DERMS with IOU-Owned Assets

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Distributed Energy Resources

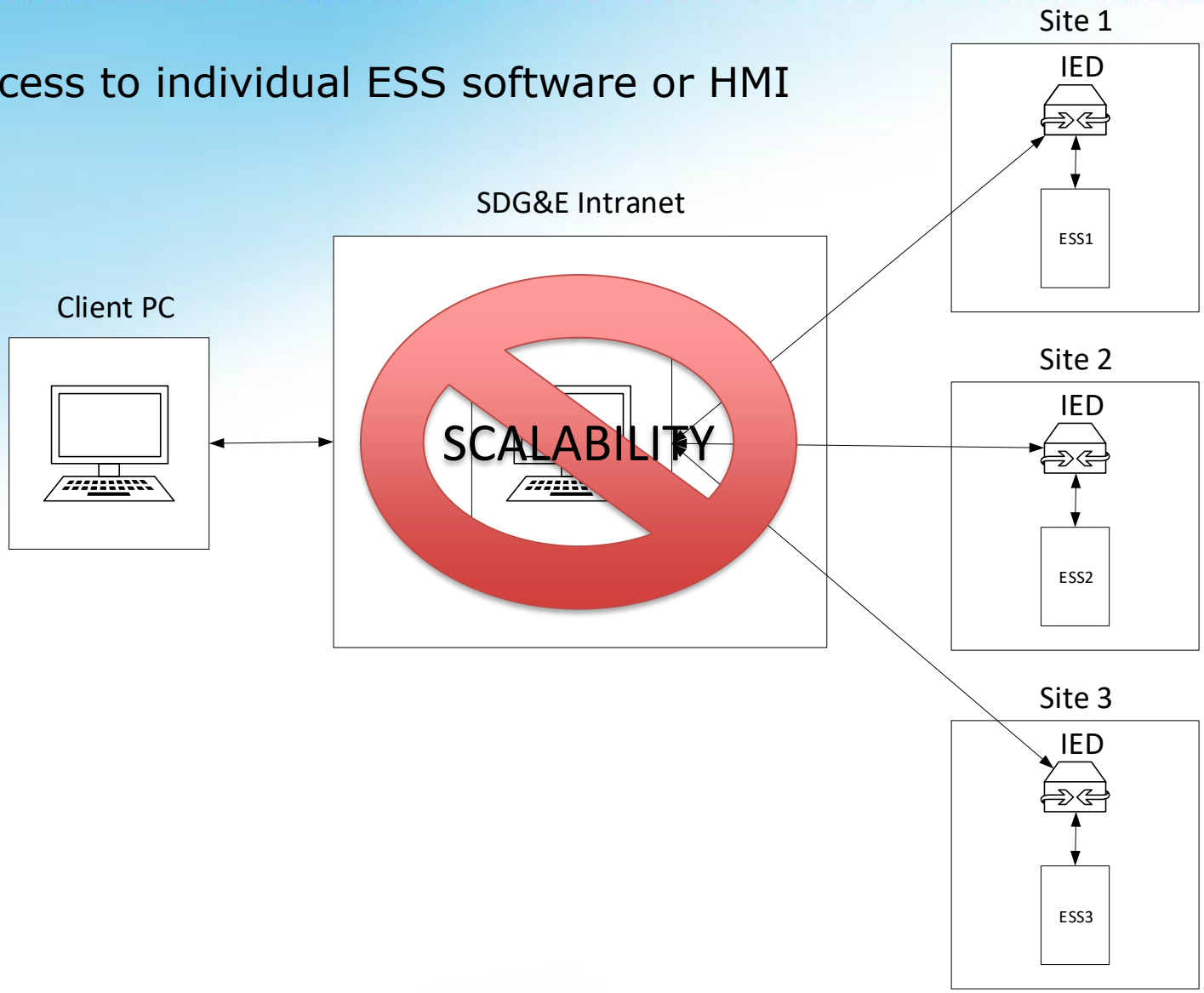
San Diego Gas & Electric

Agenda

- History of DER Control at SDG&E
- DERMS Definition
- DERMS Product at SDG&E
  - Various Applications
  - ISO Market Participation

History of DER Control at SDG&E

- Access to individual ESS software or HMI



DERMS Definition

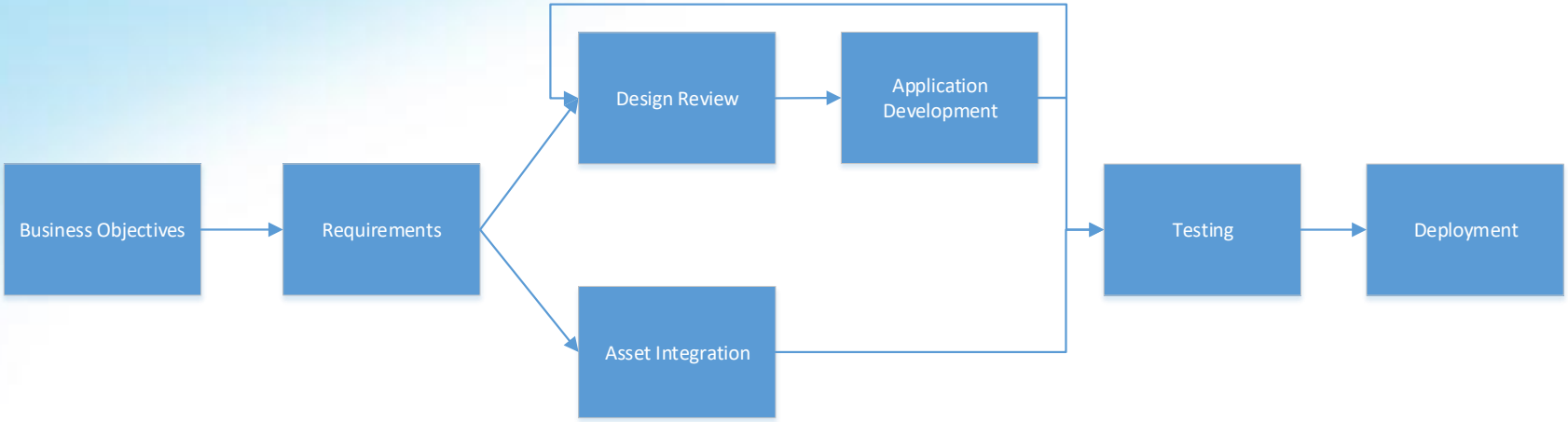
- DERMS
  - Distributed Energy Resource Management System

- Enterprise Solution to control selected Distributed Energy Resources (DER)
- Ability to control resources regardless of:
  - Manufacturer
  - Integrator
  - Resource Type
    - Solar
    - Energy Storage
    - Generators
    - Other

DERMS Product at SDG&E

- Wave® – Created by Spirae, LLC
- Product Platform has several Applications
  - Monitor and Control
  - Energy Storage Management
  - Microgrid Control
  - Demand Response

Building DERMS

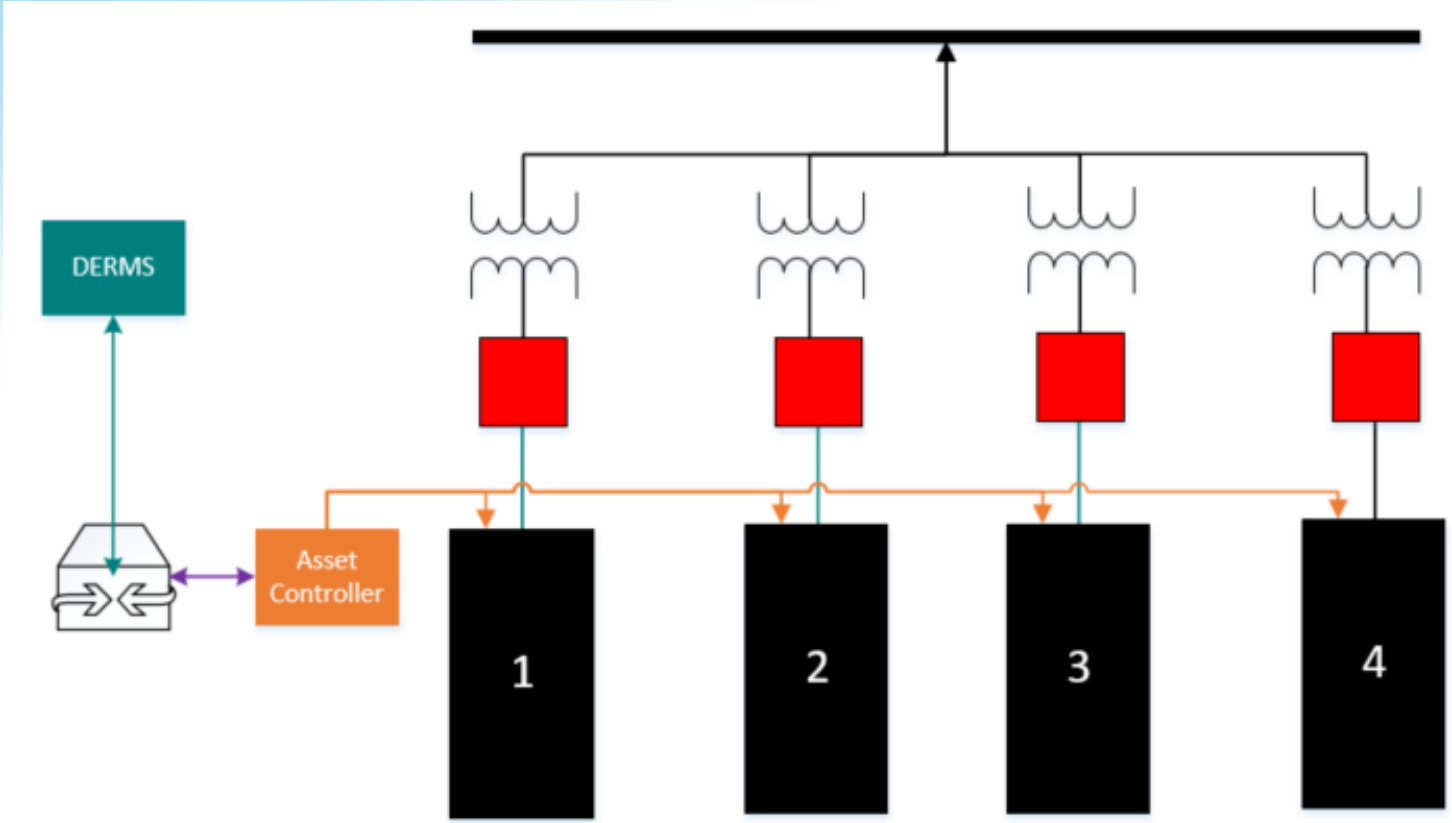


Asset Integration

- Understanding your assets
  - System Hierarchy
  - Points List
  - Asset Sequencing
  - Head-end Controller Behavior
  - Standardize, Standardize, Standardize

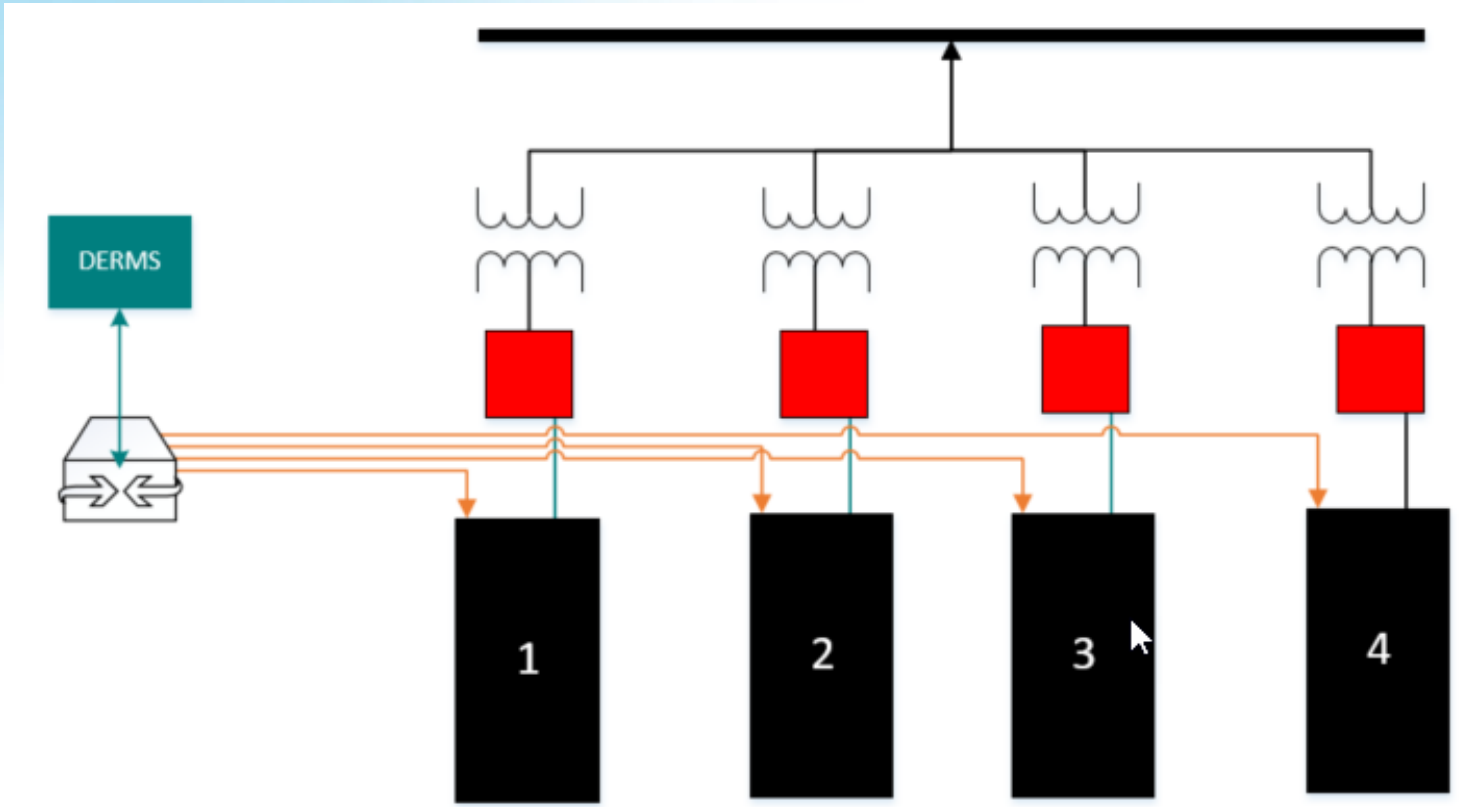
System Hierarchy

- Example 1



System Hierarchy

- Example 2



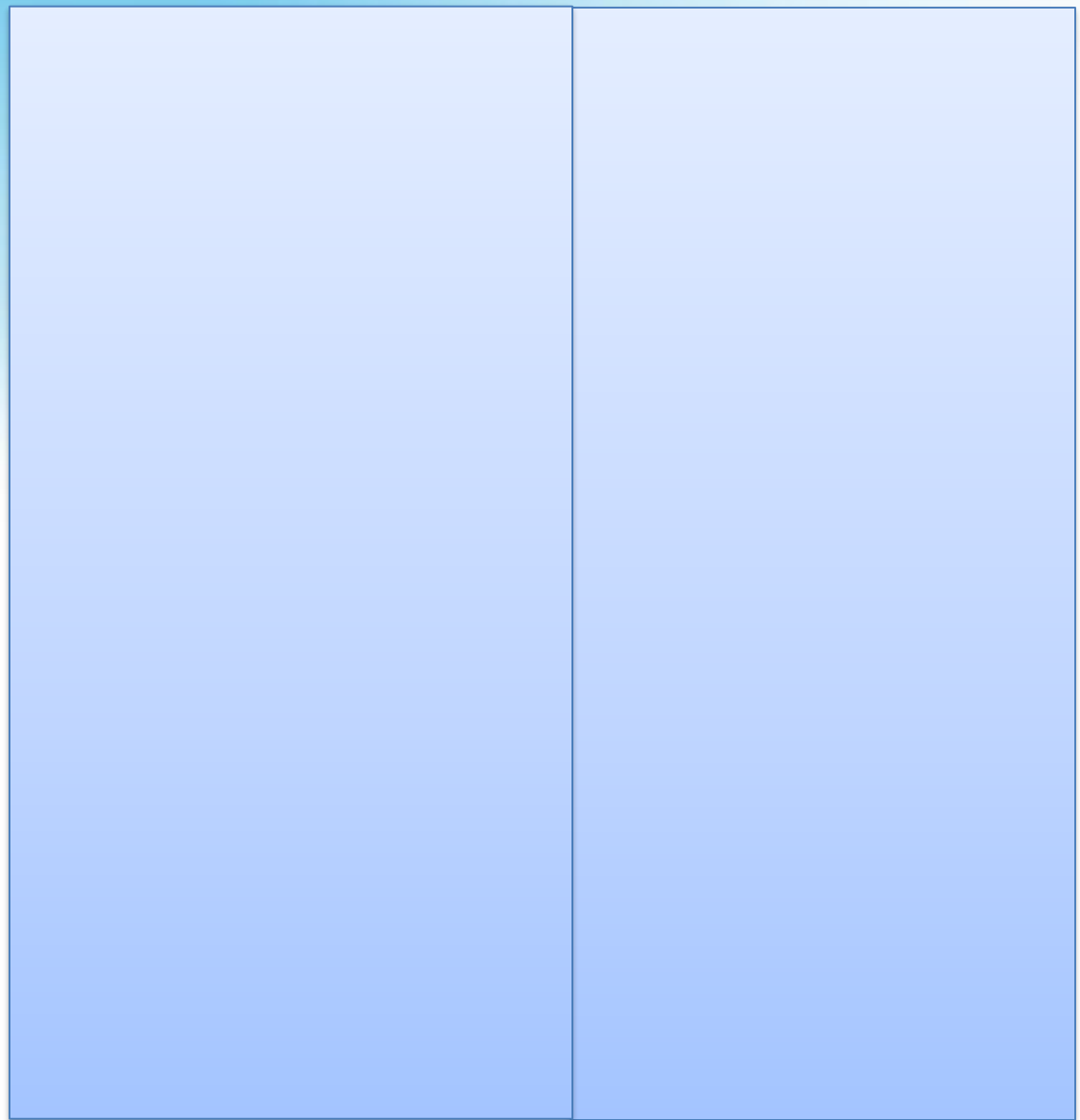
Asset Integration

- Example 1
  1. Simple vs Compound?
     i. End-user preference
  2. Points List?
     i. Do your assets provide same information and accept same commands?
  3. Asset Sequencing
     i. In what order must commands be sent?
  4. Head-end Controller Behavior
     i. Expected output at each time step
     ii. Seamless transitions between modes
     iii. Correct execution of each mode

- Example 2
  1. Simple vs Compound?
     i. Compound
  2. Points List?
     i. Points will be different from any system with Example 1 System Hierarchy
  3. Asset Sequencing
     i. In what order must commands be sent?
  4. Head-end Controller Behavior
     i. n/a

DERMS Visualization

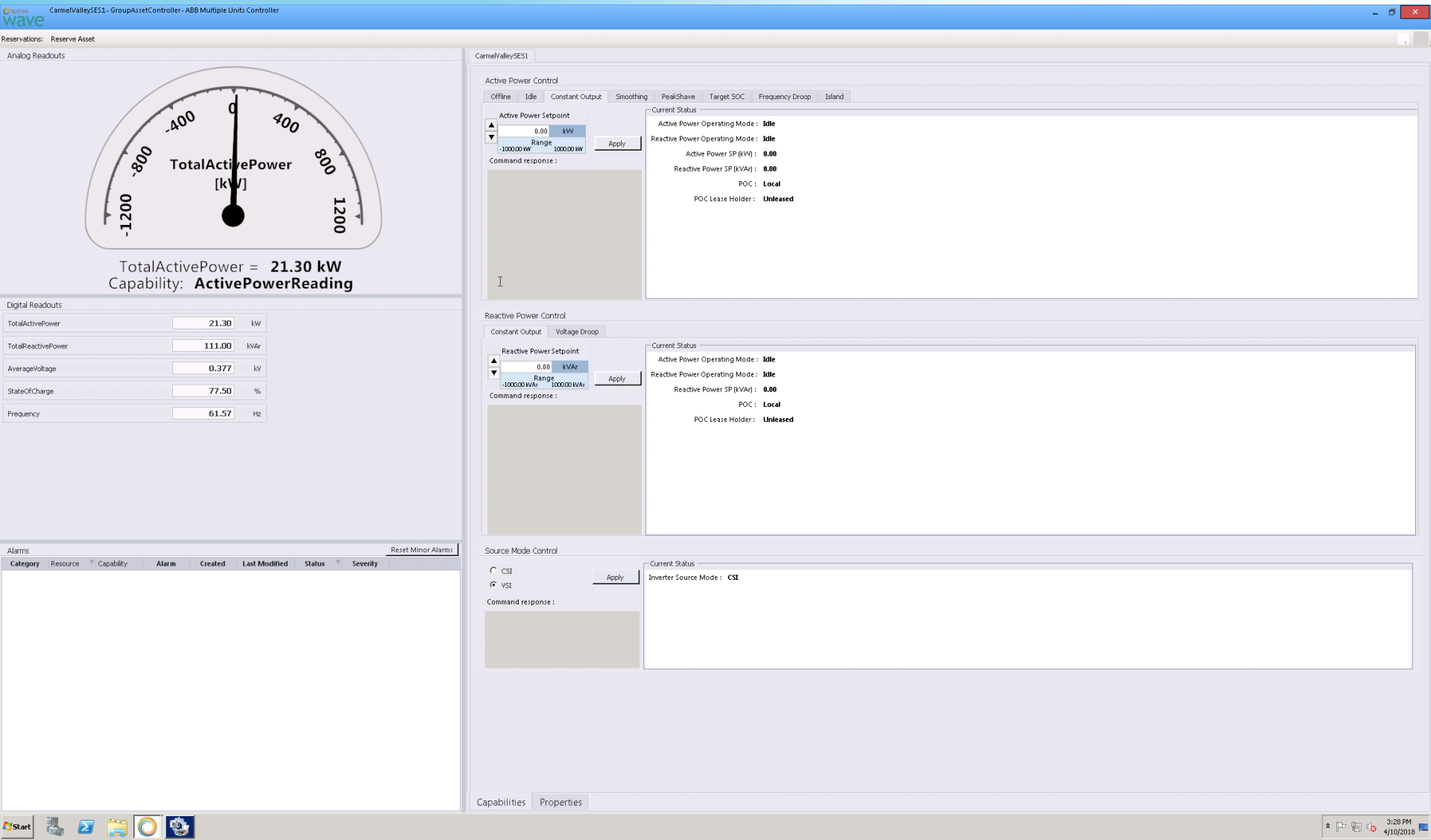
SDGE
A Sempra Energy utility®



Monitor and Control

- Control individual assets
- Native Operational Modes available to operator
  - Real Power
    - Base Mode
    - SOC
    - Peak Shave
    - PV Smooth
    - Frequency Regulation
  - Reactive Power
    - Base Mode
    - Power Factor Control
    - Voltage Regulation
- Select values to be monitored
- View alarms

Monitor and Control



Energy Storage Management

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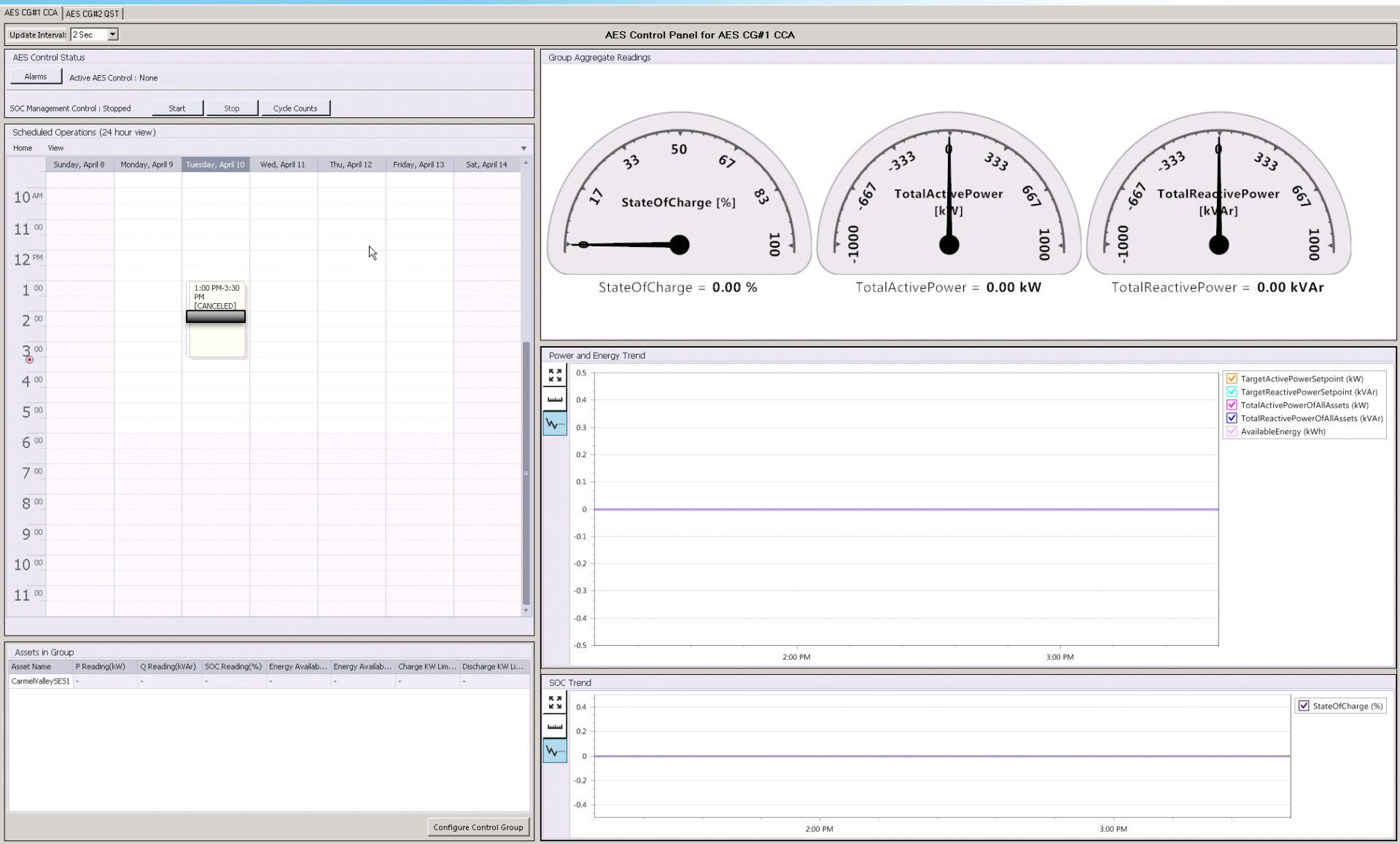

Energy Storage Management

- Key Operational Features
  - Group-level (or individual) dispatch
  - Planned and Unplanned Reservations
  - Constraint Stacking
  - Group-level (or individual) optimization

DERMS and CAISO Markets

- One possible method of capturing value of DER is participating in ISO markets
- A few of the CAISO Market and Services include:

Market/Service	Control Interval	DERMS Involvement
Day-ahead	5 minutes	Asset reservation Asset dispatch
Real-time	5 minutes	Asset reservation Asset dispatch
Ancillary Services		
- Regulation Up	4 seconds	Asset reservation
- Regulation Down		Asset reservation
- Spinning Reserve		?
- Non-spinning Reserve		?

Microgrid Control

- Key Operational Features
  - Group Import or Export across a Point of Common Coupling (PCC)
  - Transient-constraint based dispatch of supporting assets in an island scenario
  - Individual asset monitoring
  - Time-to-live monitors
  - Microgrid-specific alarm reporting

Borrego Springs Microgrid

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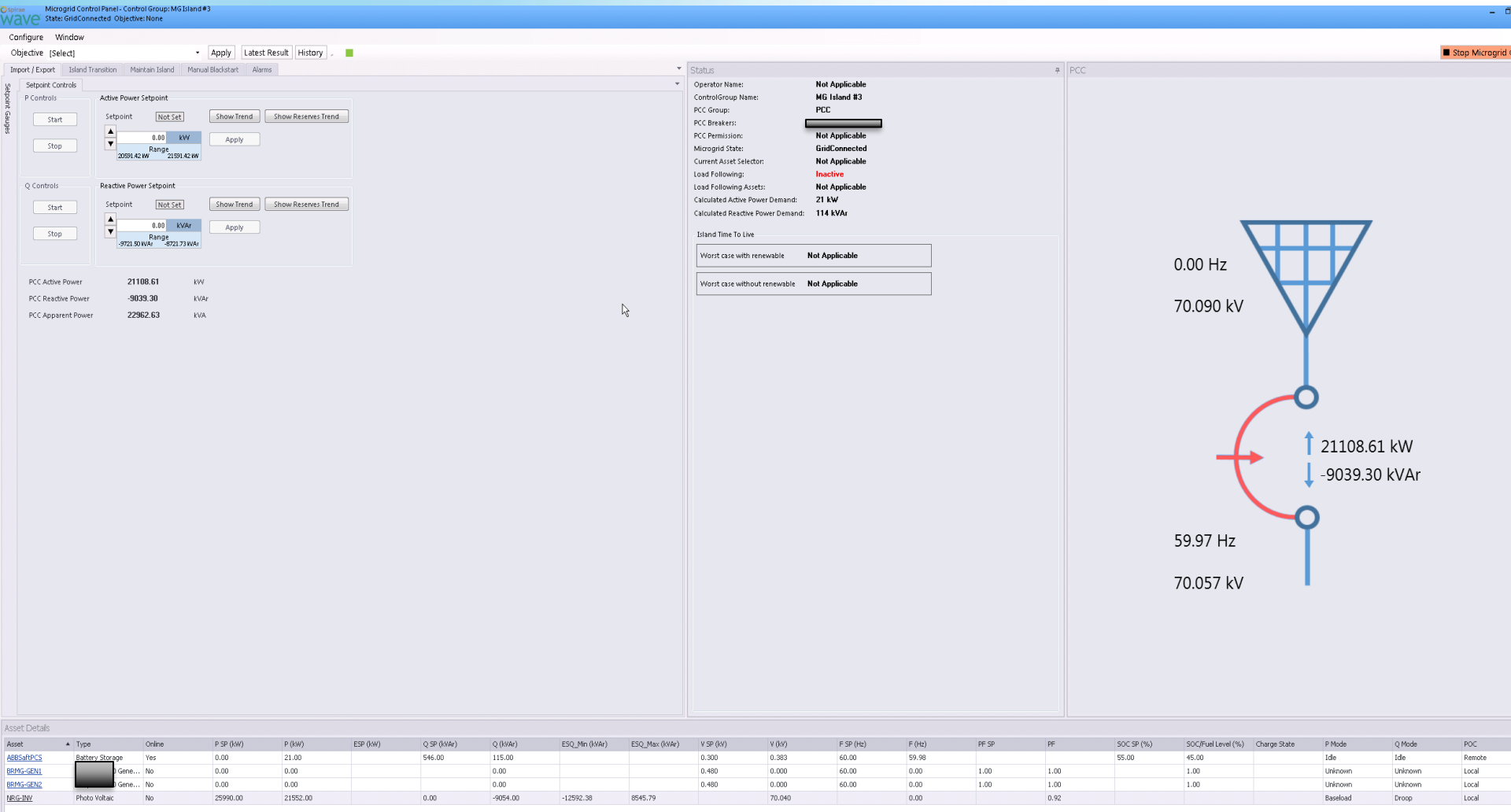

Thank You to…

- eiPi10, LLC
- Spirae, LLC
- Electric Power Research Institute

Session Goals

- **Organizers: Ajit Renjit, Tanguy Hubert and Brian Seal** (EPRI)
  - **DERMS – Origin and Definition**
  - **DER group management functions – an overview**
  - **Need for interoperable protocols that support group management functions**