opus one solutions

EMPOWERING UTILITIES IN A DECENTRALIZED ENERGY ECONOMY

Alberta School of Business Energy Symposium

September 21, 2017

OPUS ONE OVERVIEW

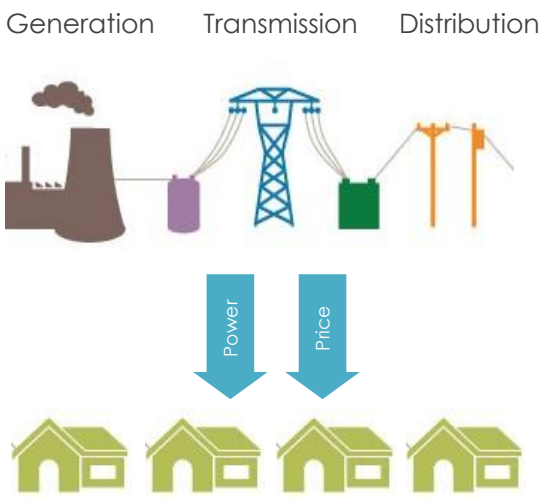
Software engineering and solutions company connecting the distributed energy network

Delivering advanced capabilities through GridOS® intelligent energy networking platform

Core Innovation around state estimation, optimization, and transactive energy networks/markets

INDUSTRY EVOLUTION

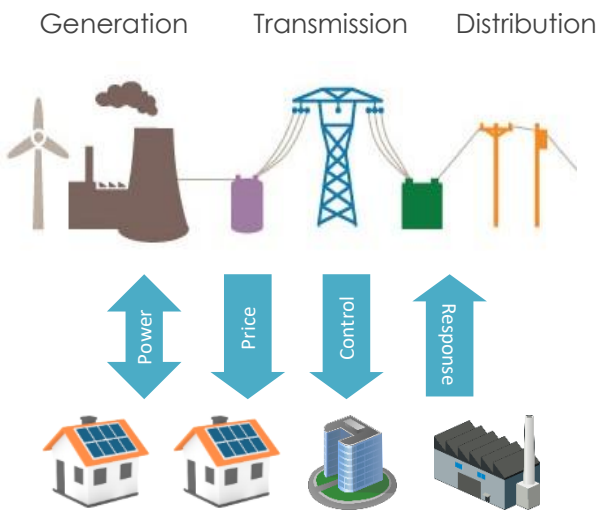
YESTERDAY



One-way pipeline model

- One-way "pipeline" model from centralized generation through to transmission and distribution
- Largely passive consumers
- Asset-based bricks and mortar platform (poles & wires)

TODAY



Distributed energy resources integration

- Increased adoption of distributed energy resources (DERs), e.g. generation, storage, demand, microgrids)
- DER accommodation to integration
- Friction between utilities/DER businesses
- Data-driven smart grid platform

TOMORROW

Multi-way transactive platform model

- Business and customer model transformation
- Utility as a service platform for DERs
- Integrative markets for win-win between utility/DER revenue models
- Value-based transactive platform

CHAIN REACTION OF 5 CHALLENGES

Blind, Aging, Congested Grid

Visibility

the distribution grid is blind…

- DER types and locations?
- Voltages?
- Capacity?
- Hosting Capacity?
- Real Power?
- Reactive Power?
- Losses?
- Unbalanced phases?

Control

without sufficient controls…

- Switching?
- Topology?
- Power quality?
- Distribution assets?
- DER dispatch?
- Curtailment?
- Ramping?
- Frequency?

Optimize

managed sub-optimally…

- Right place?
- Right time?
- Right capacity?
- Right power quality?
- Right certainty of dispatch?
- Min losses, demand, new capacity?

Valuate

unclear about the value of DERs…

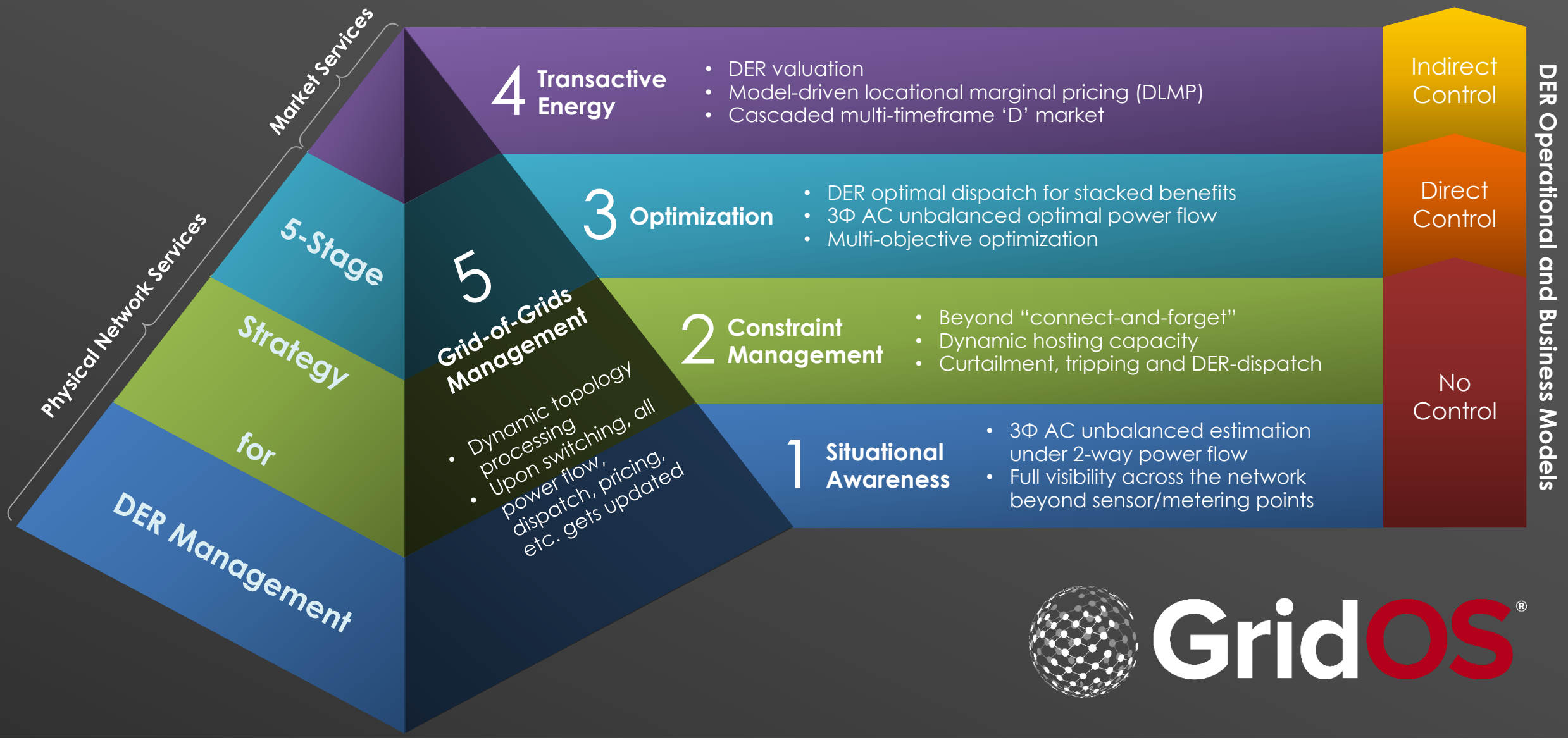
- By location
- By time
- By phase
- By service (capacity, losses, reliability, reliability, etc.)
- By certainty
- By DER type

New business models

fails to evolve in business models

- Revenue to utilities
- Revenue to DERs
- Rate impact to consumers
- Customer service
- Sustaining growth beyond "wires only"

5-STAGE STRATEGY FOR MANAGING DERS



GridOS®

THE INTEGRATED ENERGY NETWORK

The distribution system has been a black box, but holds the key to unlock value in the integrated energy network

Value Stacking

Bulk Power

Wholesale market participation
G&T coordination
Currently disconnected from distribution grid value

Distribution Grid

DER impact and valuation
Integrated planning
Optimal operation and dispatch
Greatest DER value potential along the stacked value chain

Edge-based DERs

Aggregation
Latency
Security
Availability
Ramping
Unlock value from existing fixed rate/tariff structures

Aggregated to Locational Dispatch

Integrated Distribution Planning

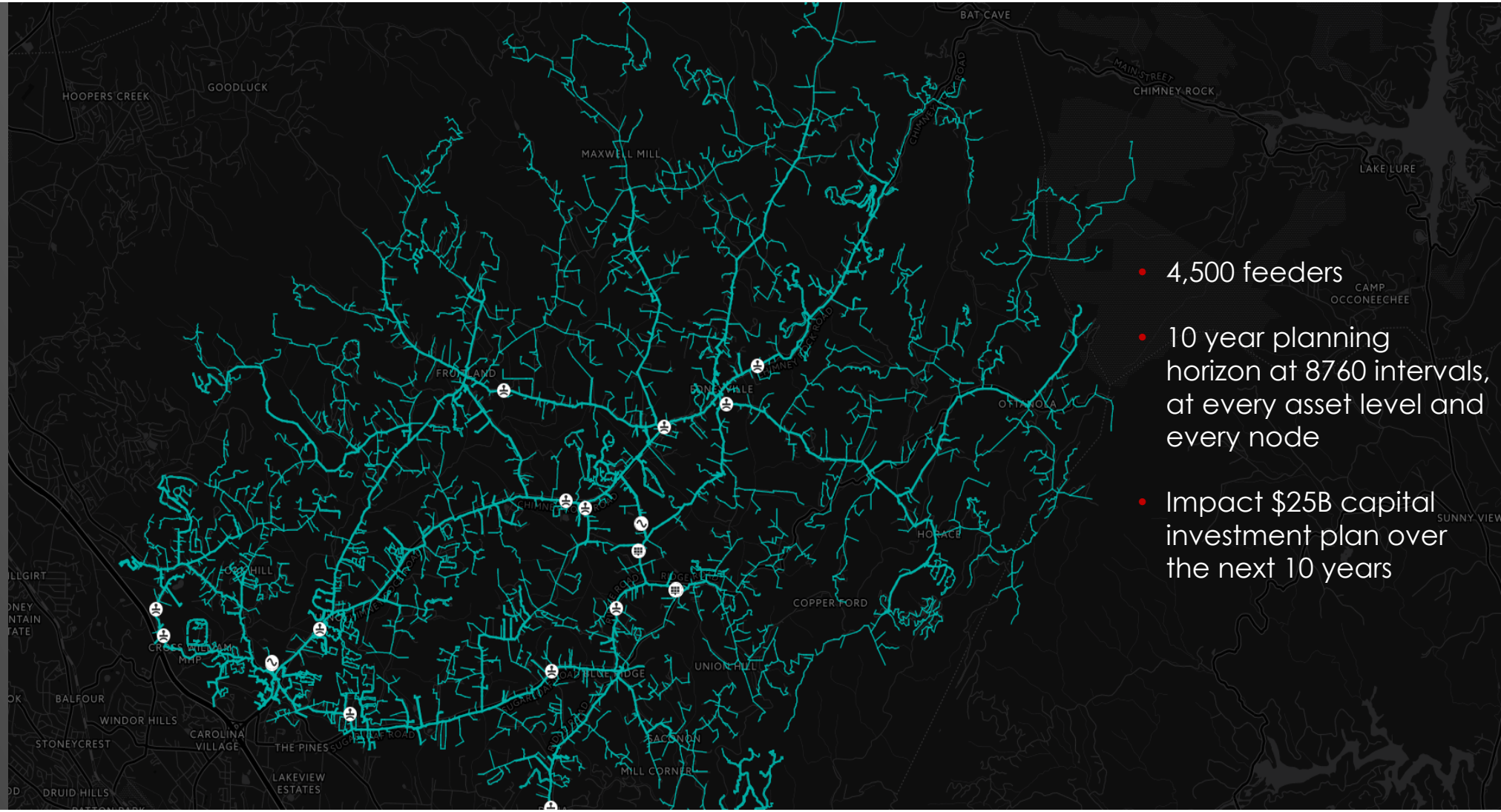
IDP REFERENCE PROJECT

Largest IDP project, repository of DER valuation and NWA generation in the world

GridOS™

Integrated Distribution Planning

1. DER valuation along full value stacks (vertically) and networks (horizontally)
2. Dynamic hosting capacity analysis
3. Non-wires alternatives generation
4. Investment strategy and risk analysis
5. Generation & transmission coordination (fuel supply, bidding, etc.)



- 4,500 feeders
- 10 year planning horizon at 8760 intervals, at every asset level and every node
- Impact $25B capital investment plan over the next 10 years

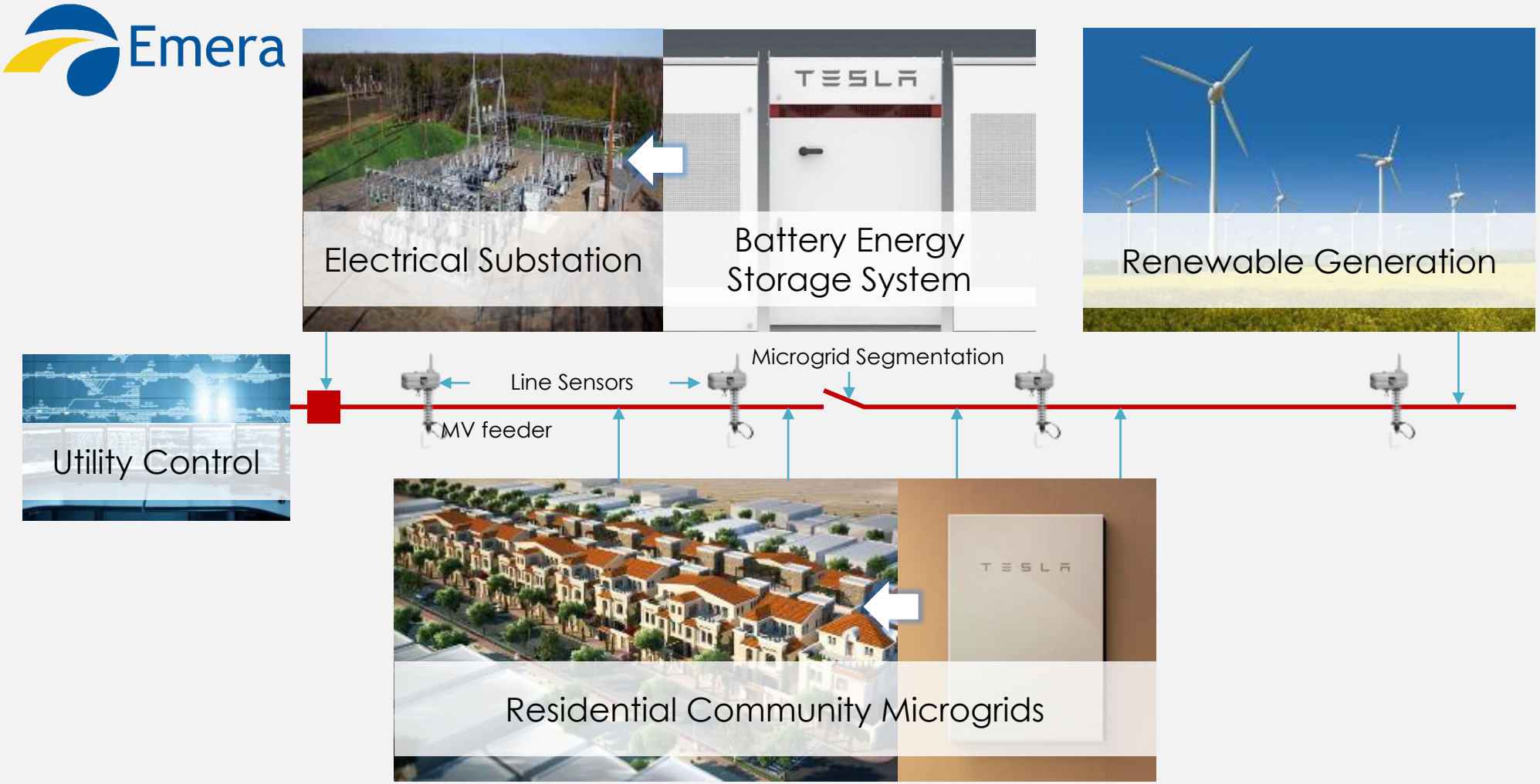
DER Management System

DERMS REFERENCE PROJECT: EMERA NSP

First-in-kind utility-scale microgrid with high DER penetration and DER value signals for operations

GridOS™ DERMS

1. Feeder level power flow with distribution state estimation
2. DER constraint management
3. Optimal DER dispatch
4. Utility-scale microgrid management
5. DER value signals



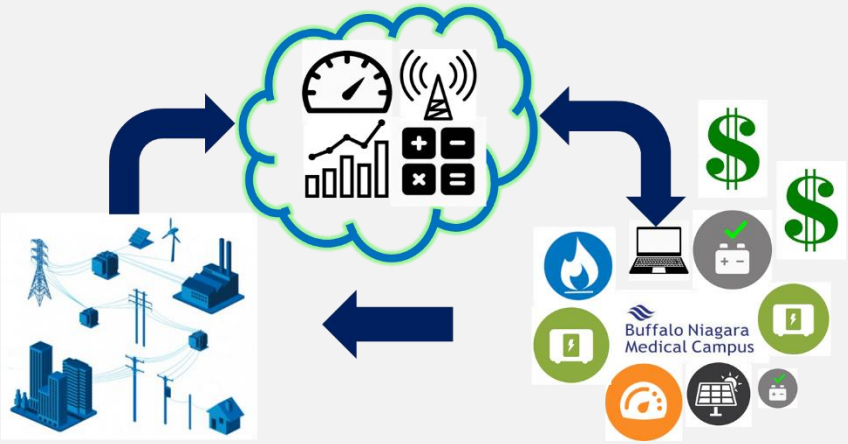
TE REFERENCE PROJECT: NATIONAL GRID

Integrative win-win business models using DER value as a key operational parameter in NY REV

GridOS™
Transactive Energy

1. **Calculate and generate location-based pricing signals based on LMP+D**
2. **Incentive generation from local DER owners**
3. **DER bidding agent**
4. **Market clearing**
5. **Adaptation of OpenADR 2.0**

nationalgrid



Distributed System Platform:

NEW YORK STATE OF OPPORTUNITY. | Reforming the Energy Vision

"an intelligent network platform that (1) provides safe, reliable, and efficient electric services by integrating diverse resources to meet customer's and society's evolving needs, and (2) fosters broad market activity by (a) including system and social values in product pricing and (b) aligning customer and third party participation in the retail market with the wholesale market and bulk power system.

Under this model, the DSP (1) offers services such as information, interconnection, or dispatch services at prices and terms regulated by the PSC and (2) compensates DER providers and their customers for the value they provide to the grid. The order states that the DSP market structure must exchange DER services in fair and open markets."

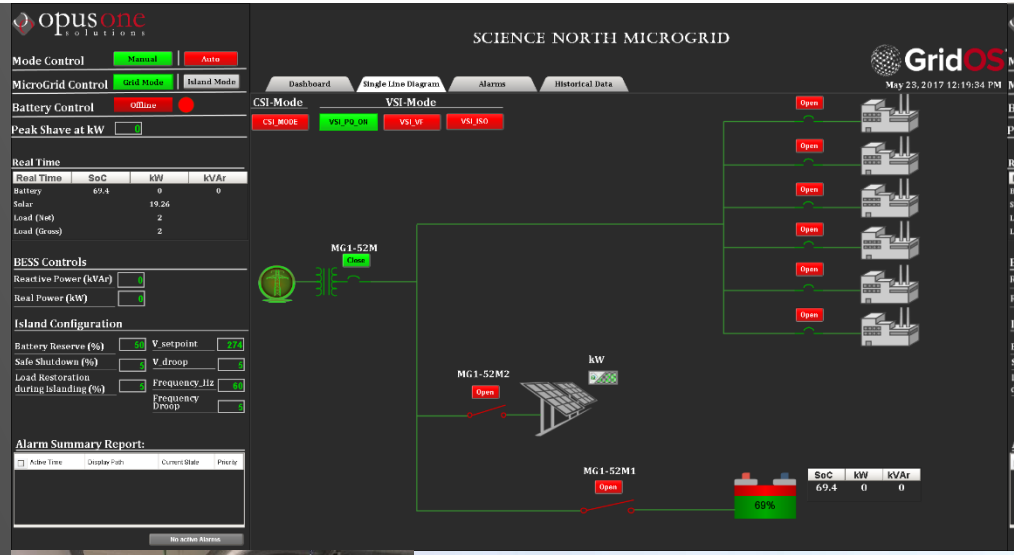
Buffalo Niagara Medical Campus

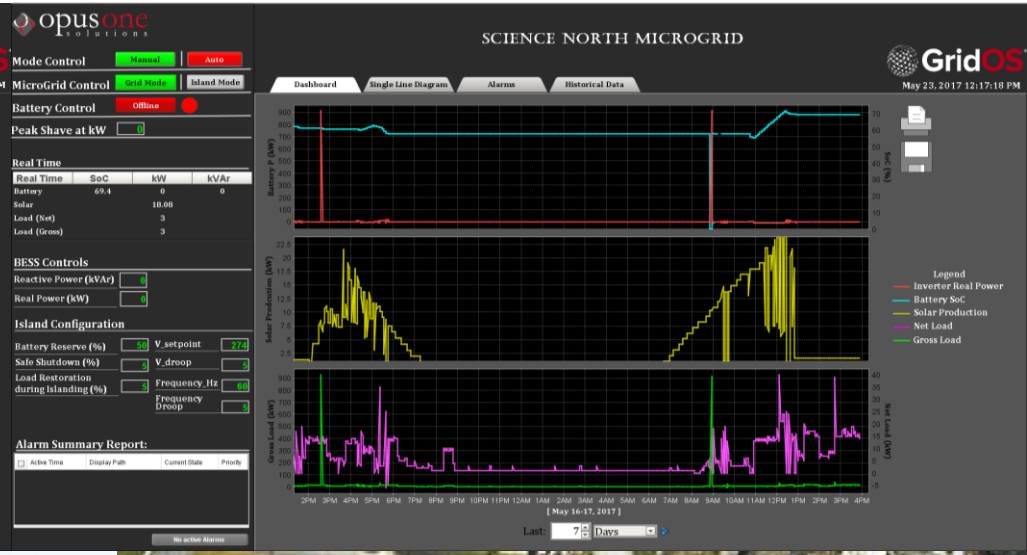
MEMS REFERENCE PROJECT: SUDBURY

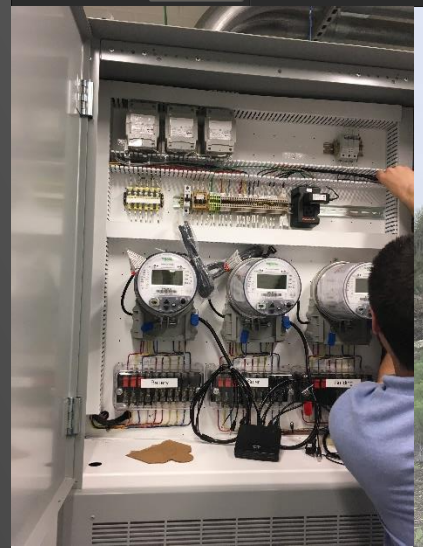
A grid-supporting microgrid that brings resiliency and energy management to both the customer and the utility

GridOS™ Microgrid Management

1. Resiliency via intentional islanding to critical loads
2. Solar/storage/EV/ building load management
3. Reduce energy costs under time-of-use
4. Grid supporting applications including VVO using microgrid P and Q capacities







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