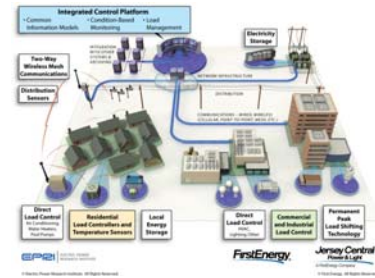


## JCP&L/FE EPRI Smart Grid Demo Host Site DER Control and Operational Functions

March 4, 2010



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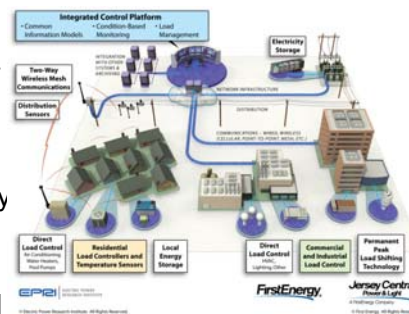
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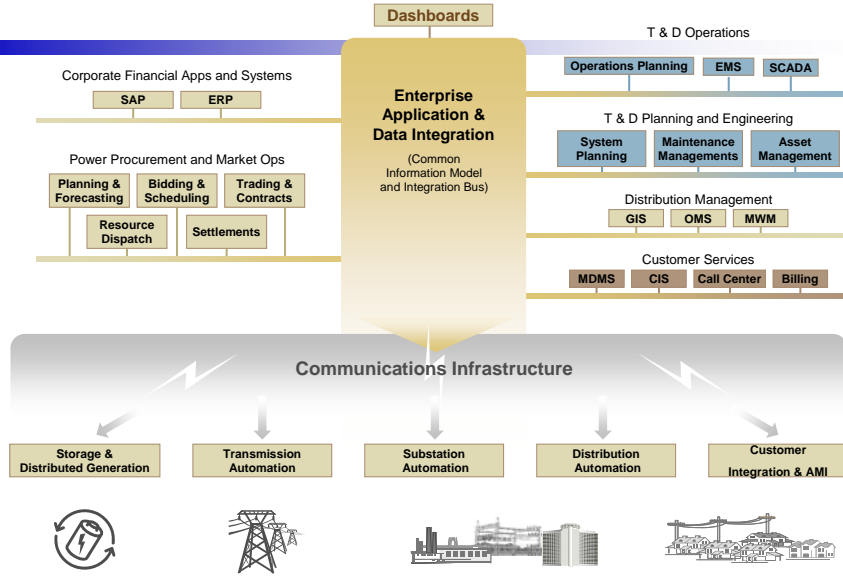
## IDER Pilot: Demonstration Objectives

- Maintain and advance Integration Strategies developed under IGCA
- Demonstrate value and viability of targeted peak load management to:
  - Enhance system reliability and energy efficiency
  - Participate in PJM market programs
- Demonstrate an integrated control platform (ICP) using a two-way communications system
- Identify DER Control and Operational Functions to achieve project benefits

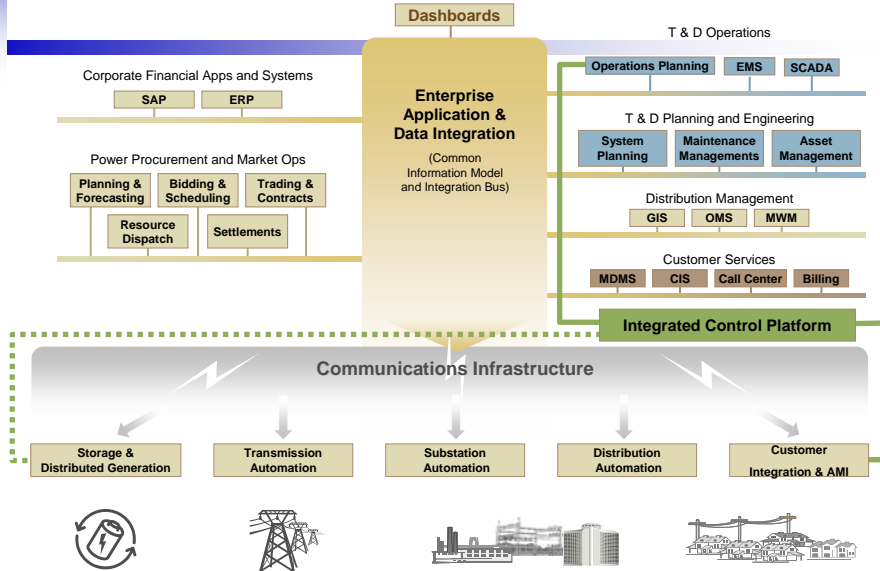


**Jersey Central  
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# Architecture Vision



# Architecture Application

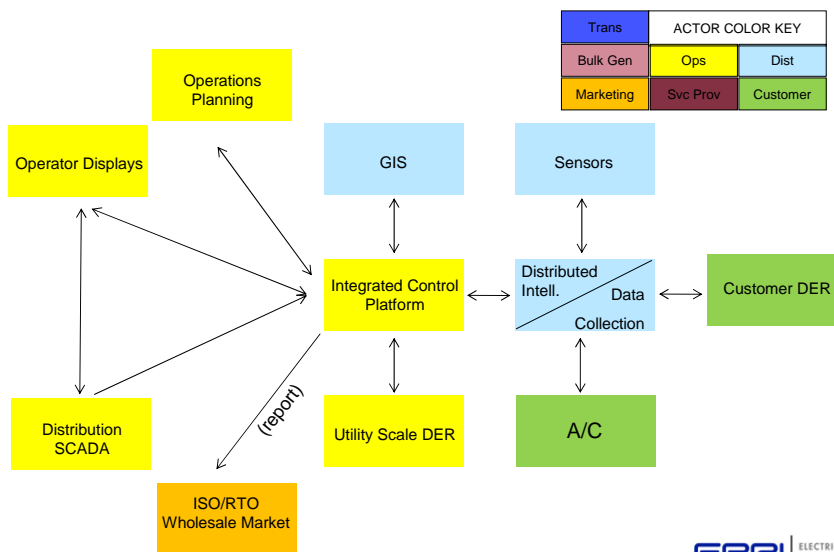


## Integration Requirements

The physical integration plan is being developed around three integration fundamentals:

- Integration and coordination of distributed energy resources
  - real-time coordination of resources (DLC, distributed energy storage devices and strategically placed sensors)
  - advanced communication and control technology to manage distributed resources as a virtual resource for operations
  - situational awareness and control capability.
- Open and flexible wide area network
  - Flexible communications infrastructure to support deployment and near real-time performance
- Enabling technology for integrated distributed intelligence:
  - process large quantities of data and respond very quickly
  - distributed intelligent devices to the right locations in the local, near and wide area networks
  - Goal of intelligence at the right place for control at the right time

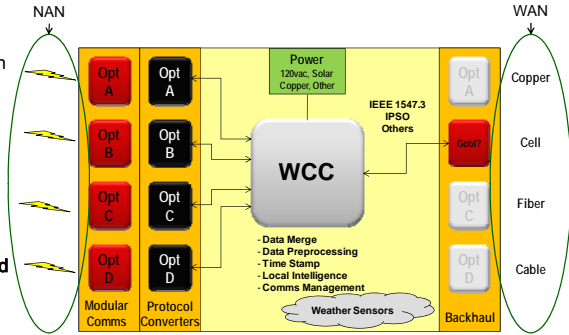
## Integration Block Diagram



# Fundamental Protocol & Data Management

The JCP&L/FE EPRI SGHS Demonstration requires open protocol conversion, data exchange and data management capability. This translates to the following highlighted functional capabilities:

1. **Accept multiple Near Area Network (NAN) solutions**, including:
  - 900 MHz, 2,4 GHz, other radio mesh
  - Ethernet radio
  - Modbus radio
2. **Support communications protocol conversion**
3. **Accept the OEM's native communications protocols**
4. **On-board intelligence**
5. **Configurable data preprocessing and integration.**
6. **Flexible security configuration**
7. **Communication Management**
8. **Accept multiple Wide Area Network (WAN) technologies**
9. **Store primary and backup configurations**
10. **Accept multiple service providers**



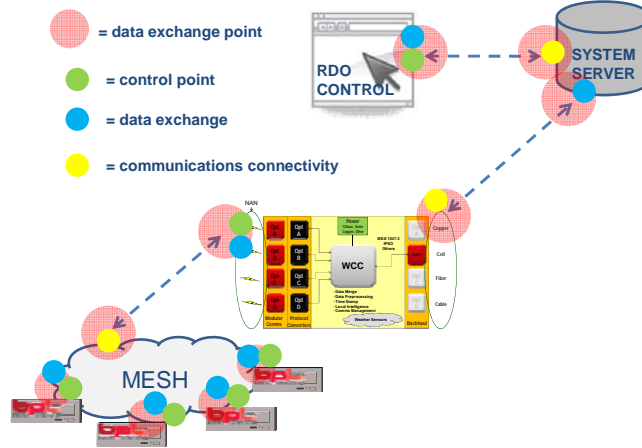
# System Specific Functional Requirements

These protocol conversion, data exchange and data management capabilities support the IDER system specific Functional Requirements highlighted below:

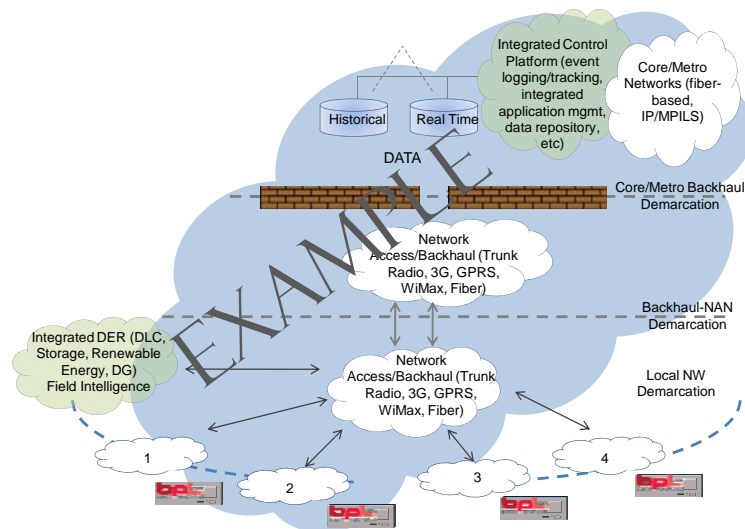
Functionality Sequence	Functional Requirement	Enabled Feature
Visualization	Integration of multiple device signals to common view	Manage single devices or hierarchies
Recognize Conditions	Receive multiple alarms; isolate manageable attributes	Recognize range of responses
Capacity Assessment	Dynamic management of logical groups	Determine available capacity in diverse aggregates
Initiate Response	Dynamic configuration of system response	Match of response with need
Evaluate Impact	Receive and consolidate individual measurements; isolate changes in system stress	Gauge impact of response to need
Adjust Response	Adjust DER control configuration to optimize impact	Adjust response as conditions change

# Integration Points

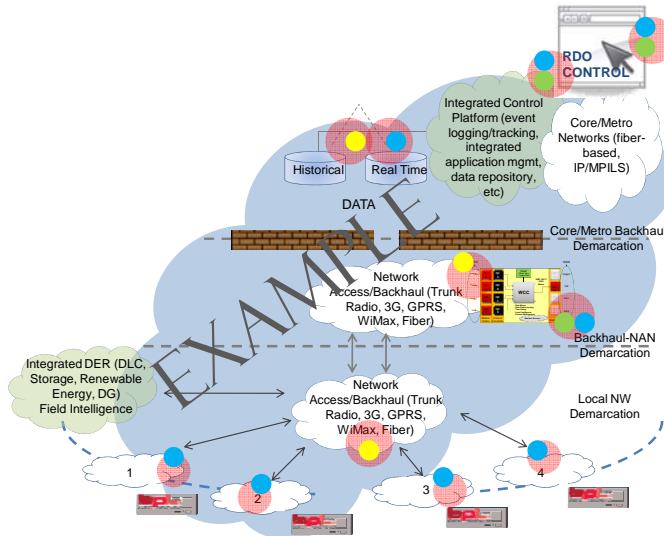
There are multiple device integration points associated with the IDER system. These integration points support communications connectivity, facilitate data exchange and allow secure control, when operating circumstances warrant.



# IDER Architecture Hierarchy



## IDER Architecture with Data Exchange Overlay



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## IDER Operations Sequence

The system of integration, connectivity, data exchange and secure control supports the IDER operations sequence which is driven by six key IDER capabilities. This operations sequence produces system features and addresses the functional requirements that JCP&L/FE specified as part of the project.

Functionality Sequence	Functional Requirement	Enabled Feature
Visualization	Integration of multiple device signals to common view	Manage single devices or hierarchies
Recognize Conditions	Receive multiple alarms; isolate manageable attributes	Recognize range of responses
Capacity Assessment	Dynamic management of logical groups	Determine available capacity in diverse aggregates
Initiate Response	Dynamic configuration of system response	Match of response with need
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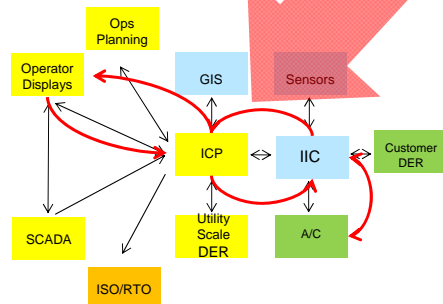
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# Example: IDER Data Exchange Management

Requirement	Feature	Data Exchange	Control Functionality
<b>Initiate Response</b>	application of integrated DER in response to assessed condition	<ul style="list-style-type: none"> <li>RDO to Display</li> <li>Display to ICP</li> <li>ICP to IIC</li> <li>IIC to Mesh Network</li> <li>Mesh Network to Devices</li> </ul>	Control function relates to a load reduction per site temperature, load availability and relevant rules; control initiated at RDO; control instruction relayed at Intelligent Integrator/Concentrator Unit; control enacted at site switch



Data exchange and control functionality are supported by system architecture in order to produce required functionality.

# Example: Technology Benefits

JCP&L/FE EPRI SGHS Demonstration Integrated DER/Load Management				
Pre-Condition	System Operational Sequence	Objectives Achieved	Impacts Measured	Benefits Quantified
System Wide Stress	Wide Scale Load Reduction	PJM Market Economic	• System wide load reduction	kW
		PJM Market Emergency	• System wide load reduction	kW
Isolated Stress	Targeted Load Reduction	Load Reduction for Operational Efficiency	• Reduce system losses @ peak	kW/kWh
		Load Transfer Assistance	• Reduce system losses @ peak	kW/kWh
		Voltage Management	• Reduce system losses @ peak	kW
		Targeted Load Shaping	• Reduce system usage hours @ peak	kWh
		Asset Management	• Reduce asset usage hours @ peak	kWh

## Questions?

