Microgrid as a Foundation for DERMS

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CHALLENGE

Existing grid control solutions cannot address utility scale renewable and DER integration effectively

- Designed for “pooling” concept, centralized design
- Too slow to react to intermittencies
- Designed for transmission, not for distribution networks

SOLUTION

Controls solution that focus on the distributed nature of current and future grid

- Microgrid local areas for reliability
- Local voltage management
- Local operational insight

RESULTS

Control and visibility at the distribution level.

- Able to visualize and resolve feeder disturbance
- Better insight into fault detection
- Better resiliency

PXiSE Energy Solutions

A Modern Grid Control Solutions Company

Located in San Diego, CA

Backed by Sempra Energy and Mitsui

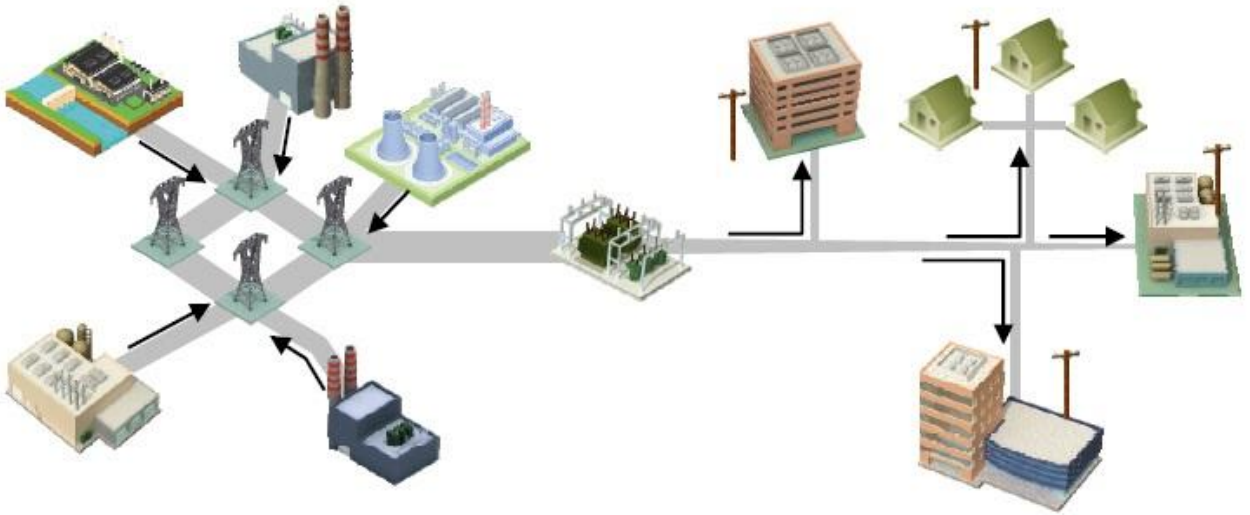
Utility industry is transforming

Operational challenges requiring new solutions

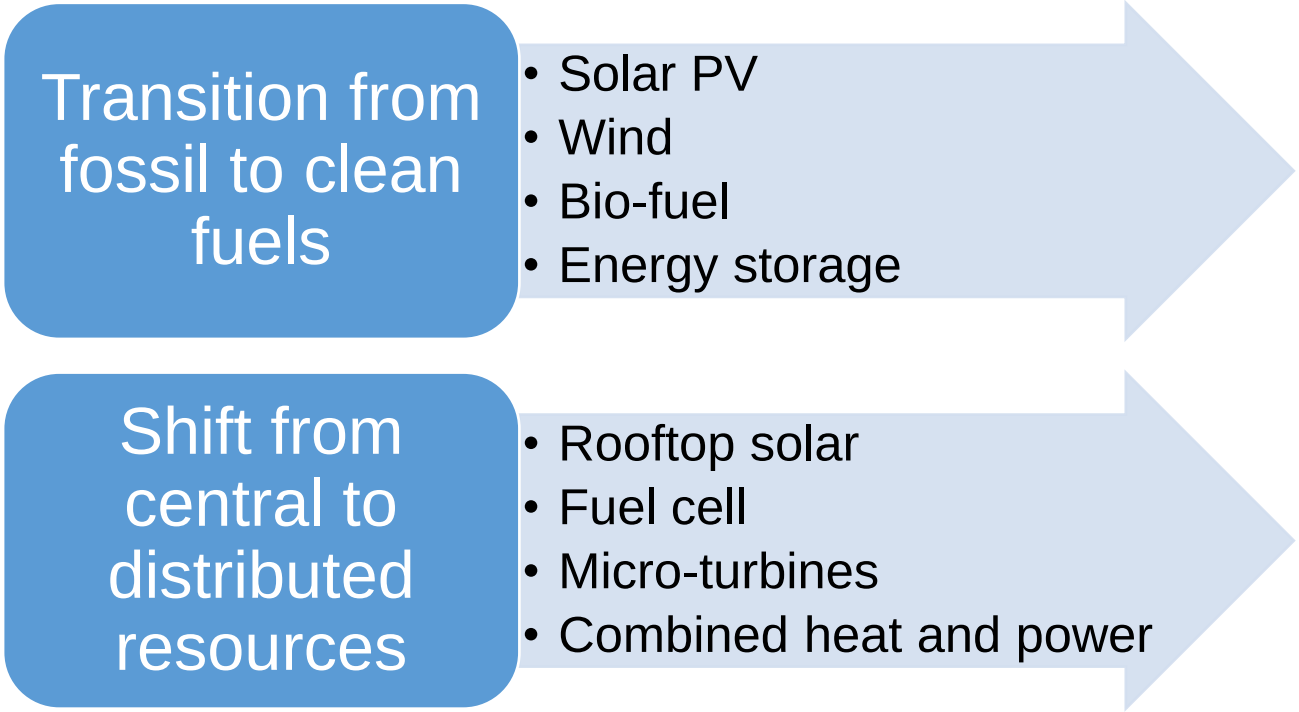
Introducing PXiSE Advanced Control Technology (ACT) to address these challenges?

Advanced DERMS + MGC

TODAY'S POWER SYSTEM HAS EVOLVED



The common themes we continue to hear in the electric industry today



You also hear news about the challenges in operating an electric grid in transition

Forecasting and
Flow Control Problems
Slow Down DER Integration

Variability and
Intermittencies Problems
Limit Renewables adoption

Centralized CONTROL Transmission Level

AGC

Automatic Generation Control

- Dispatch system for centralized generation assets.

Centralized Generation

CONTROL

Transmission Level

EMS

Energy Management System

- Tools used by operators of electric utility grids to monitor, control, and optimize the performance of the generation and/or transmission system.

ADMS

Distribution Management System

- An utility IT system capable of collecting, organizing, displaying and analyzing real-time or near real-time electric distribution system information

Distribution Grid Performance Optimization

What are the priorities of the ADMS

- Is it to solve today's or tomorrow's problem?
- An effective ADMS platform "has to balance the constraints of the past, the needs of today, and the uncertain challenges of the future

When you have seen one ADMS, you have seen one ADMS

- What works in one utility may not work in another?
- Why?
  - Priorities: Business over System
  - System design – distribution level
  - Land,
  - Demographic
  - Regulation
  - Different operational challenges

Requirements to operate a modern grid

- Intelligence
  - Electric components and devices
  - Distributed energy resources
- Faster decision making
  - Control center
  - Automated controls
- Coordinated System controls
  - Directly controlled resources
  - Indirectly controlled resources (market-based - forecast, dispatch, monitor)
  - Unmanaged resources - Forecast
- Better customer engagement (both as a producer and consumer)

Monitor

Forecast

Coordinate

DERMS

Scheduled per Network Model

Distributed Energy Resource **Management** System

- Software platform with the specific function to forecast, monitor, control and coordinate distributed energy resources (DER) on the distribution electric grid system consistent with the resource management and optimization performed by a network model system

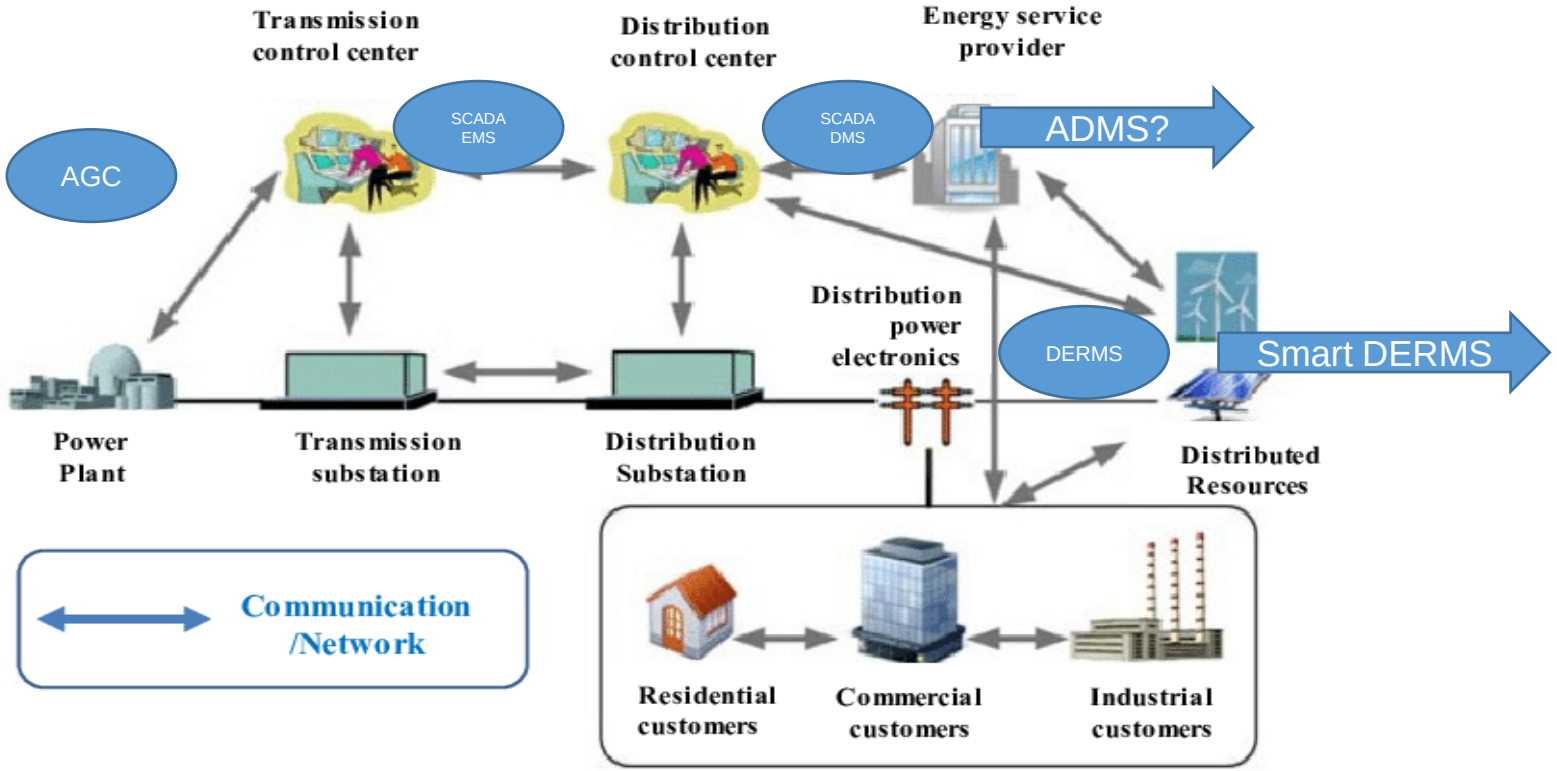
What's a DER?

- DER covers large to small resources on both sides of the meters
  - Generators
  - CHP
  - Photovoltaic
  - Energy Storage
  - Fuel Cells

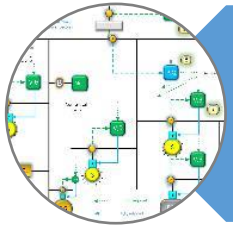
Smart DERMS

- Smart DERMS is a comprehensive system that address all resources in the distribution system while maintaining system reliability and integrity
  - Has all the capabilities of the traditional DERMS
  - Has ability to mitigate energy imbalance and disturbances in real-time and under dynamic conditions
  - Has integrated both the system level controls and local level controls (e.g. microgrid)
  - Can optimize in real-time and operate autonomously
  - Can integrate with transmission system for active grid control (control a federation of substations just like DER)

POWER SYSTEM OPERATIONS TODAY



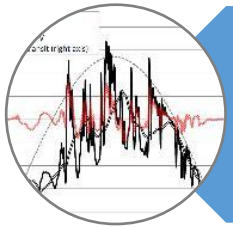
Unfortunately the existing grid control solutions cannot address renewable and DER integration effectively



Largely slow, centralized, transmission level existing control solutions cannot cope with many randomly integrated DERs on the distribution system

EMS

AGC



Current power dispatching tools are too slow to respond to sudden changes of renewables and dynamic changes in a grid

DMS

ADMS

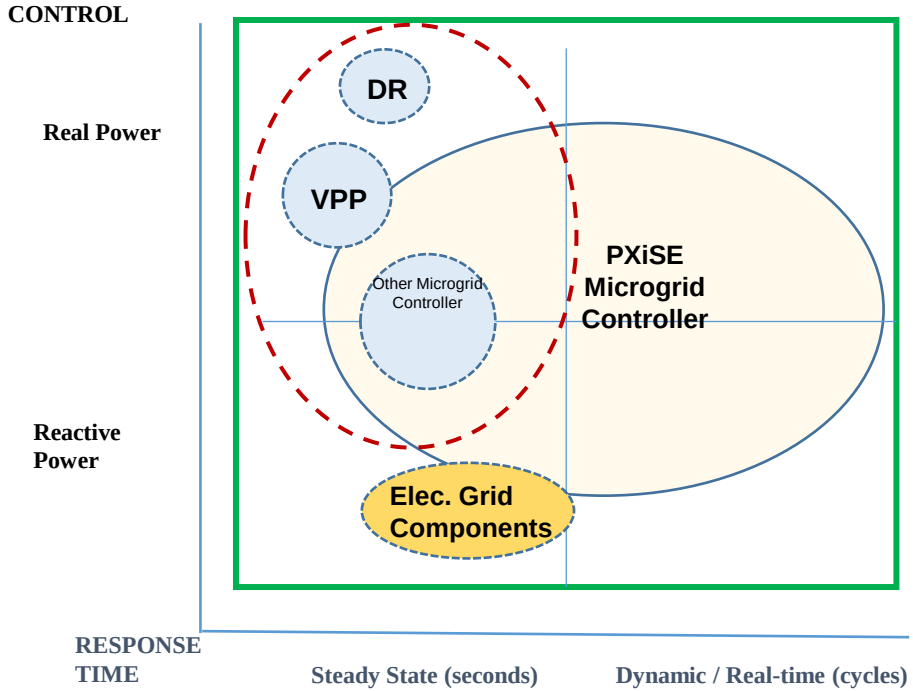
Aggregation of right DERs for planning and forecasting drastically differs than real-time operational needs

DERMS

There aren’t any tools available to control the grid, especially at the distribution level!

PXiSE Has the Most Comprehensive DER Management Solution

Distribution Management Solutions in the Market



PXiSE's Comprehensive DER Management Solution

PXiSE MGC Solutions

Other DERMS Solutions

Other Grid Solutions

Utility industry is transforming

Operational challenges requiring new solutions

Introducing PXiSE Advanced Control Technology (ACT) to address these challenges?

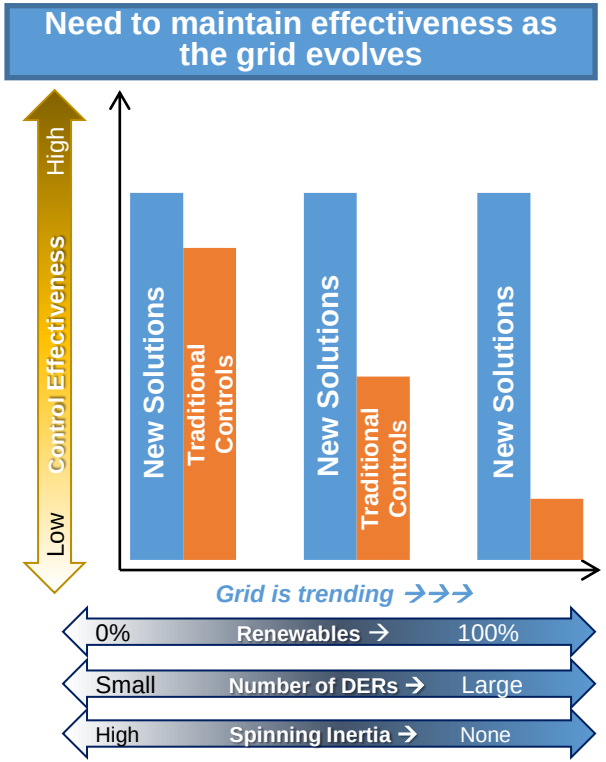
Advanced DERMS + MGC

Demonstrated benefits for a wide range of applications in an electric grid

Industry needs an advanced control technology to mitigate the major challenges facing the today's electric system

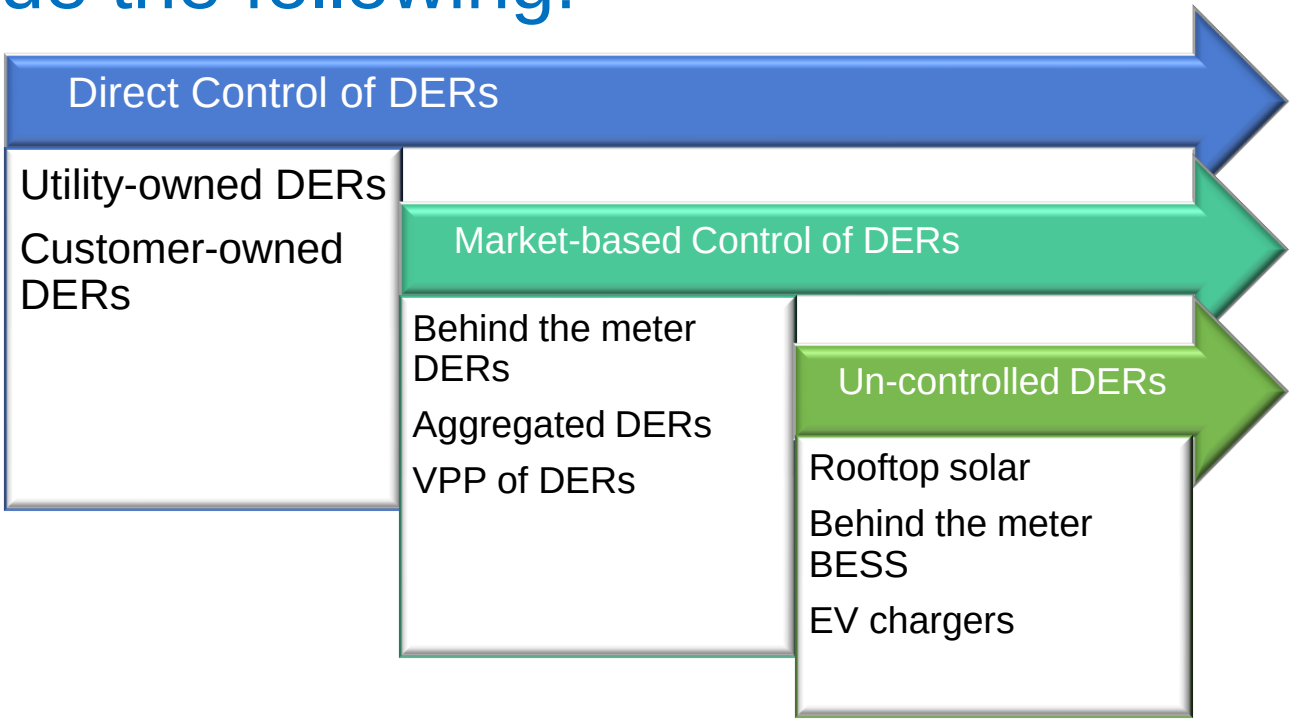
New Solutions needs to effectively:

1. Manage fast changes in demand, e.g. EV
2. Address intermittency issues from renewables
3. Actively and precisely control bi-direction energy flow
4. Optimize the utilization of a diverse mix of resources to meet operational objectives
5. Minimize infrastructure capital and O&M costs in the transition



A complete solution for modern grid control should include the following:

A comprehensive solution to manage and control all DERs logically organized as **microgrids**, **VPPs**, and **aggregated resources**



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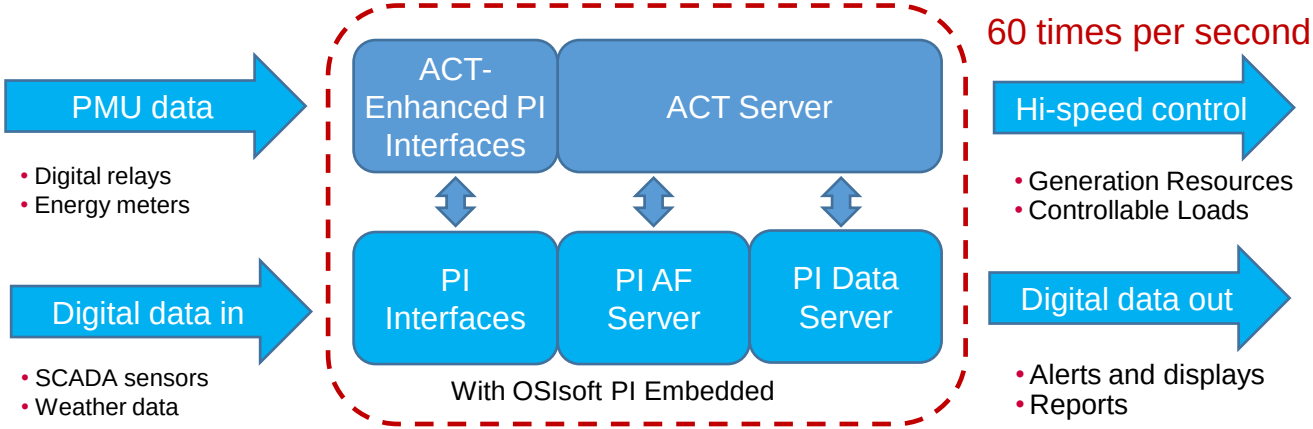
Ultimately: An integrated software solution functions like a fast and intelligent SCADA - "an auto-pilot grid controller"

1. Integrated on a Proven Data Platform with licensed and pending patents

PXiSE ACT Solution



2. Implemented on Field Proven Hardware

3. Software Designed for Fast Field Implementation

PXiSE is an advanced control technology (ACT) - a simple concept with complex value propositions

Higher resolution data allows for more effective and faster control of responsive resources to coordinate with slower resources

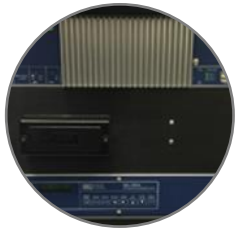
PXiSE ACT is a well-designed electric control system solution with "desirable characteristics"

PXiSE

Advanced Control Solution

IEEE 37.118

Standard Interfaces



Common hardware

Familiar software

Proven OSIsoft Data Infrastructure

Flexible design

Ease of use

Eliminate Network flow analysis

Intelligent

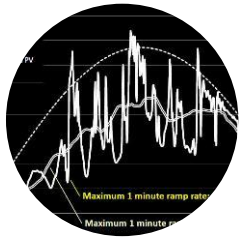
Systematic & robust

Scalable

Nested multi-level controls

PXiSE's Advanced Control Solutions have "desirable performance capabilities"

Mitigate disturbances



Address intermittencies

Precision control

Multi-objectives resource optimization

Lower Cost

An efficient and reliable electric grid

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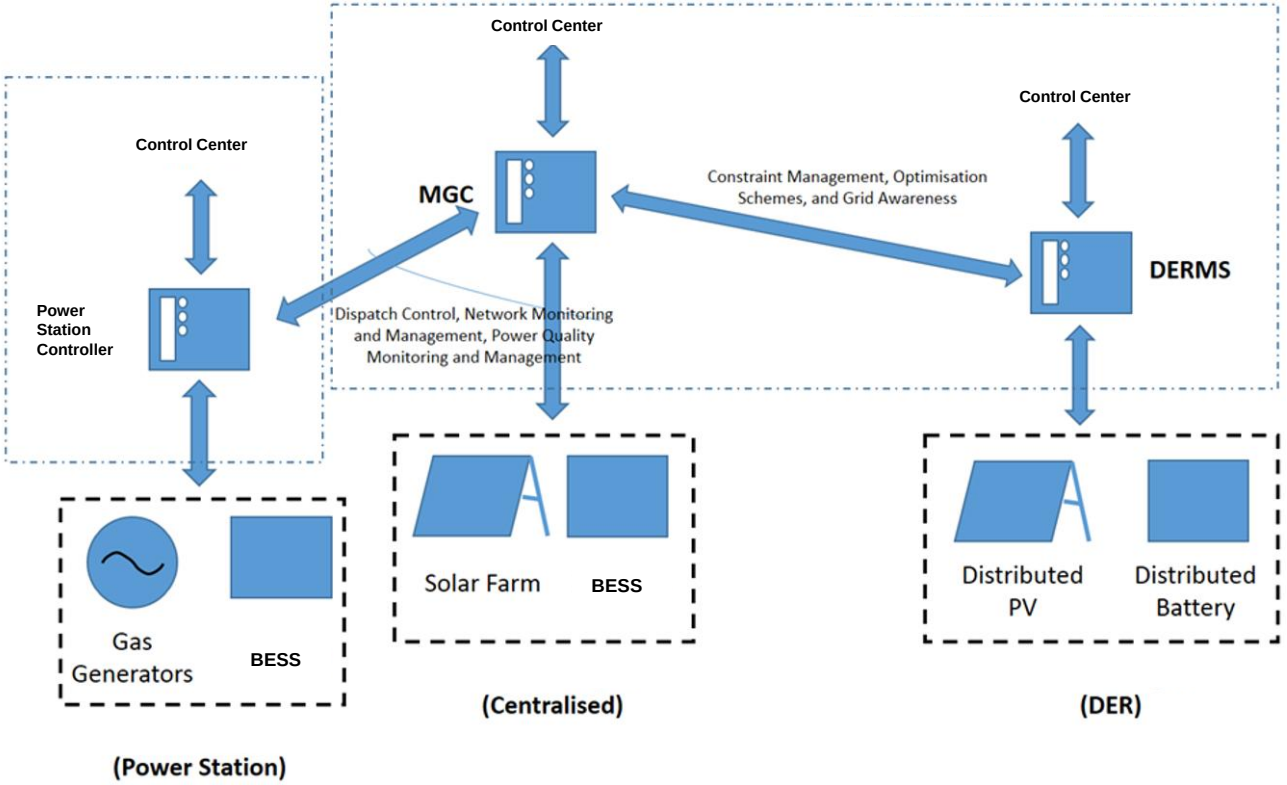
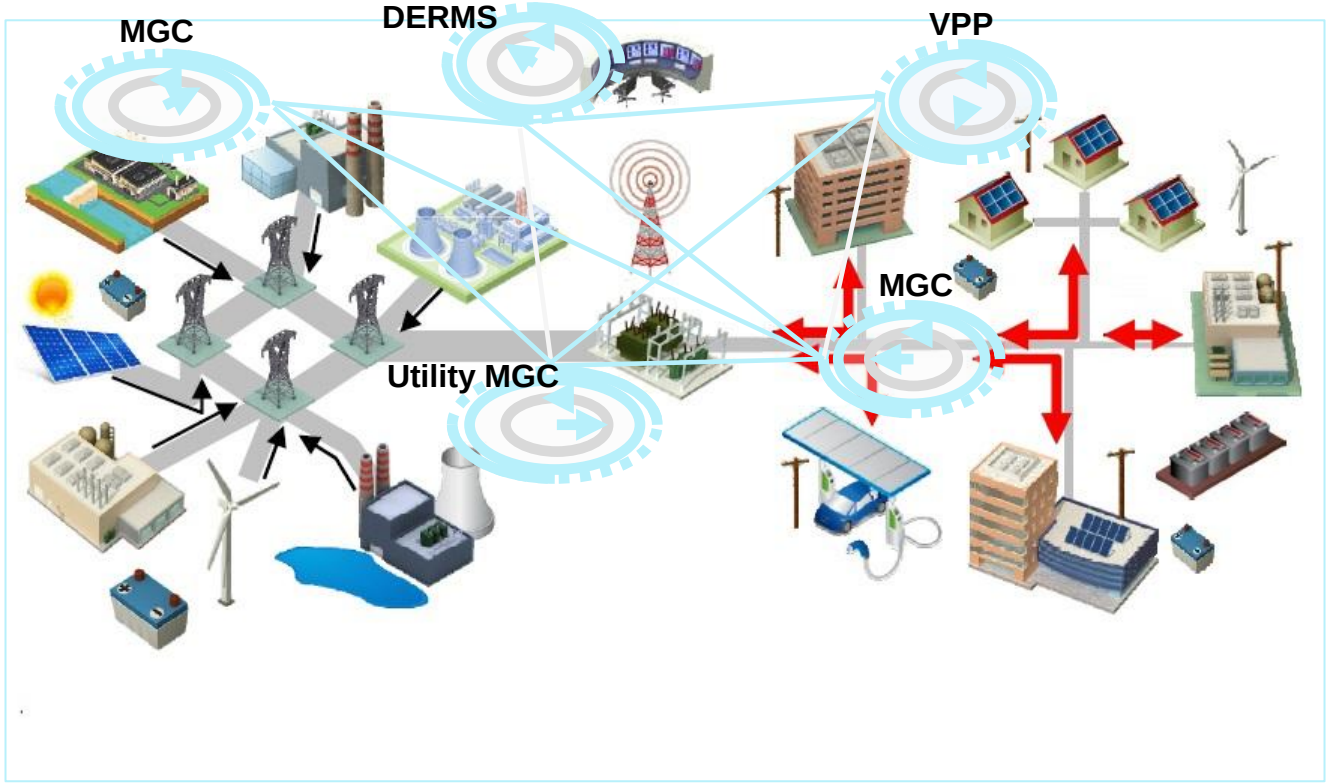
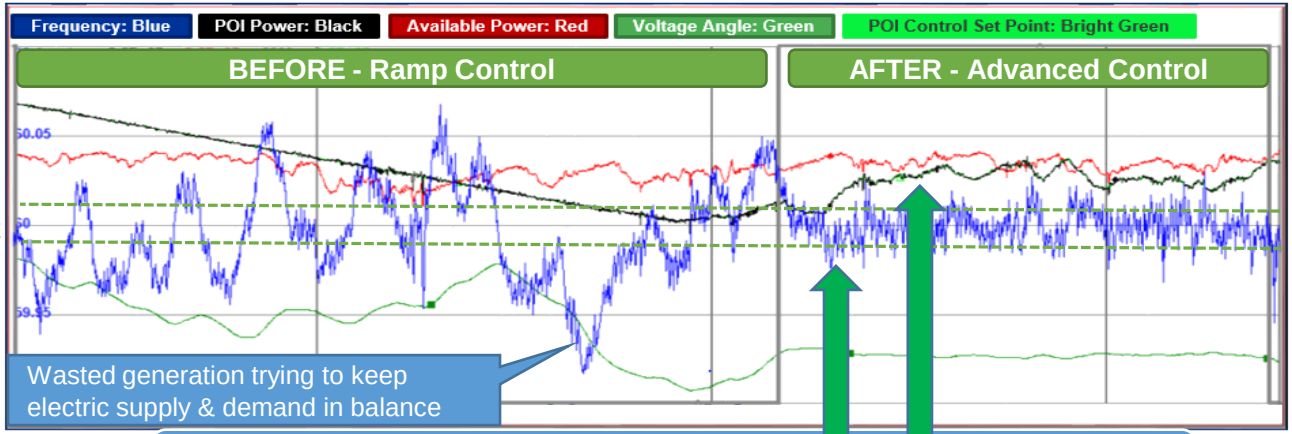
DERMS/MGC Design

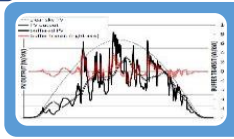


Grid of the Future
(A System of Systems Applicable in T & D)



Actual results validated significant value proposition of the ACT in isolated grid with large renewable penetration



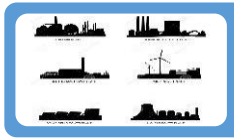


Stabilized frequency of grid

- Addressed solar PV intermittency issues
- Support more renewables adoption
- Achieved high power quality

Maximizes renewable energy delivery

- More energy delivered from wind turbines with more effective use of battery
- Less operational wind curtailments



Improves thermal generator efficiency

- Less cycling of generators with stable frequency
- More operational flexibility of thermal generators with battery providing regulation service

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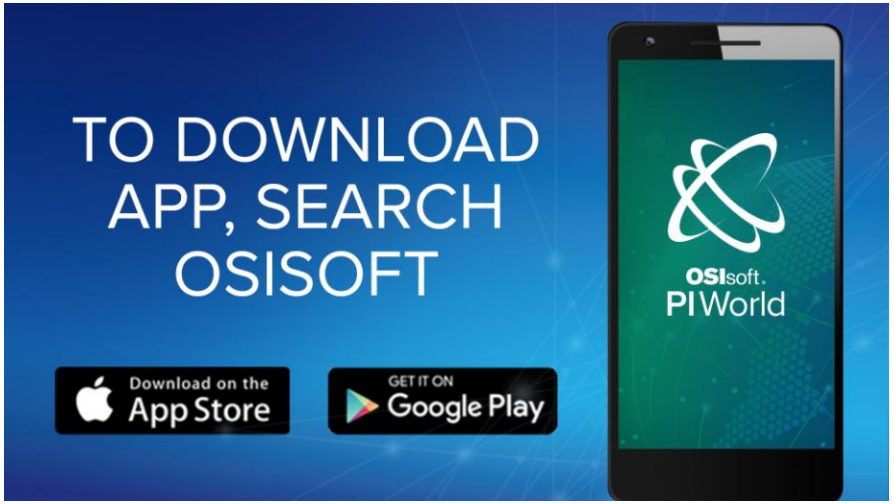
Questions?

Please wait for the **microphone**

State your **name & company**

Please remember



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