ENERGISE Program Kickoff

DOE Award #: DE-EE0008010

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Security Constrained Economic Optimization of PV and Other Distributed Assets

Advanced Microgrid Solutions

October 11, 2017

Project Team

Advanced Microgrid Solutions

- Project Management
- System Integration
- Business Modeling
- Market Transformation

Opus One Solutions

- GridOS™ Platform
- Grid and Microgrid Modeling
- Power Analytics
- Physical Optimization
- DMS Interfaces

Georgetown Utility Systems

- Hosting Utility
- Data
- Validation
- Acceptance

Advanced Microgrid Solutions

- Armada Platform
- Security Constrained Optimization
- Business Analytics
- Storage System (EPC)
- Utility and Market I/F
- Micro PMUs

GridBright – The Grid Management Specialists

- Data Integration and Management Plan
- Open Source Software Distribution Plan
- Cybersecurity Plan
- Interoperability Plan

Project Goals

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- ❖ Demonstrate a comprehensive integrated solution that co-optimizes aggregated solar and storage to maximize:
  - Site host energy benefits,
  - Utility grid services, and
  - Wholesale energy market services.

- ❖ Implement a security constrained economic optimization of DER dispatch that includes physical grid constraints, performance, load needs, and cost reduction.

  - Enable cost effective integration of high penetrations of distributed PV in the power grids of the future, while meeting the objectives of reliability, resiliency and affordability.

- ❖ Demonstrate that these methods are scalable at massive levels of PV penetration

Major Innovations

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- Currently, DERs are integrated with the grid on an ad-hoc basis; opportunities to self-mitigate impacts or provide grid services through optimized aggregation are lost.
- This project will provide an integrated solution to systematically integrate DER and obtain the greatest grid benefits at the lowest cost.
- Major innovations include:
  - Enabling a storage-backed building microgrid to function as an intelligent network node, co-optimizing PV, storage, other DERs and the building load.
  - Developing an enhanced grid system layer through utilizing advanced sensors with real-time distribution system situational awareness, topology estimation and advanced analytics.
  - Prove out how coordinated dispatch DER can improve power flow efficiency and system hosting capacity.

Main Project Tasks/Subtasks

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- **Develop Microgrid Optimization Algorithm**
  Simulate, model and factory test grid edge optimization solution for a microgrid that incorporates: PV, EV chargers, back-up generation, battery energy storage and other systems.

- **Deploy Utility Microgrid Energy Storage System**
  Construct and commission a battery-centric microgrid at GUS' Westside Service Center to pair with its in place 132kV PV system.

- **Develop Feeder-level Power Flow Optimization**
  Develop a real-time system simulation platform interface with the Utility SCADA; demonstrate feeder-level optimization.

- **Simulated Scalability Demonstration**
  Demonstrate in simulation the scalability of the solution to a system that includes at least 10,000 active nodes, 3 microgrids, 10 feeders, 3 substations and high penetration PV.

- **Integration of Grid Services**
  Demonstrate solution of how the deployment of solar enabling technologies with stacked revenue streams/cost avoidance lowers the effective cost of deploying and integrating PV.

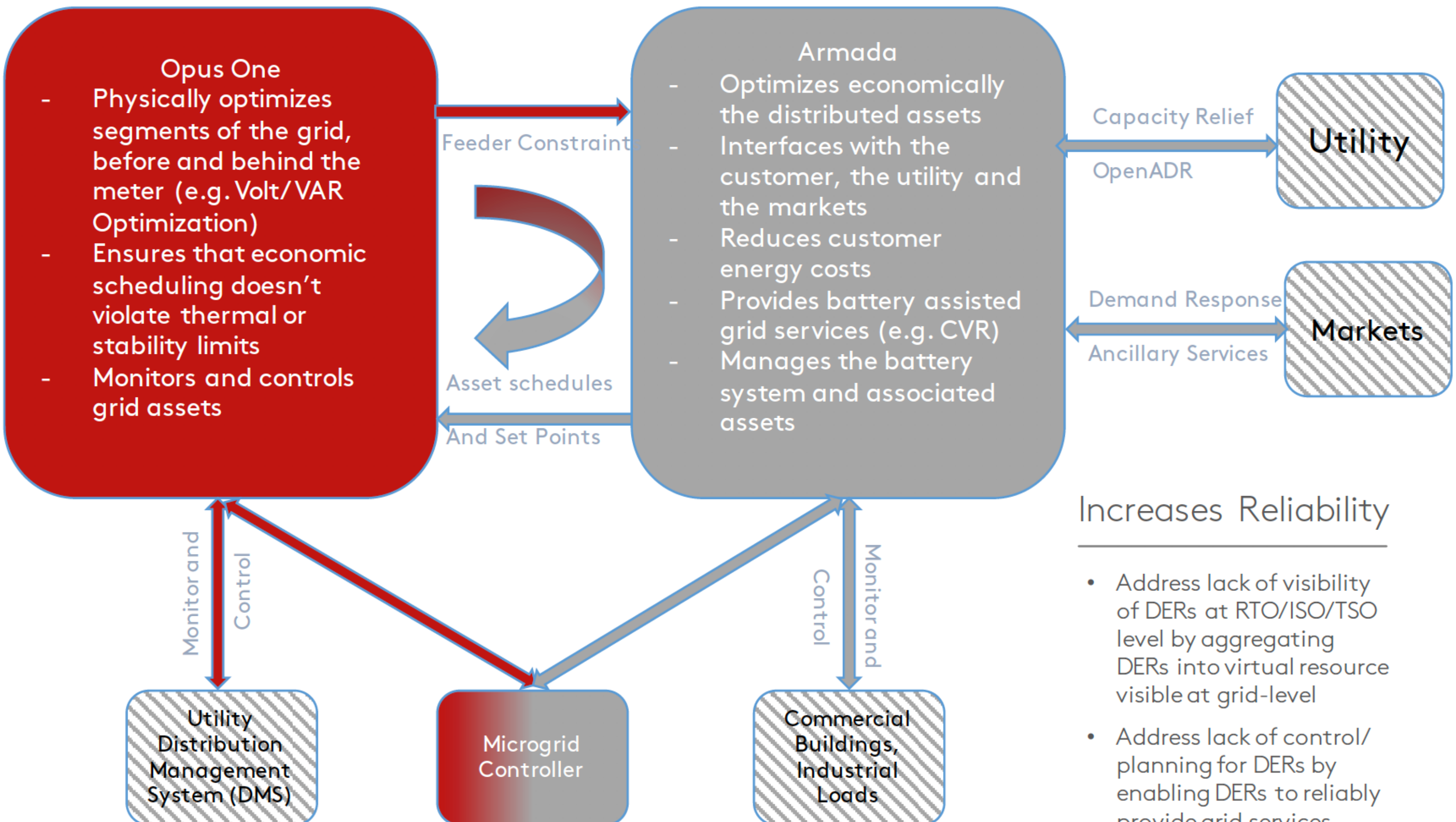
- **Develop Enhanced Grid-interactive Gateway**
  Create an intelligent gateway capable of micro-PMU (Phasor Measurement Unit) based sensing, 4 quadrant inverter control, revenue grade metering and local optimization.

- **Stakeholder Engagement and Dissemination of Project Results**
  Engage multiple utility cooperatives to ensure market relevance for the project.

Project Milestones/Deliverables

- Budget Period 1:
  - Deliver completed test plan
  - Define baseline data
  - Complete power flow and OPF model for integration
  - Test gateway communications
- Budget Period 2:
  - Deploy DER and microgrid assets
  - Complete acceptance testing
  - Document scalability results and the extended solution deployment analysis
- Budget Period 3:
  - Complete one year of operation of microgrid and optimized DER dispatch
  - Finalize integrated test results and final report

Project Architecture



Increases Reliability

- Address lack of visibility of DERs at RTO/ISO/TSO level by aggregating DERs into virtual resource visible at grid-level
- Address lack of control/ planning for DERs by enabling DERs to reliably provide grid services

Project Architecture

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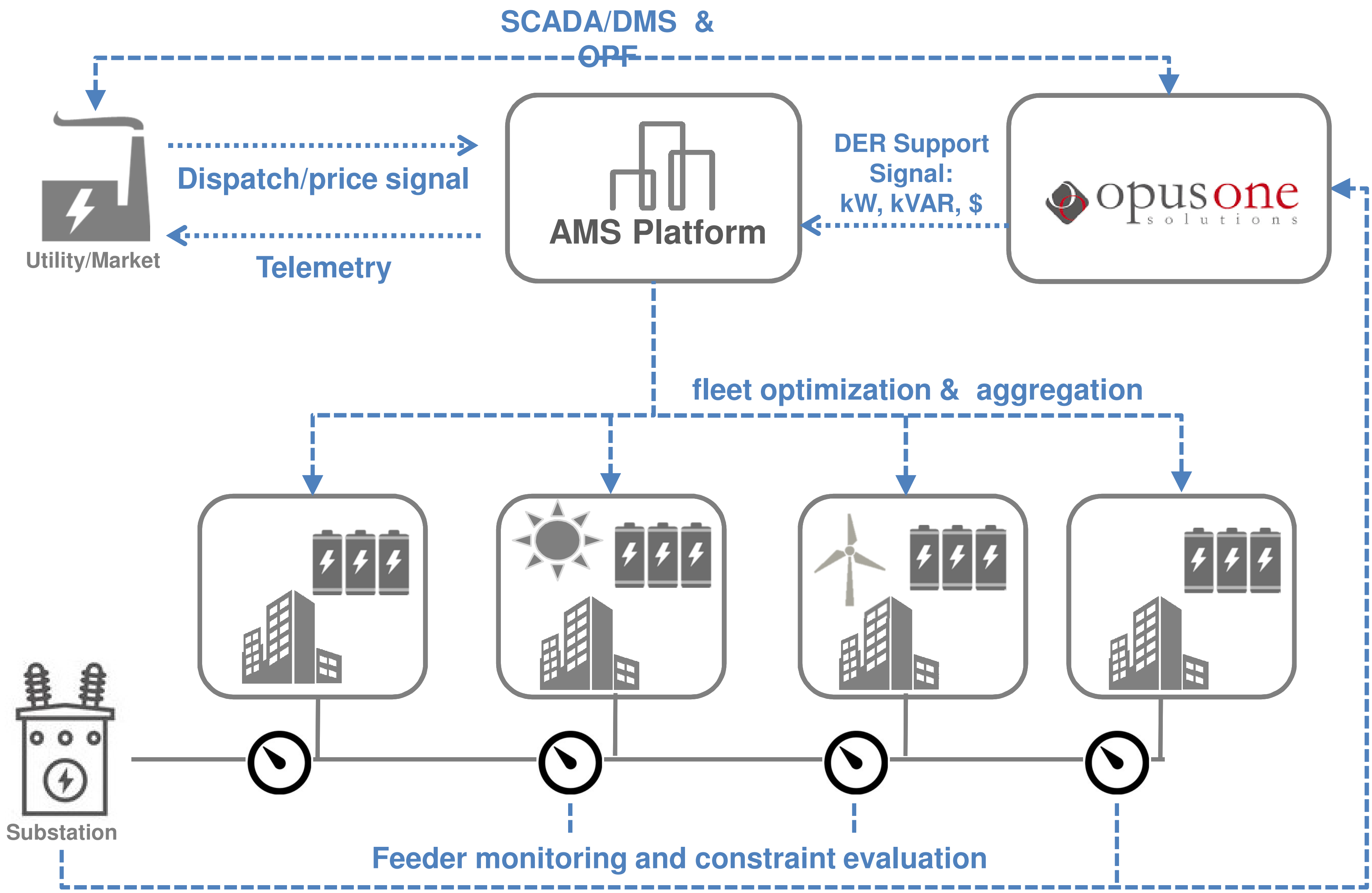

High Risks & Mitigation

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Risk	Description	Mitigation Strategy
Project, personnel, and consumer health, safety and security	Health, safety and security of individuals associated with the project	• Provide safety training • Address potential safety issues in the field
Performance of vendors and sub-recipients	Increased complexity and interdependencies	• Establish PM and SME team responsible for communication and coordination • Identify and address potential design and execution issues
Interoperability and security	System integration efforts of multiple vendors and existing utility systems	Develop a documented interoperability and security plan
Changes of federal, state, or local utility regulation	Updates to policies may cause deviation from project objectives	Monitor all applicable regulations.

Cybersecurity & Interoperability

- Define Cybersecurity Risks
  - Integrate security controls and perform acceptance and security evaluation testing.
  - Engage operations for security monitoring and incident handling.
  - Establish maintenance cycles for system changes such as credential management and patching.
- Create Interoperability Criteria for Vendor and Device Selection
  - Evaluate each vendor's device for cybersecurity risk and interoperability feasibility.
  - Perform periodic design reviews and security tests as project progresses.
- Standards and Best Practices
  - Identify and include logical and physical security controls in the system requirements specification.