

**4th International Conference on Integration and
Distributed Energy Resources**

**Smart Grid Demonstration in
Los Alamos**

15 Min

Dec.10 (Fri) , 2010

Dr. Hideki Hayashi,

General Manager – Smart Grid Technology

Toshiba Corporation

Contents

— Smart Grid Demonstration in Los Alamos —

1. Smart Grid Concept
2. US-Japan Collaboration for New Mexico Smart Grids
3. Los Alamos Smart Grid Demonstration
4. Advanced Energy Management by μ EMS
5. Summary

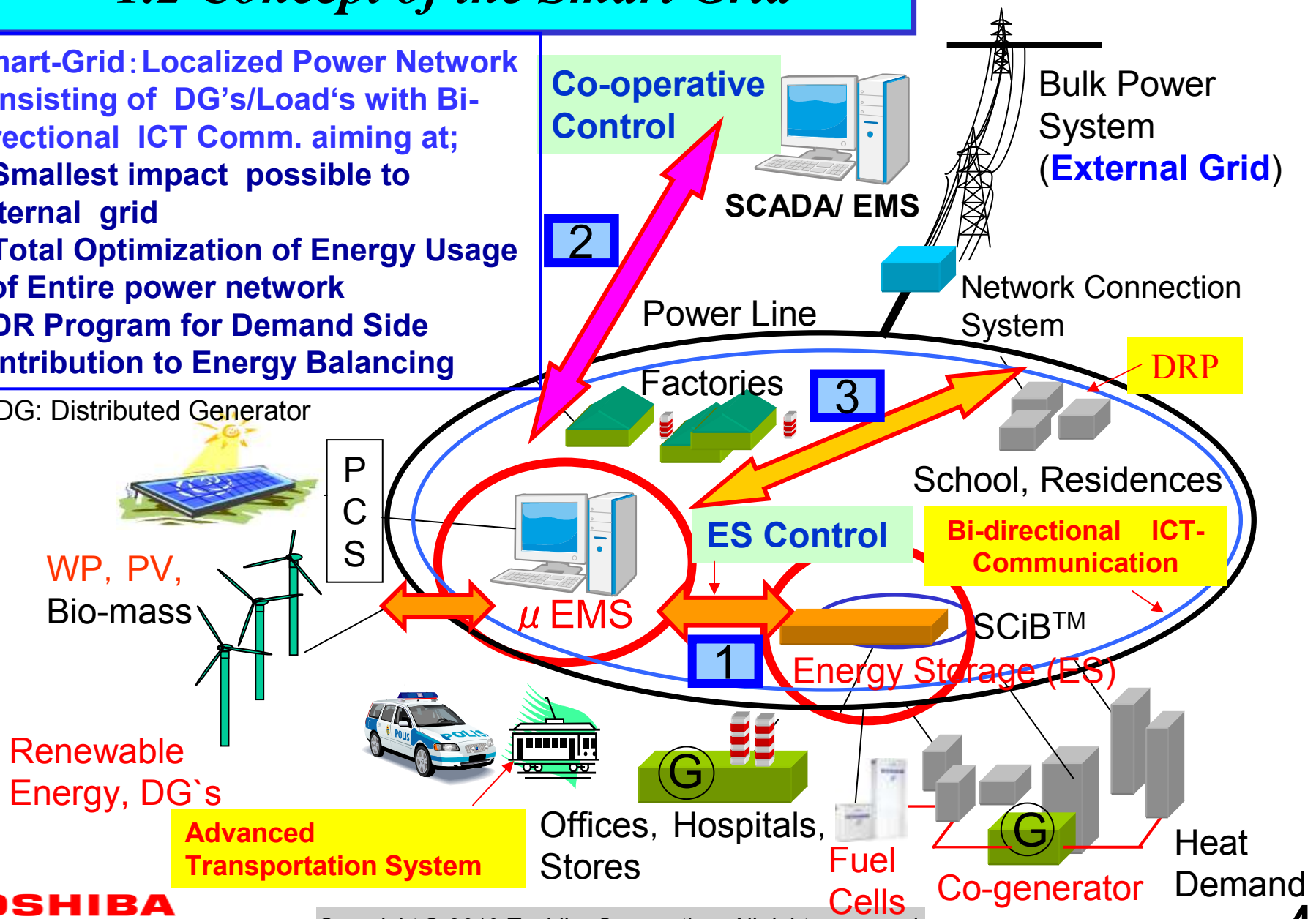
1. Smart Grid Concept

1.2 Concept of the Smart Grid

Smart-Grid: Localized Power Network consisting of DG's/Load's with Bi-directional ICT Comm. aiming at;

- 1)Smallest impact possible to external grid
- 2)Total Optimization of Energy Usage of Entire power network
- 3)DR Program for Demand Side contribution to Energy Balancing

* DG: Distributed Generator



2. US-Japan Collaboration for New Mexico Smart Grids

US-Japan Collaboration for New Mexico SG Project

➤ 1. US-Japan Collaboration

US: LAC, ABQ, LANL, SANL, PNM, UNM

Japan: NEDO & 21 Companies

notes) LAC; Los Alamos County, ABQ; Albuquerque, Mesa del Sol, LANL; Los Alamos National Lab. SANL; Sandia National Lab., UNM; University of New Mexico, NEDO; New Energy and Industrial Technology Development Organization

➤ 2. Three Parts of SG Demonstration

(1) Los Alamos SG (PV, ES, HEMS)

(2) Albuquerque SG (BEMS)

(3) Collective Research (Model/Simulation, Evaluation of DG, Safety Tech. for DG, Cyber Security)

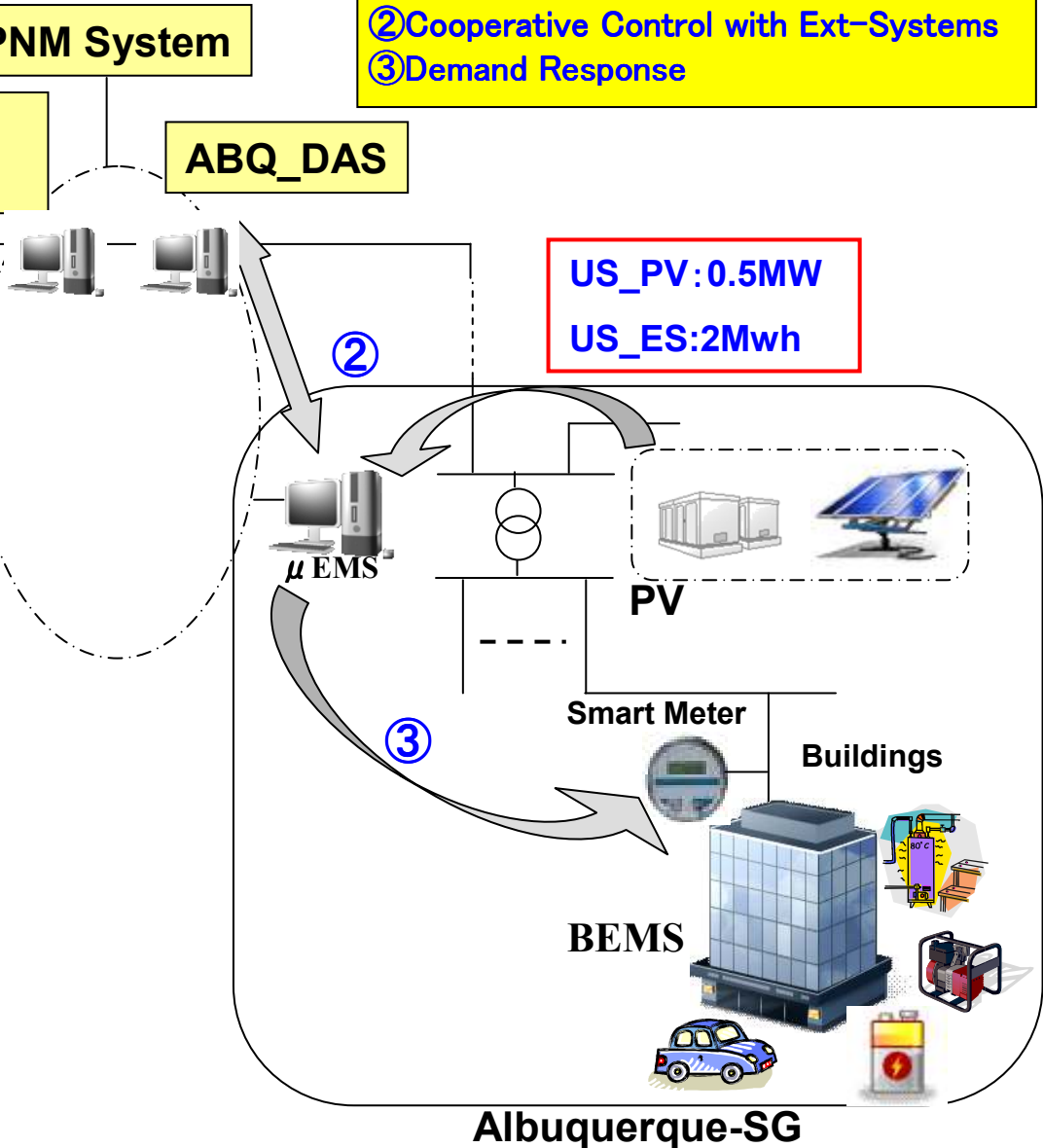
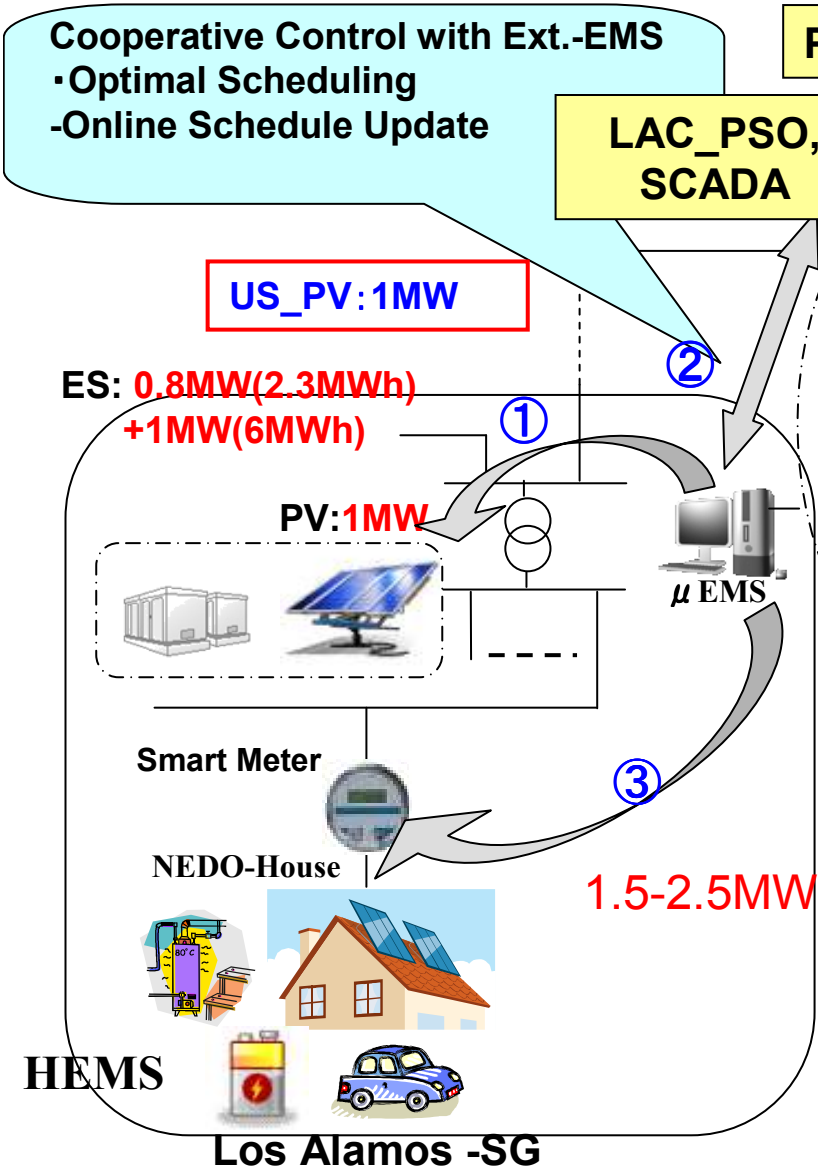
➤ 3. Outline of Schedule

-2010-11: Installation

-2012-13: Demonstration

New Mexico Smart Grid System

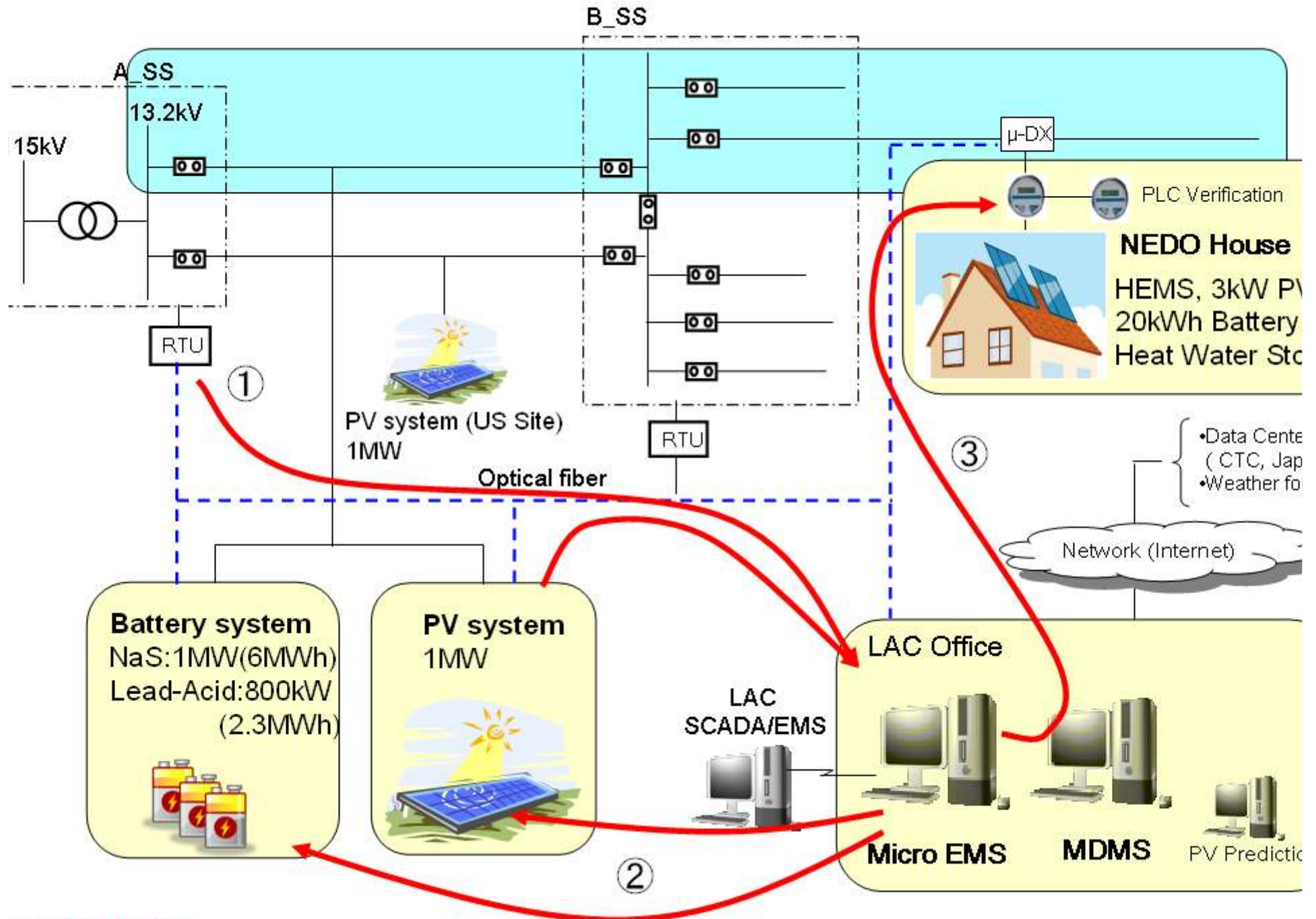
- ① Power Balance Control (DG, ES)
- ② Cooperative Control with Ext-Systems
- ③ Demand Response



3. Los Alamos Smart Grid Demonstration

- Utility Scale Business Model Development
- Renewable Energy Integration with PV
Penetration of 25% - 50%
- Demand Response to the Home (HEMS)

Data flow of Demonstration



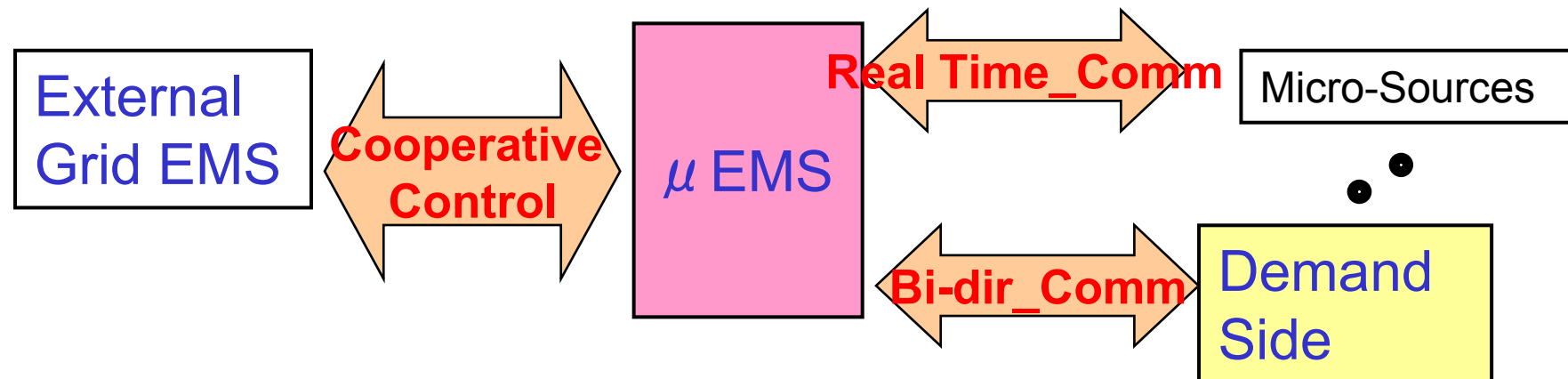
Major Components of the Smart Grid

Micro Source (including PCS)	PV Generator, Advanced PV Generator, Wind Power
	Gas, etc
	FC, Others
Energy Storage (Rechargeable Batteries)	Li-ion (Lithium-ion Battery)
	SCiB™ (Rechargeable Battery)
	NaS (Natrium(Sodium)- Sulphur Battery), Lead-Acid, Others
μ EMS	EMS of SG, DAS function, ES Control, Cooperative Control (1) External Power System
WAMS, WASA	PMU, IED (Protective Relay), SCADA, etc.
Smart-Meter	Advanced Metering Infrastructure (AMI) (2)
Communication	Communication Network, etc.
Other Facilities	Transportation, Power Equipment, Load, etc.
Common	Communication Security

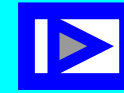
(1) μ EMS (EMS dedicated to the Smart Grid)



- **Optimize Power Balance and Power Quality** via Real-time Communication with Micro-sources (incl. Energy Storage)
- **Total Optimization of Cooperative Control** with Ext. grid EMS.
- **Support the Demand Response** Program (e.g. Real-time Price Notification and Other Services) with Demand Side by Bi-directional Comm.



Result of Power Balance Control

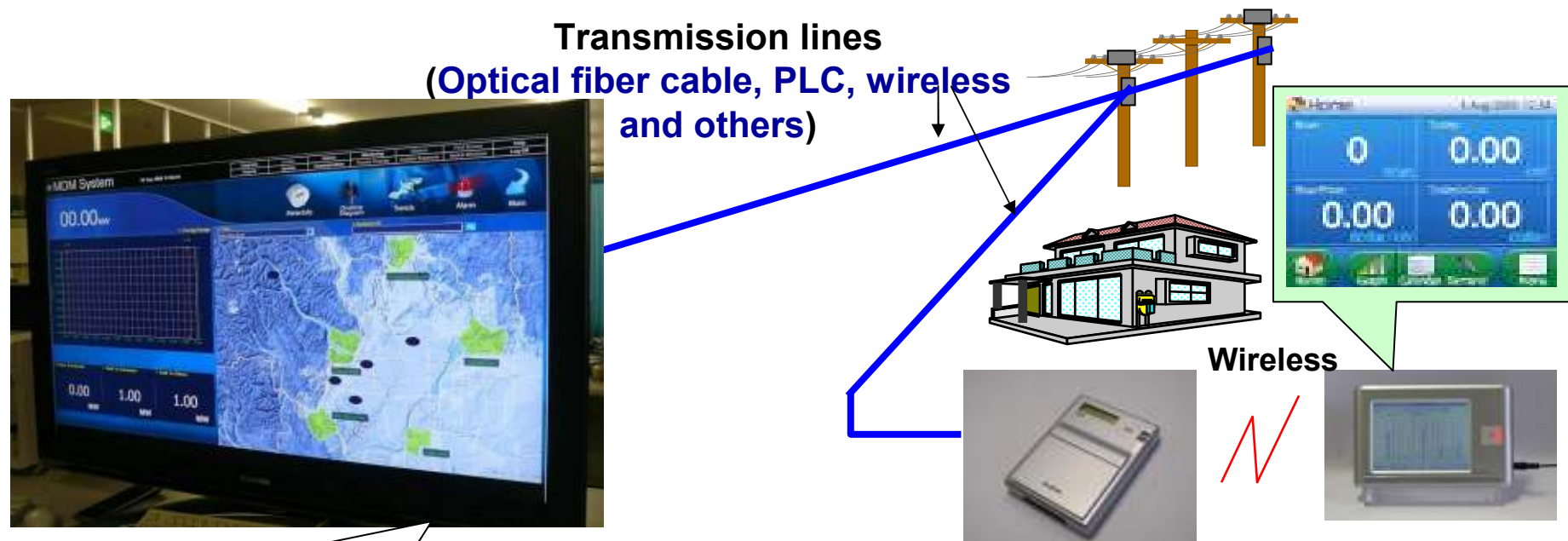


0:00~24:00
(24 hours)



(2) Advanced Metering Infrastructure (AMI) System

remote metering of individual customers, reducing CO₂ emissions by
-visualizing power consumption
-leveling loads by guiding customers to low-demand time zones



Meter Data Management System (MDMS)
Remote metering of data measured by the smart meter.
Real time data collection, management and analysis.

**ANCI/IEC
Smart Meter**

Home Display

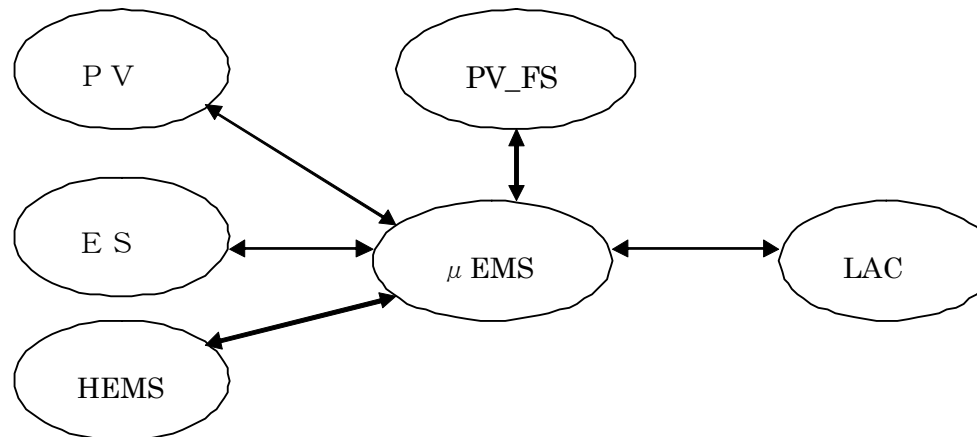
4. Advanced Energy Management by μ EMS

Use Case#1 (Under Planning) : Cooperative control among μ EMS, HEMS and ext-SG of LAC Area

Scenario 1: Active power Scheduling Cooperating with LAC

Scenario 2: Active power Online Schedule Update cooperating with LAC

Scenario 3: Voltage & Reactive Power Control in LAC SG (ES/PV control)



Major Actors; LAC_ μ EMS, LAC_HEMS, PV_Forecasting_Systems, AMI, RTU, ES&PCS, PV&PCS, μ EMS_Operator, LAC_.....

5. Summary-Smart Grid Demonstration in Los Alamos

1. Smart Grid Concepts and μ EMS: *smallest impact, cooperative control, DR*

2. US-Japan Collaboration for New Mexico Smart Grids :LAC, LANL, Japan

3. Advanced Energy Management by μ EMS: *Use Case, 3 Scenarios*

Thank you for your kind attention!





Please Contact To Dr. Hideki Hayashi ;

hideki.hayashi@toshiba.co.jp