



Active distribution system management for integration of distributed resources – research, development and demonstration needs

*Third International Conference on Integration of
Renewables and Distributed Energy Resources
Pre-Conference Workshop*

Nice, France

December 9, 2008

Mark McGranaghan

EPRI

mmcgranaghan@epri.com

+1-865-218-8029



Workshop Objectives

- Present the state-of-the-art in active distribution networks and microgrids
- Example projects and system applications from around the world
- Provide discussion forum for research issues related to active distribution networks and microgrids
- Define goals for addressing challenges in critical areas that can be the basis of an update in two years

Information will provide direct input for demonstrations being organized by EPRI as part of Smart Grids Demonstration Initiation

Schedule Overview

1. Morning Session –
Example Projects demonstrating the integration of distributed resources with active distribution management
2. Afternoon Session –
More examples and research projects focused on distribution management systems and distributed resource integration
3. Wrap-up and discussion of important gaps and research needs
4. CIGRE C6.11 Update and Coordination

Morning Schedule

<u>TOPIC</u>	<u>SPEAKER</u>
1. Overview of EPRI Smart Grid Demonstration Initiative	
9:00 am - Overview of the EPRI Smart Grids Demonstration Initiative	Mark McGranaghan
2. Example Distributed Resource Integration Projects and Demonstrations	
9:20 am - Con Edison Distributed Generation Integration (DOE)	Mark McGranaghan for Frank Doherty
9:30 am - FirstEnergy Distributed Resource Integration Demonstration Project	Said Abboudi
9:45 am - Detroit Edison DG Integration and Advanced Modeling with DEW	Rich Seguin
10:00 am - California DR Integration Projects – San Diego and Marin County	Frances Cleveland
10:20 am - Fort Collins Colorado/DOE Distributed Resource Integration Project	Sunil Cherian
10:35 am - Denmark Cell Controller Project	Sunil Cherian
10:45 BREAK	
11:00 am - Endesa DENISE Project	Antonio Castellanos De Toro
11:15 am - Capenergies PREMIO Project	Jean-Christophe Delvallet and Regine Belhomme
11:35 am - Model City Mannheim Project	Dr. Britta Buchholz
11:55 am - ADINE Project	Dr. Sami Repo

Afternoon Schedule

<u>TOPIC</u>	<u>SPEAKER</u>
3. RESEARCH UPDATES	
1:00 pm Integration Research Activities from DMS Group/Telvent	Elena Boskov
1:20 pm Canadian Research	Abbey
1:40 pm Smart Grids Austria	Andreas Lugmaier
2:00 pm DR Integration Research in Ireland	Mark O'Malley
2:20 pm DOE Research and Demonstration Initiatives and GridLab-D	Eric Lightner and Robert Pratt
2:45 BREAK	
3:00 pm - European ADDRESS Project	Regine Belhomme
3:20 pm - More Microgrids Demonstrations	John Eli Nielsen
3:40 pm - DR Integration at Ergon Australia	Grahame Foulger
4:00 pm - CRIEPI Research in Japan	Yoshizumi Serizawa
4:20 pm - CIGRE C6.11 Activities – Quick update	Chad Abbey
4:30-5:00 pm Discussion of Research Needs – Group	

Workshop Presentations

- Presentations will be posted at the following site:

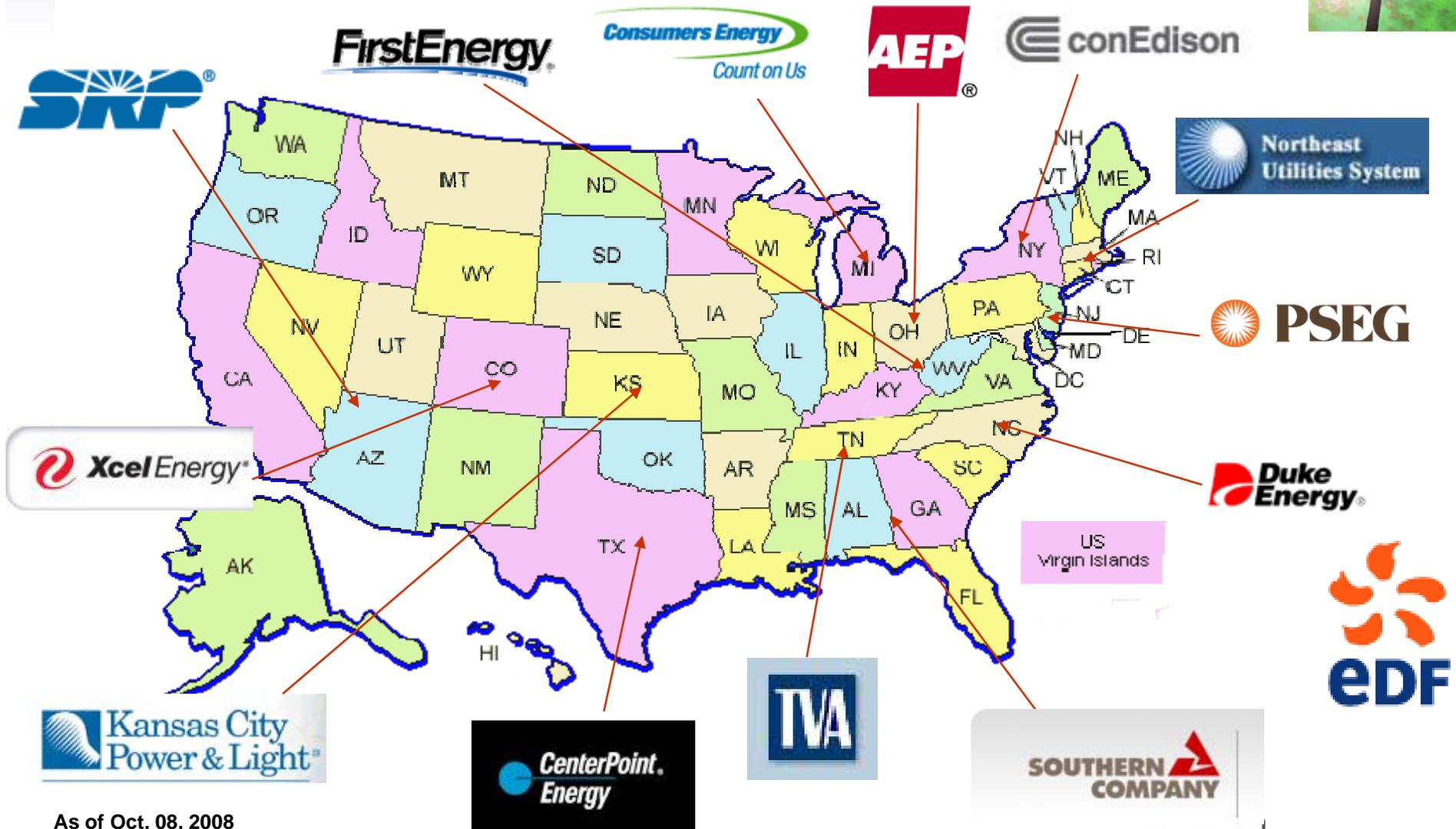
<http://sites.google.com/site/smartgridresourcecenter/epri-active-distribution-network-workshop---nice-france--dec-2008>

EPRI Initiatives developing active distribution networks

- Intelligrid Research Program – Base research program focused on the smart grid infrastructure
 - Communication Infrastructure
 - Information Integration
 - Security
- Smart Distribution Applications and Technology – Base research program focused on distribution applications for the smart grid infrastructure
- Green Circuits Initiative – initiative focused on demonstrating and assessing technologies for improving efficiency of the distribution system.
- **Smart Grids Demonstration Initiative – 5 Year initiative demonstrating widespread integration of distributed resources with the grid operation**

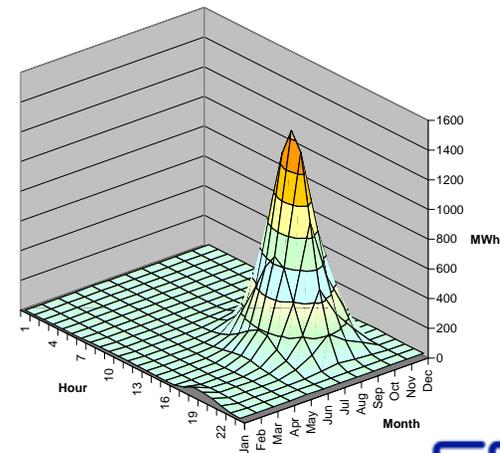
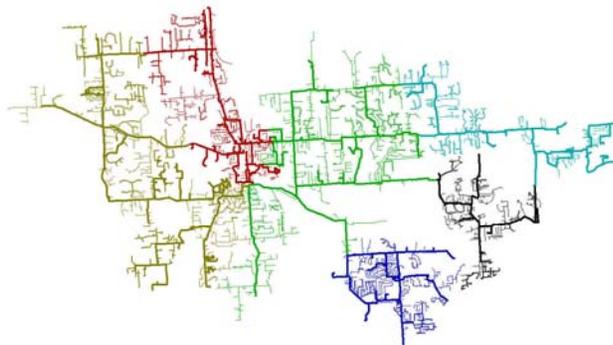
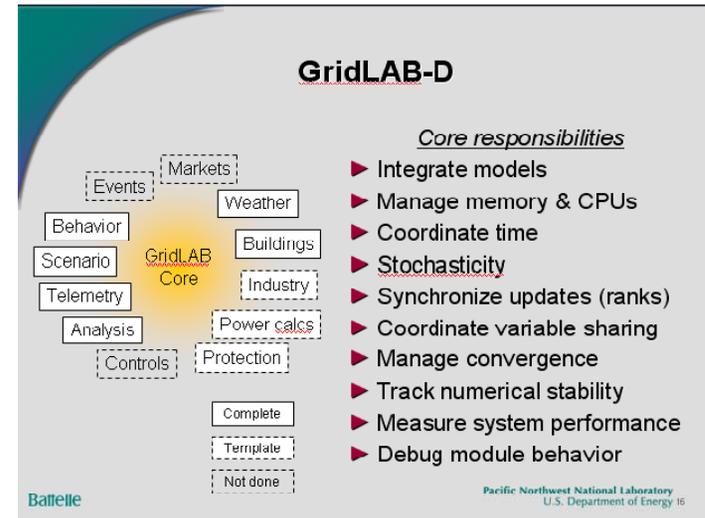
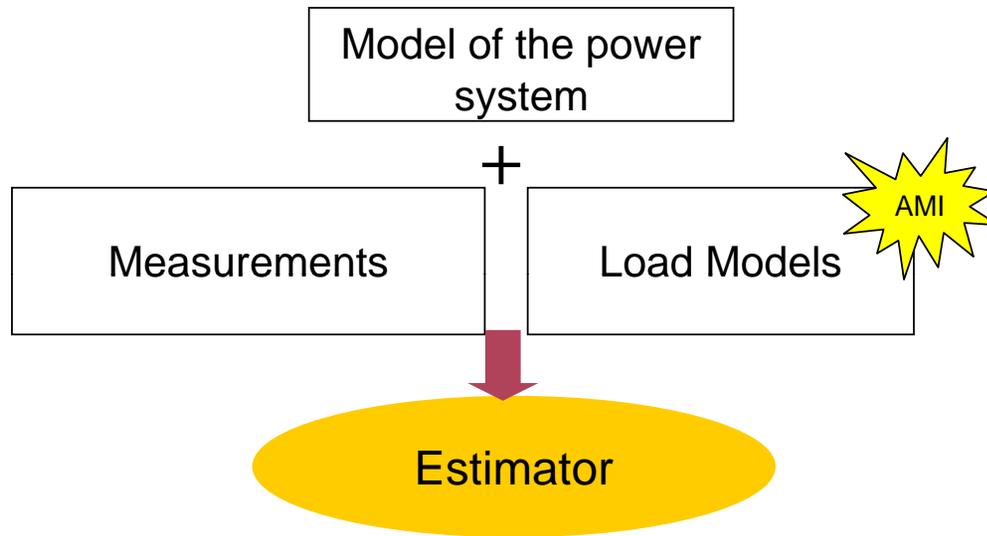
Green Circuit Initiative

Today: 61 ckts, 24 states and 2 countries

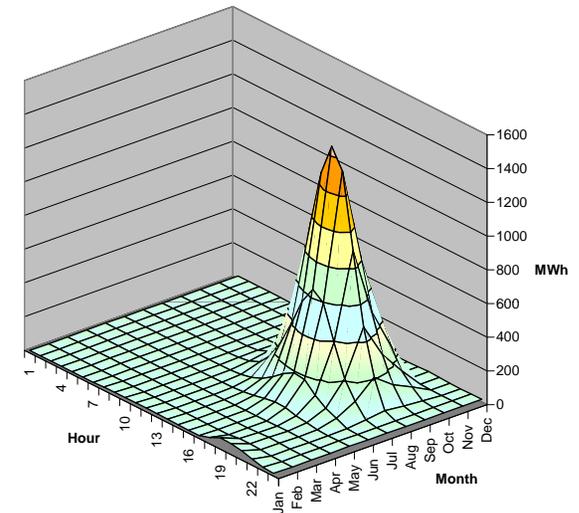
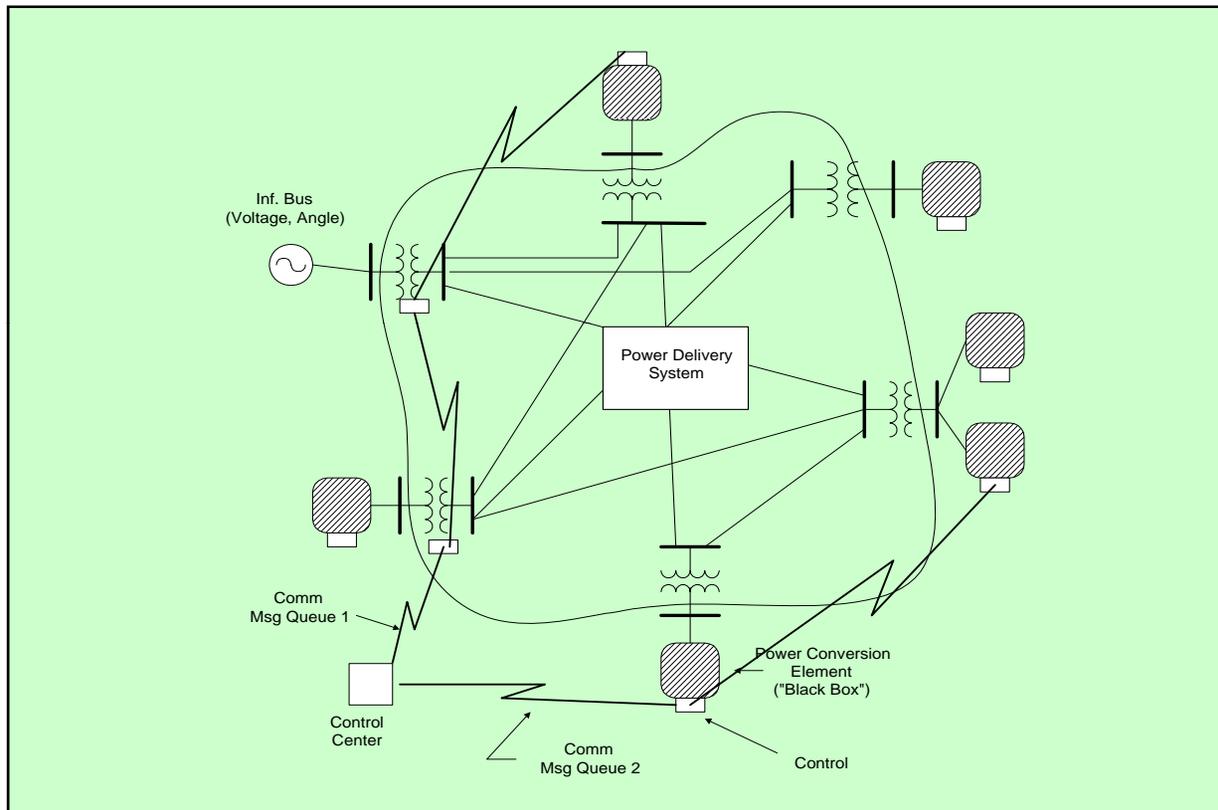


As of Oct, 08, 2008

New simulation approaches for automation (planning and real time applications)

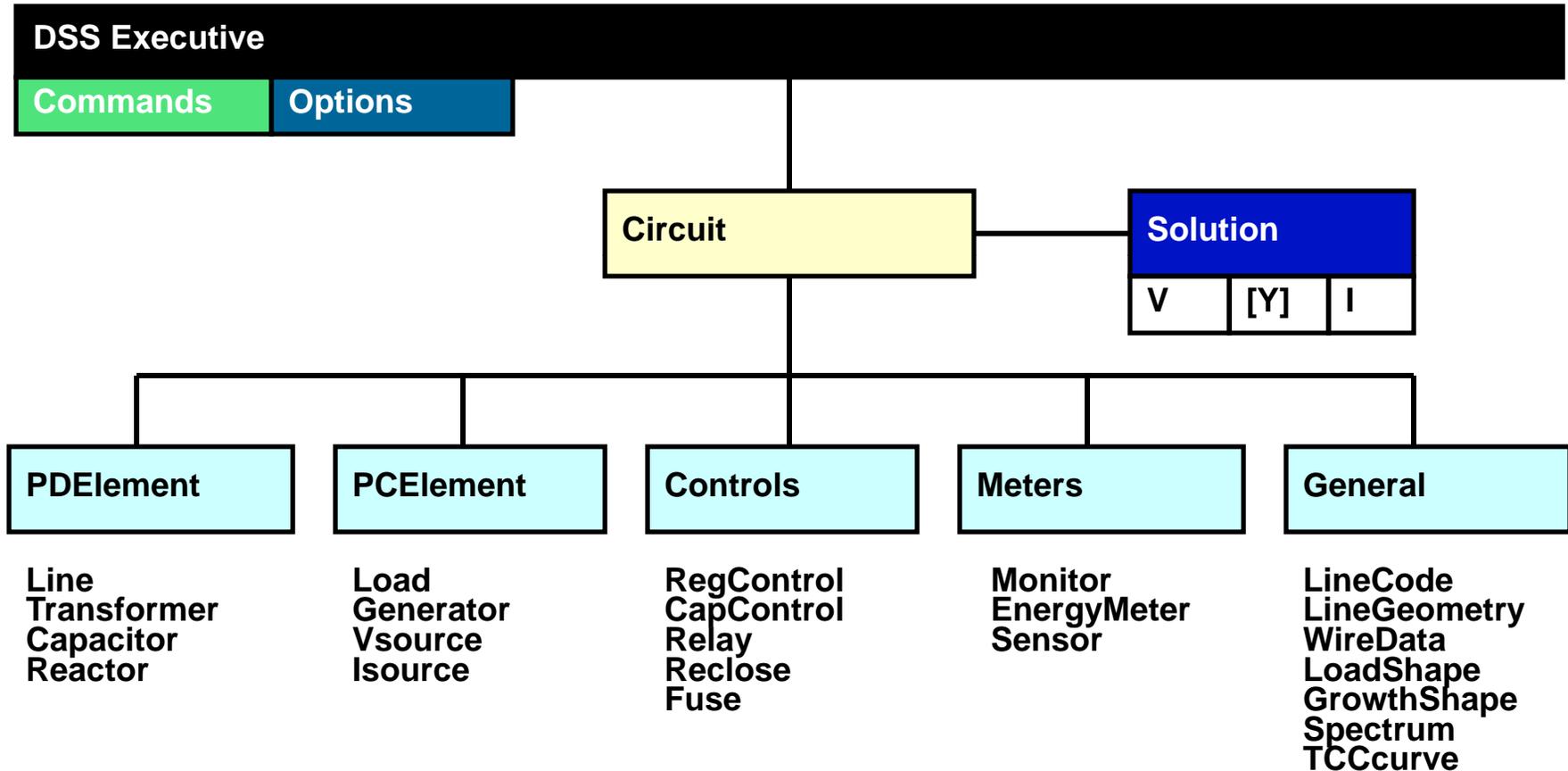


OpenDSS permits communications and control infrastructure to be included in model



2008 Approach – Benchmark models for two distribution systems that incorporate automation with integrated distributed resource management

OpenDSS Object Structure



Industry Smart Grid Demonstration: Integrating Distributed Resources

- Concept is Simple, but...
- Millions of Integration points
- Multiple Communication Types
- Lack of standards



Distributed Resources

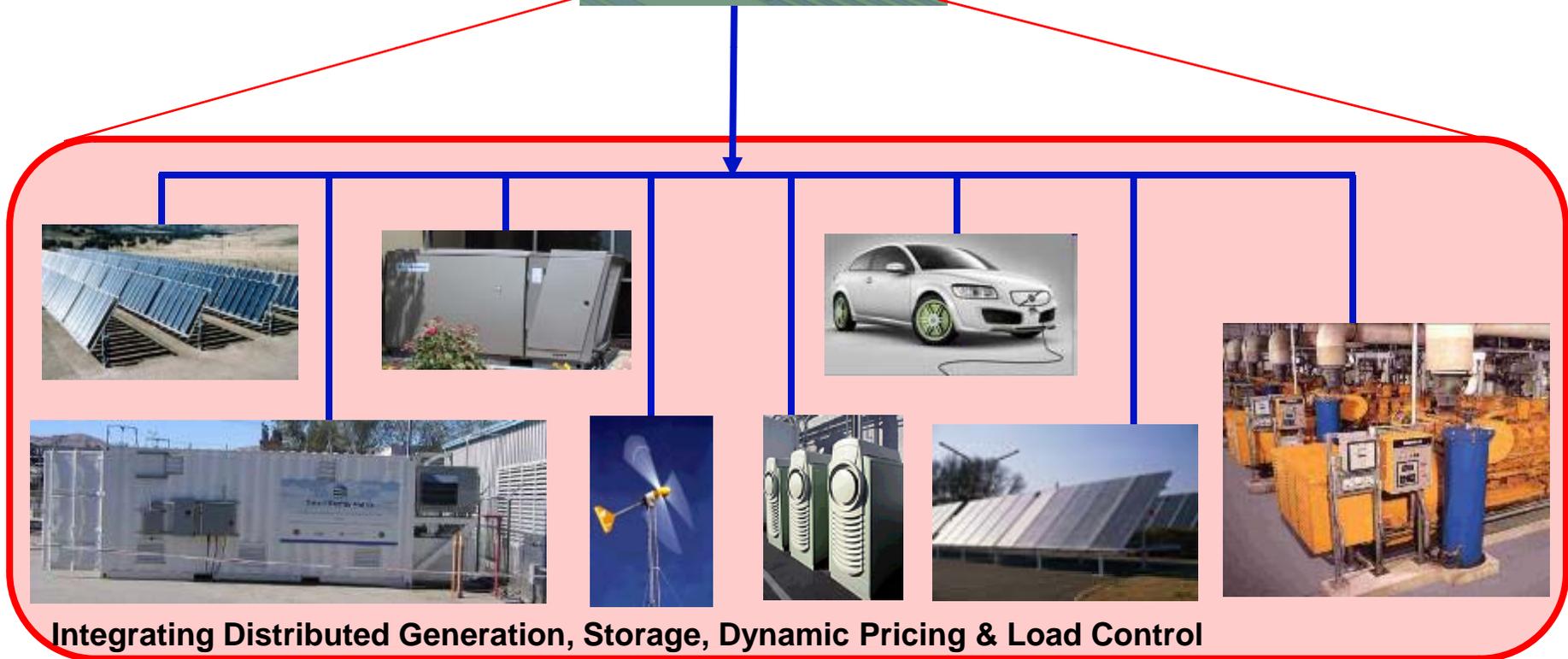


Central Generation



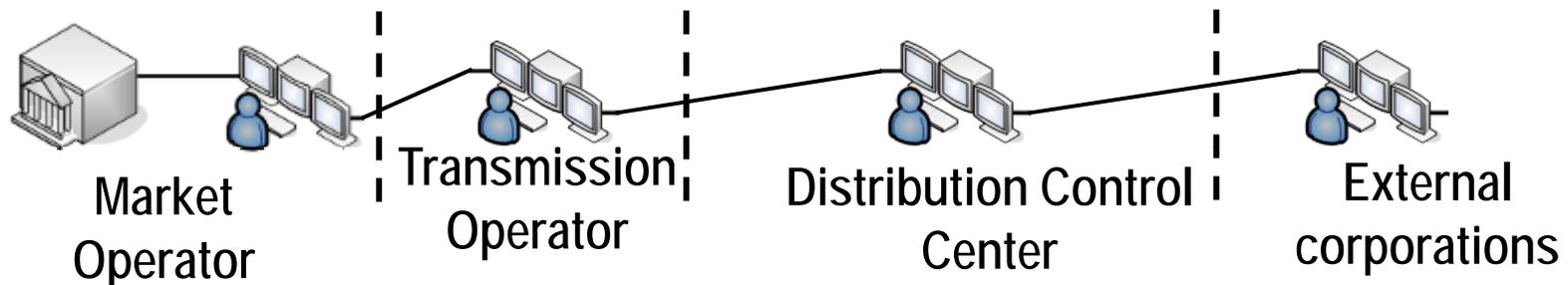
Intermittent Generation

Virtual Power Plant



Smart Grid Demonstration Approach

- **Integration of Distributed Resources with Utility Operations**



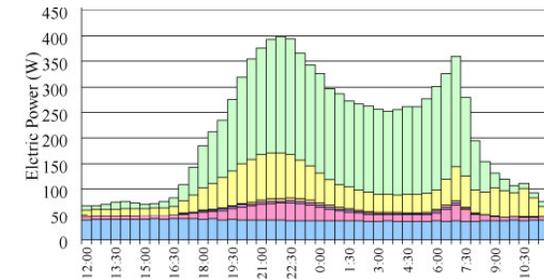
- **Ensure Interoperability of Distributed Resources**

- Demonstrate common language to exchange information
- Leverage communication infrastructure for multiple uses

Shared Learning from Multiple Demonstrations and Use of EPRI's IntelliGrid Architecture will Lead to Expandability, Scalability, and Repeatability

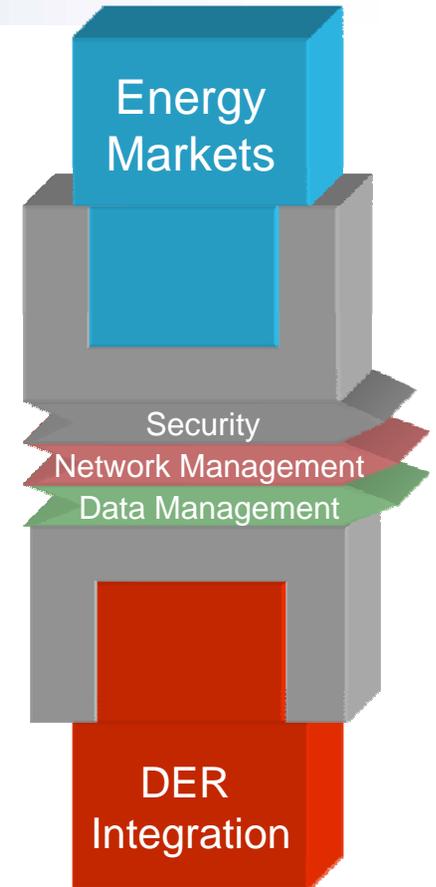
Diverse Characteristics Lead to Multiple Demonstrations

- Regional characteristics
 - Weather
 - Regulatory / Market
 - Availability of Renewable Generation & Storage
- Customer / Load characteristics
 - Residential, Commercial, Industrial
- Distribution system characteristics
 - Rural, suburban, urban overhead and underground systems
- Communication Infrastructure available
 - Public (internet, cellular)
 - Private (AMI, licensed)



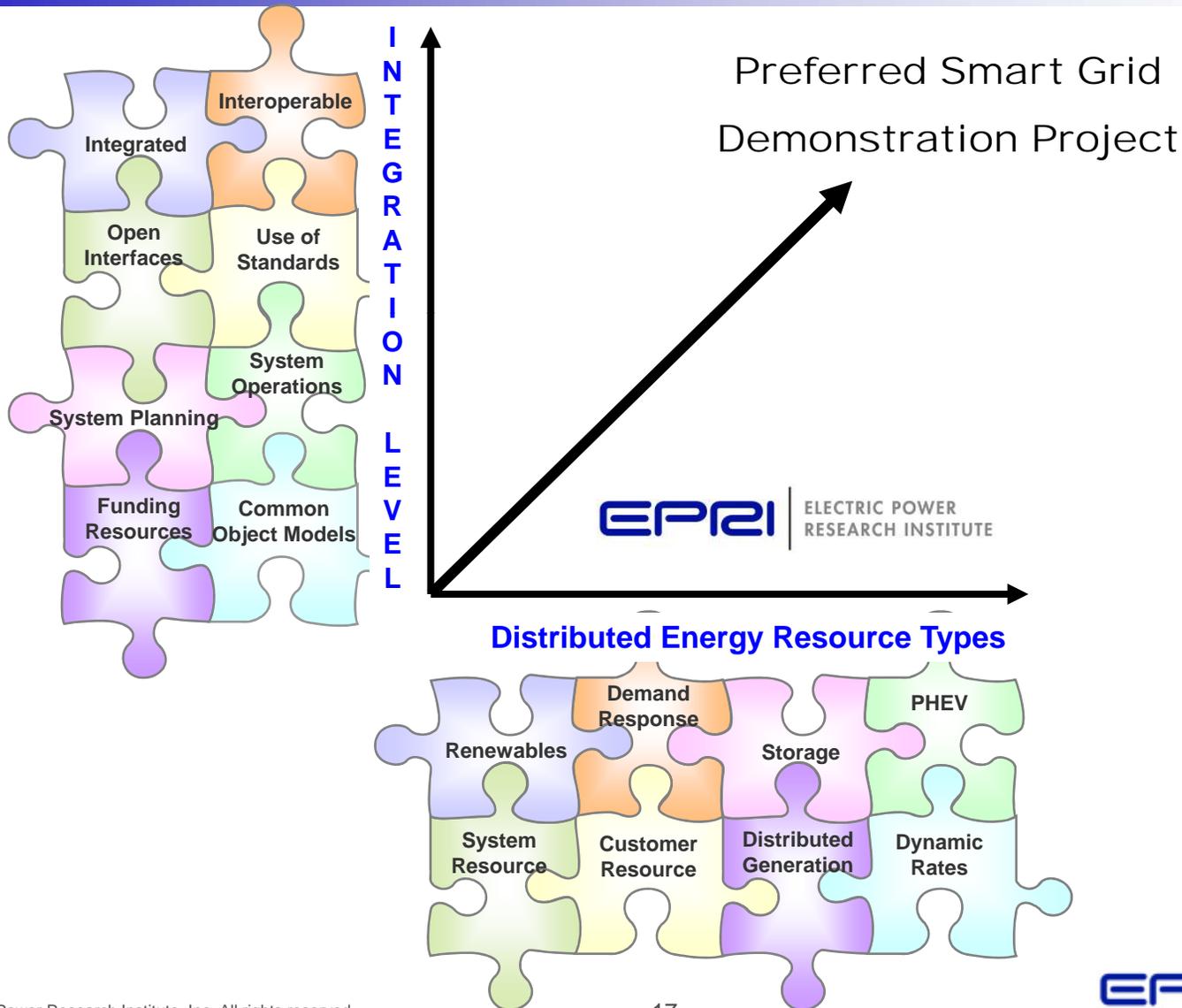
Objectives of the Demonstration Initiative

- ✓ Define information models and communications interfaces
 - All Levels of distributed resource integration (home, enterprise, market)
- ✓ Develop application guidelines, integration requirements and standards for distributed resource integration.
- ✓ Field Assessments to:
 - Understand required systems and technologies for distributed resource integration
- ✓ Verify Smart Grid business case assumptions
 - Describe costs and benefits associated DER Integration



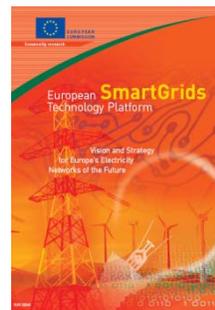
Smart Grid Demonstration Critical Elements

Integration Level vs. DER Types



Industry Coordination

- Use Case and Information Repository
- Joint Advisory Group for Demonstration Projects
- Coordinated business case approach



Summary

- **Maximize the benefits of existing and planned investments**
 - Communications and advanced metering infrastructures
 - Identify and further the foundation for demand side resource integration.
- **Integration of distributed resources with markets, operations and planning operating as a demand-side virtual power plant.**
- **Development of common language to exchange information with multiple distributed resources**
- **Interoperability of renewable and distributed resource, storage and demand response technologies**