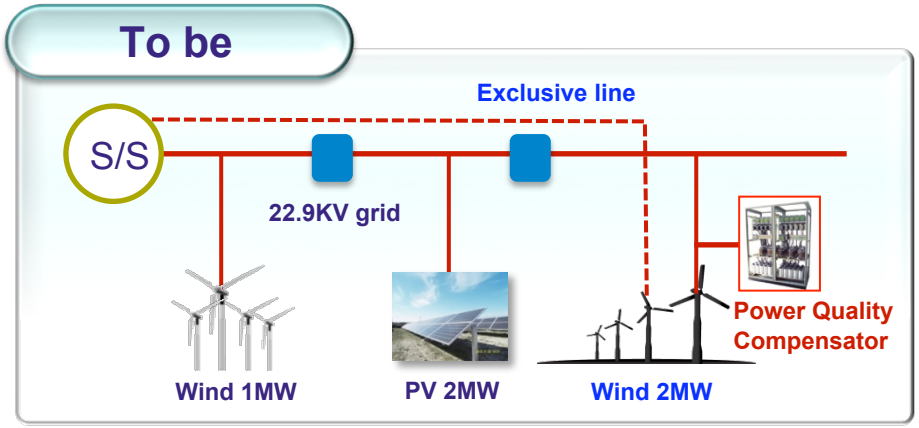


IV. Business Models

Conncetion Cost Reduction

- Adding quality conpensation equipment → Stabilizing SR power
- Setting up connection capacity regulation to common line (under 3MW → over 3MW)

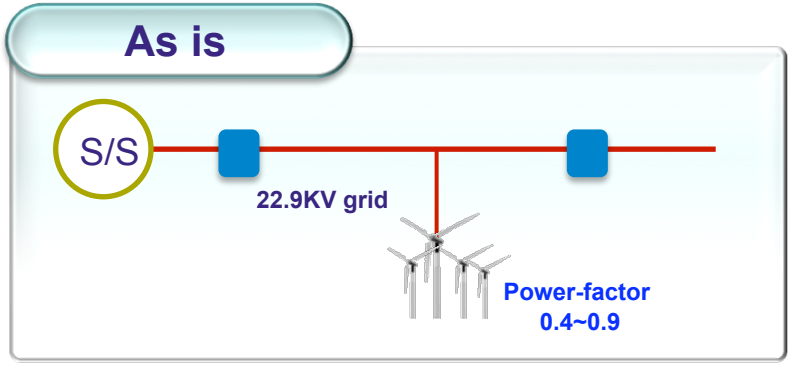


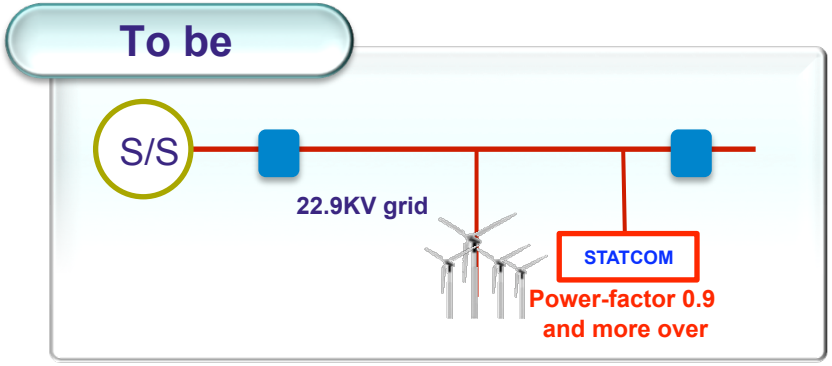


IV. Business Models

Enhancing SR Generation efficiency and Profit

- Power-factor of wind power alone : 0.4~0.9
- Power-factor improvement by STATCOM → Increasing active power and profit
  (STATCOM : STATic synchronous COMpensator)





- Economic feasibility of STATCOM and SR power profit in Jeju Project

IV. Business Models

Energy Shifting

- Charging in low load time, Discharging in peak by ESS → Energy Shift

  ※ ESS : Energy Storage System

- Demand controlled application and UPS(uninterruptible power supply)

Point at Issue

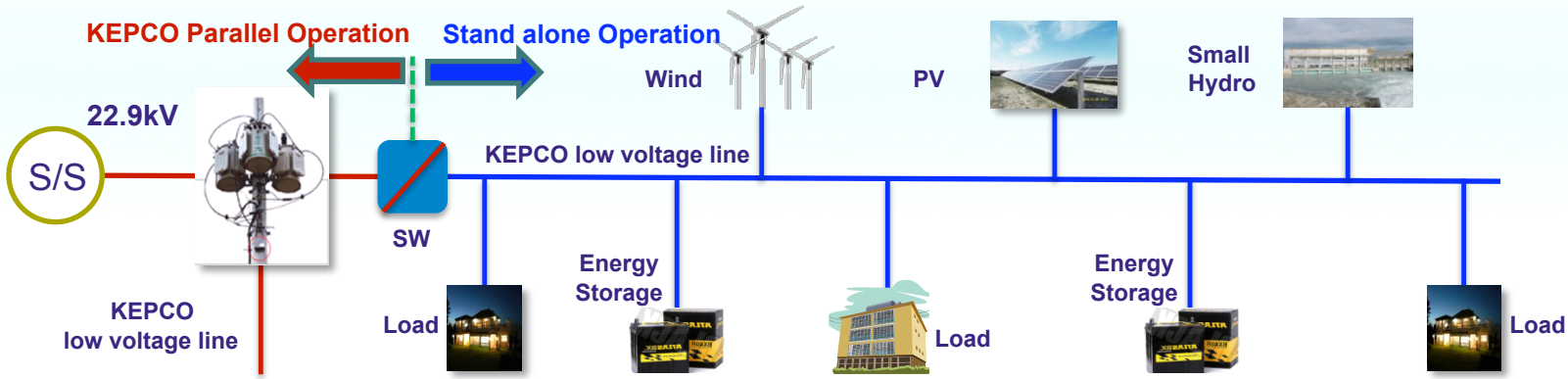
- Expensive Battery → Technical development
- RPS expectional item : ESS → Support by Goverment policy

  ※ RPS : Renewable Portfolio Standard

IV. Business Models

Intentional Islanding

Outline



Fuctions

- **Ordinary** : Minimize consumption of power from Grid, Renewable energy sources service electricity for the area
- **Grid black out** : Island Grid can supply enough power for the area without black out
- **After recovery**: Automatically close switch and re-connect with Grid

IV. Business Models

Intentional Islanding

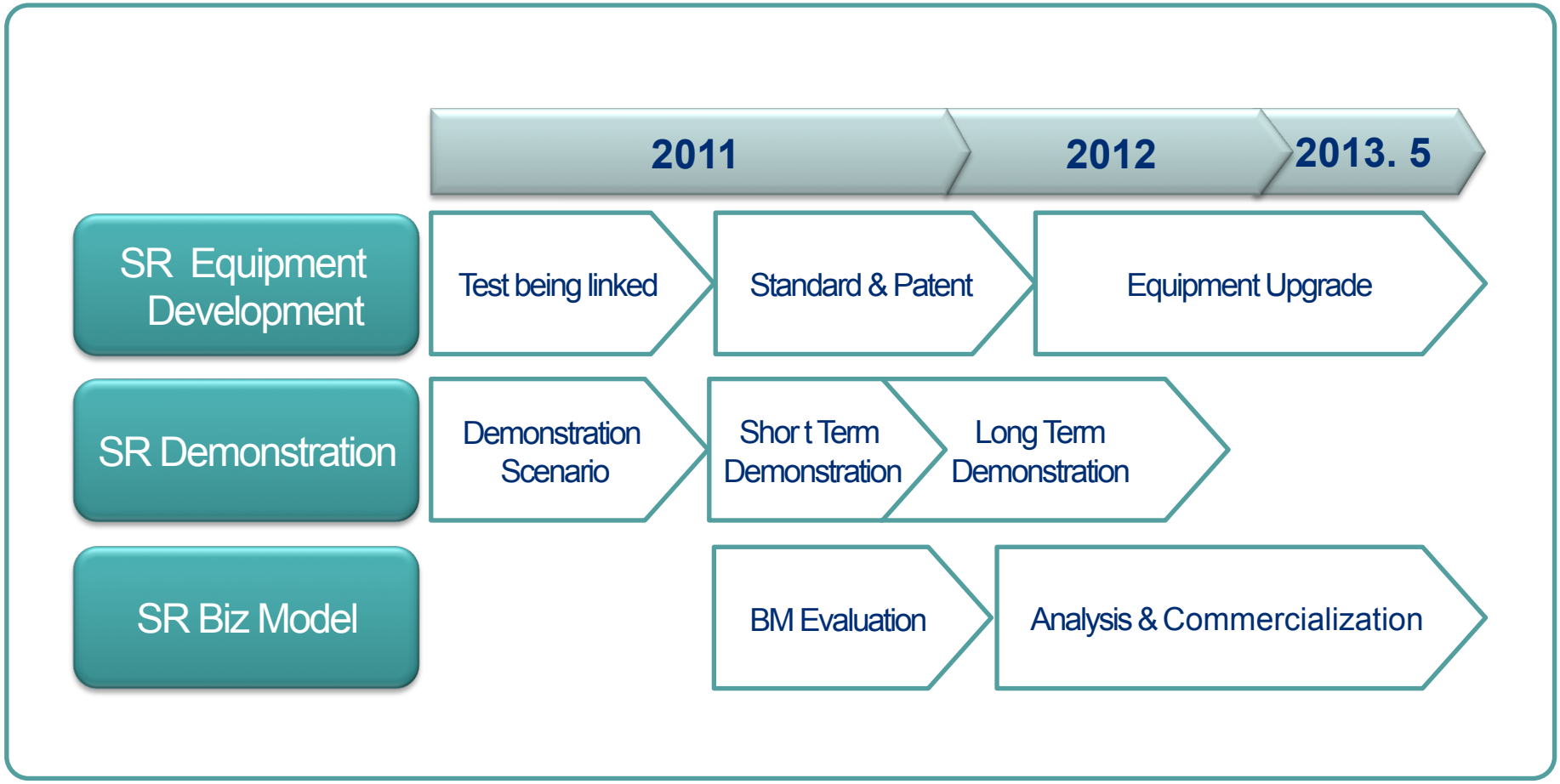
Domestic Market

- Substitution for diesel power in island region
  - case : Denmark Samso island

Overseas Market

- Supply power to customer in isolated region without grid connection
  - target
    - Area where enough electricity is not available
    - Area where Extremely high Power Quality is necessary

IV. Future Plan



the end

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