

DERMS with IOU-Owned Assets

May 2, 2018



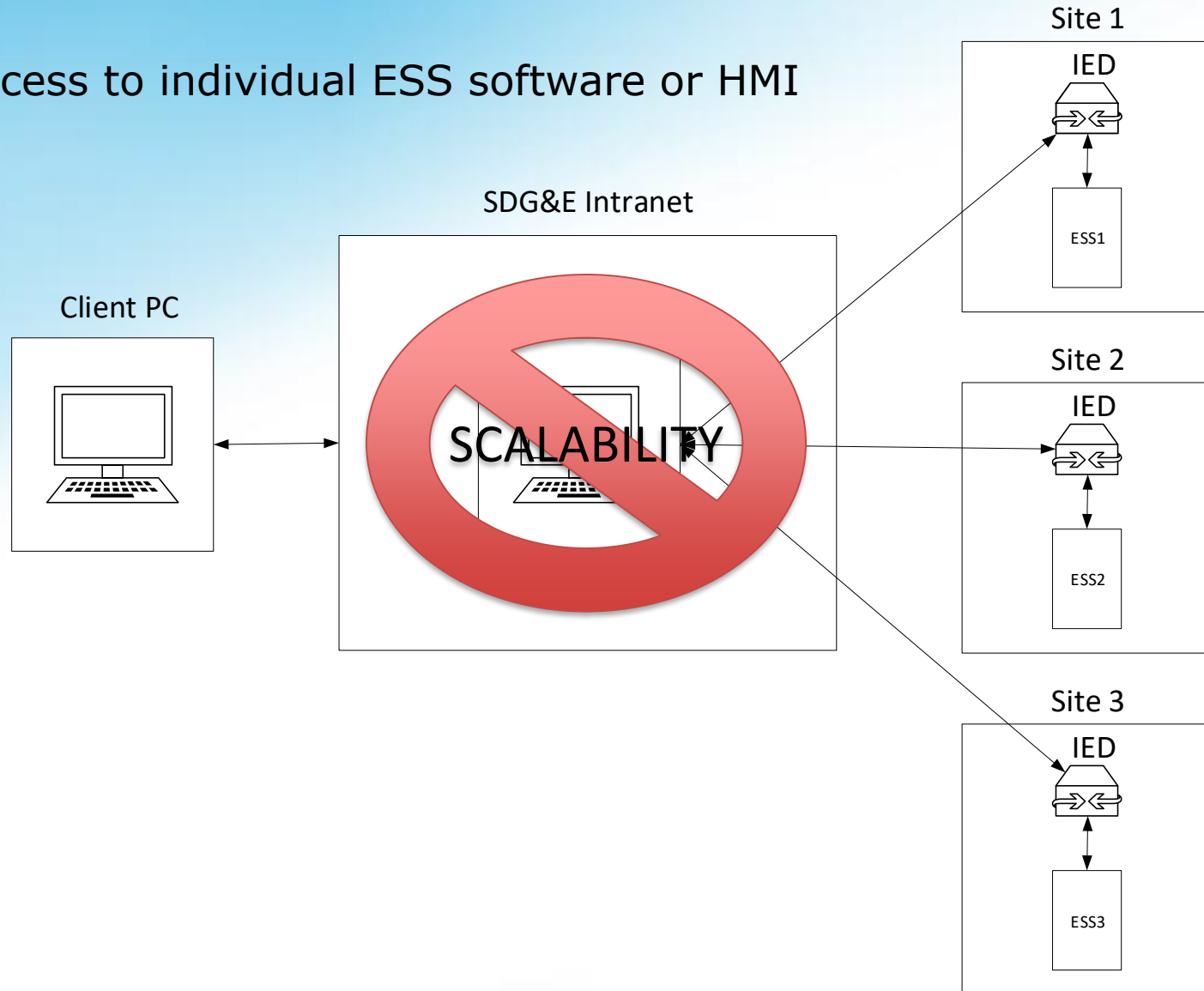
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Agenda

- 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

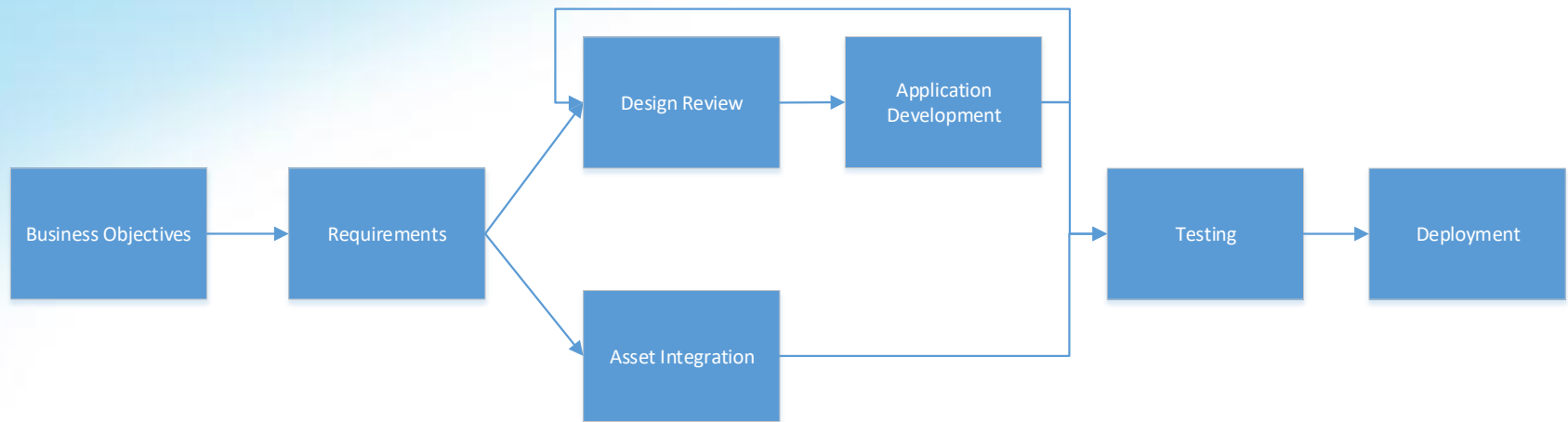
- DERMS
 - Distributed Energy Resource Management System

- 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 Spiraе, LLC
- Product Platform has several Applications
 - Monitor and Control
 - Energy Storage Management
 - Microgrid Control
 - Demand Response

Building DERMS

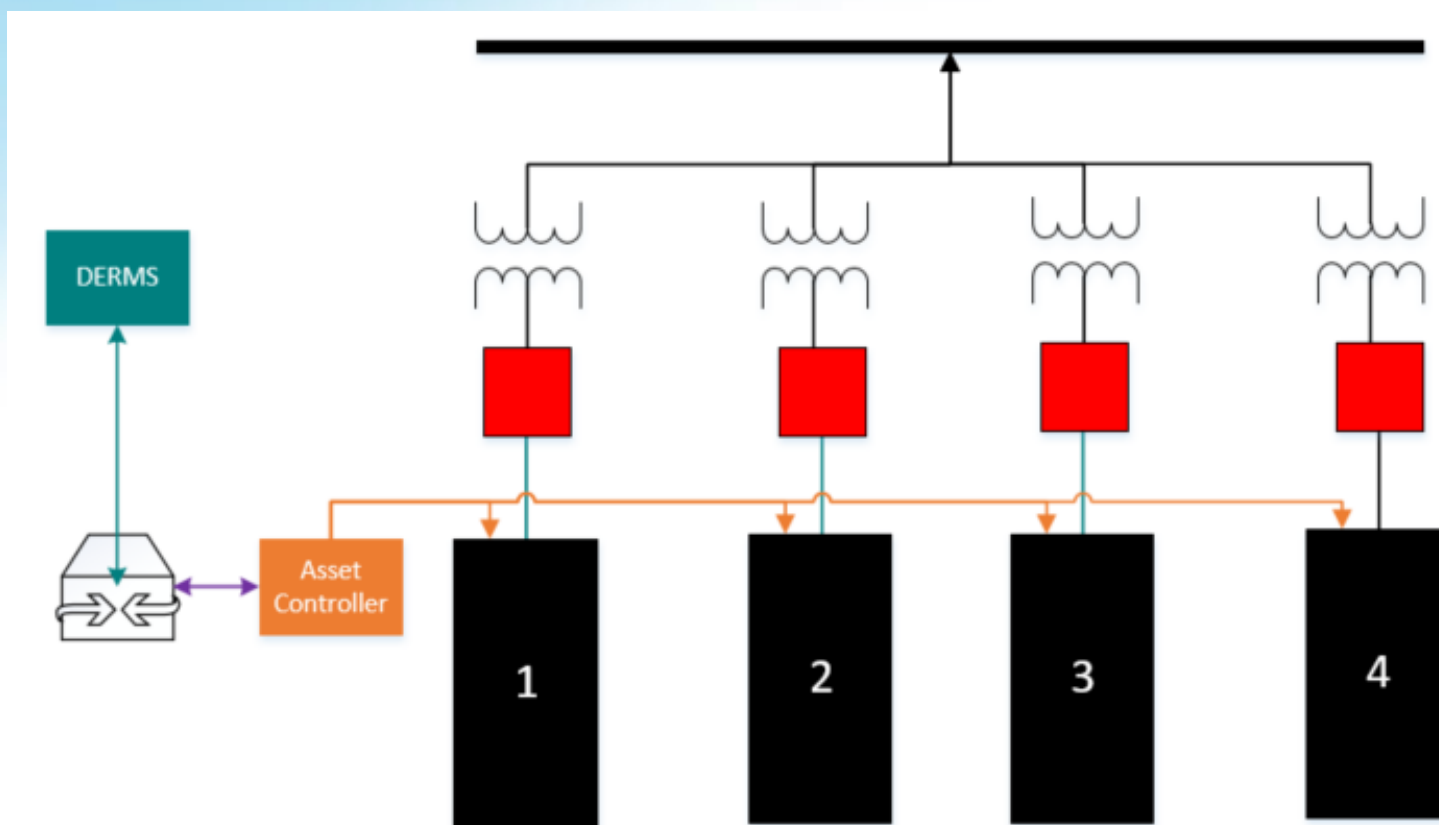


Asset Integration

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

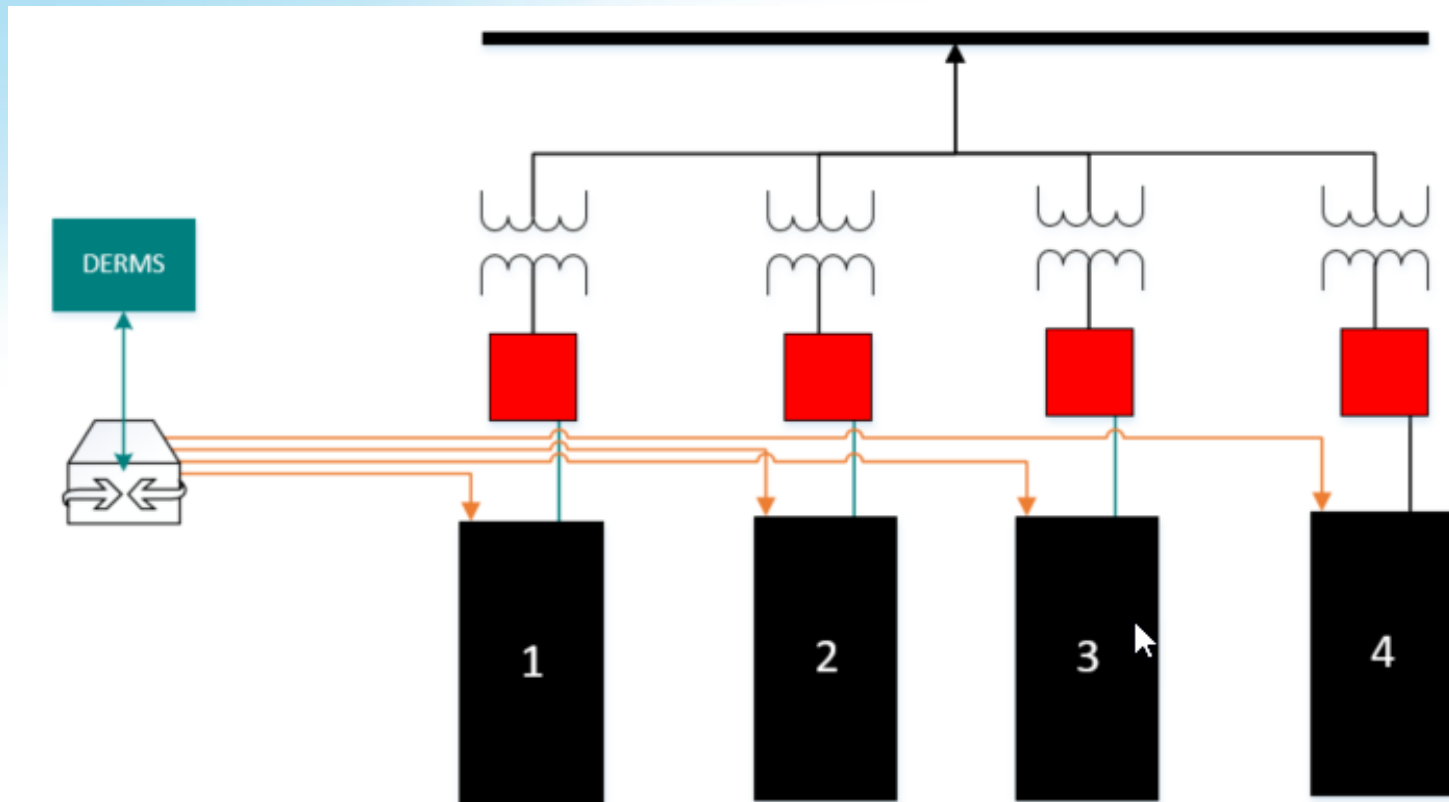
System Hierarchy

- Example 1



System Hierarchy

- Example 2



- 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

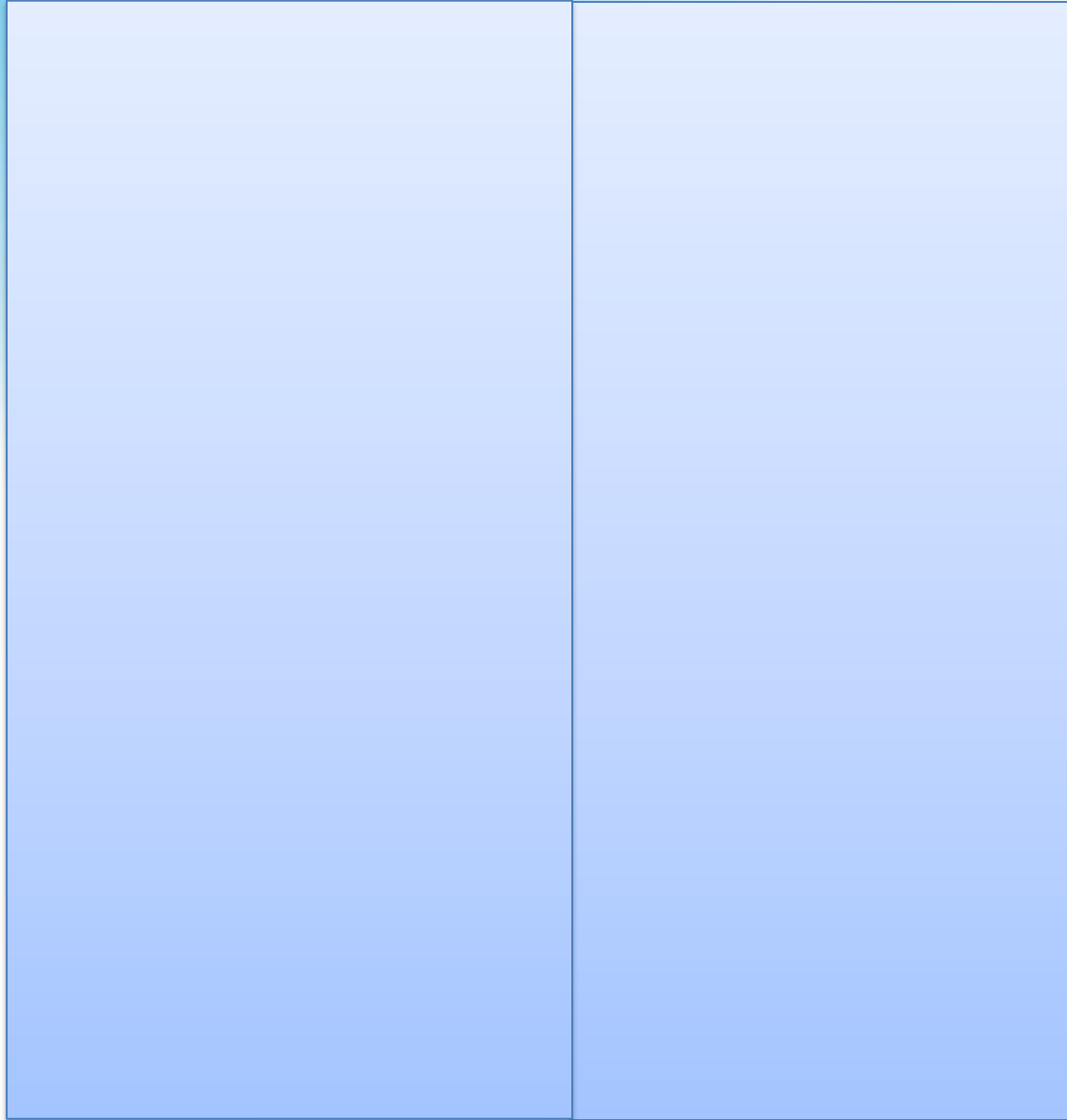
- Example 2

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



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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



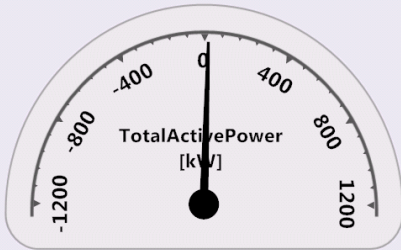
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CarmelValleySE51 - GroupAssetController - ABB Multiple Units Controller

Reservations: Reserve Asset

Analog Readouts



TotalActivePower = **21.30 kW**
Capability: **ActivePowerReading**

Digital Readouts

TotalActivePower	21.30	kW
TotalReactivePower	111.00	kVar
AverageVoltage	0.377	kV
StateOfCharge	77.50	%
Frequency	61.57	Hz

Alarms

Reset Minor Alarms

Category	Resource	Capability	Alarm	Created	Last Modified	Status	Severity
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CarmelValleySE51

Active Power Control

Offline Idle Constant Output Smoothing PeakShave Target SOC Frequency Droop Island

Active Power Setpoint
▲ 0.00 kW
▼ Range -10000.00 kW 10000.00 kW
Apply

Command response:



Current Status

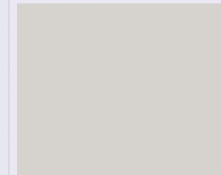
Active Power Operating Mode: **Idle**
Reactive Power Operating Mode: **Idle**
Active Power SP (kW): **0.00**
Reactive Power SP (kVar): **0.00**
POC: **Local**
POC Lease Holder: **Unleased**

Reactive Power Control

Constant Output Voltage Droop

Reactive Power Setpoint
▲ 0.00 kVar
▼ Range -10000.00 kVar 10000.00 kVar
Apply

Command response:



Current Status

Active Power Operating Mode: **Idle**
Reactive Power Operating Mode: **Idle**
Reactive Power SP (kVar): **0.00**
POC: **Local**
POC Lease Holder: **Unleased**

Source Mode Control

CSI
 VSI
Apply

Command response:



Current Status

Inverter Source Mode: **CSI**

Capabilities Properties



3:28 PM 4/10/2018

Energy Storage Management



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AES CG#1 CCA | AES CG#2 QST

Update Interval: 2 Sec

AES Control Status

Alarms: Active AES Control : None

SOC Management Control : Stopped Start Stop Cycle Counts

Scheduled Operations (24 hour view)

Home	View	Sunday, April 8	Monday, April 9	Tuesday, April 10	Wed, April 11	Thu, April 12	Friday, April 13	Sat, April 14
10 AM								
11 AM								
12 PM								
1 PM				1:00 PM-3:30 PM [CANCELED]				
2 PM								
3 PM								
4 PM								
5 PM								
6 PM								
7 PM								
8 PM								
9 PM								
10 PM								
11 PM								

AES Control Panel for AES CG#1 CCA

Group Aggregate Readings

StateOfCharge = 0.00 %

TotalActivePower = 0.00 kW

TotalReactivePower = 0.00 kVAr

Power and Energy Trend

SOC Trend

Assets in Group

Asset Name	P Reading(kW)	Q Reading(kVAr)	SOC Reading(%)	Energy Availab...	Energy Availab...	Charge KW Lim...	Discharge KW L...
CarmelValleySES1	-	-	-	-	-	-	-

Configure Control Group

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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Microgrid Control Panel - Control Group: MG Island #3
 State: GridConnected Objective: None

Configure Window
 Objective [Select] [Apply] Latest Result History

Import / Export Island Transition Maintain Island Manual Blackstart Alarms

Setpoint Controls

P Controls

Active Power Setpoint

Setpoint: Not Set

0.00 kW

20891.42 kW Range 21391.42 kW

Q Controls

Reactive Power Setpoint

Setpoint: Not Set

0.00 kVAr

-8721.50 kVAr Range -8721.73 kVAr

PCC Active Power: 21108.61 kW

PCC Reactive Power: -9039.30 kVAr

PCC Apparent Power: 22962.63 kVA

Status

Operator Name: Not Applicable

ControlGroup Name: MG Island #3

PCC Group: PCC

PCC Breakers: []

PCC Permission: Not Applicable

Microgrid State: GridConnected

Current Asset Selector: Not Applicable

Load Following: Inactive

Load Following Assets: Not Applicable

Calculated Active Power Demand: 21 kW

Calculated Reactive Power Demand: 114 kVAr

Island Time To Live

Worst case with renewable: Not Applicable

Worst case without renewable: Not Applicable

PCC

Asset Details

Asset	Type	Online	P SP (kW)	P (kW)	ESP (kW)	Q SP (kVAr)	Q (kVAr)	ESQ_Min (kVAr)	ESQ_Max (kVAr)	V SP (kV)	V (kV)	F SP (Hz)	F (Hz)	PF SP	PF	SOC SP (%)	SOC/Fuel Level (%)	Charge State	P Mode	Q Mode	POC
ABBS-MPCS	Battery Storage	Yes	0.00	21.00		546.00	115.00			0.300	0.383	60.00	59.98			55.00	45.00		Idle	Idle	Remote
BBFMS-GEN1	Gene...	No	0.00	0.00			0.00			0.480	0.000	60.00	0.00	1.00	1.00		1.00		Unknown	Unknown	Local
BBFMS-GEN2	Gene...	No	0.00	0.00			0.00			0.480	0.000	60.00	0.00	1.00	1.00		1.00		Unknown	Unknown	Local
BBIC-BV1	Photo Voltac	No	25990.00	21552.00		0.00	-9054.00	-12592.38	8545.79		70.040		0.00		0.92			Baseload	Droop	Local	

Thank You to...



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

Session Goals



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- **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**