



Electrification Futures

POWER THE ENERGY TRANSITION WITH THE GRID AS A PLATFORM

October 13, 2021



The Energy Transition is Driving Grid Modernization

INDUSTRY DRIVERS



Rise in Renewables



Electrification of Transportation



Prosumer Engagement



Corporate Goals



Legislative, Regulatory & Energy Markets



Global Infrastructure Spending

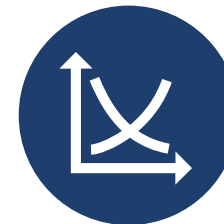


ENABLING ELECTRIFICATION FUTURES



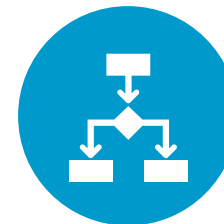
Grid Risk Management

DERs can potentially impact and threaten the safety, reliability, performance, and affordability of the electric grid



Customer and Business Models

Customer engagement and utility business models must provide the right pricing and operational signals to leverage DER's opportunities to provide grid services.



Availability of Systems and Tools

Analytics and systems to manage DERs, particularly in concert with existing grid planning, operations and markets

Distribution System Operations (DSO) Platform

Existing utility systems



GIS



ADMS



AMI



ERP

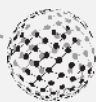


MMS

1 Grid Modeling and Optimization Engine

Three-phase AC unbalanced grid and DER modeling, security constrained optimal power flow

Operational Analytics



GridOSSM

Gatekeeper of the grid,
bridging traditional
systems and DERs

Markets

DERMS

4 DSO Markets & Programs

- Distribution level markets and programs
- Flexibility trading with bids and offers
- Smart pricing / value of DER (including DLMP)
- Grid-safe market operation and T&D coordination

2 Grid's Operational Intelligence under DERs

- Situational awareness of DER impacts to the grid
- Risk management – operating envelopes for safe operation and market participation
- Constraint management – curtailment, dispatch
- Optimal dispatch for grid services – VVO, peak shaving, economic, resiliency, etc.

3 DER Control and Program Management

- Full life cycle DR/DER programs
- Direct control
- Price-based control and programs
- M&V, Settlement



Edge players

DER owner / developers

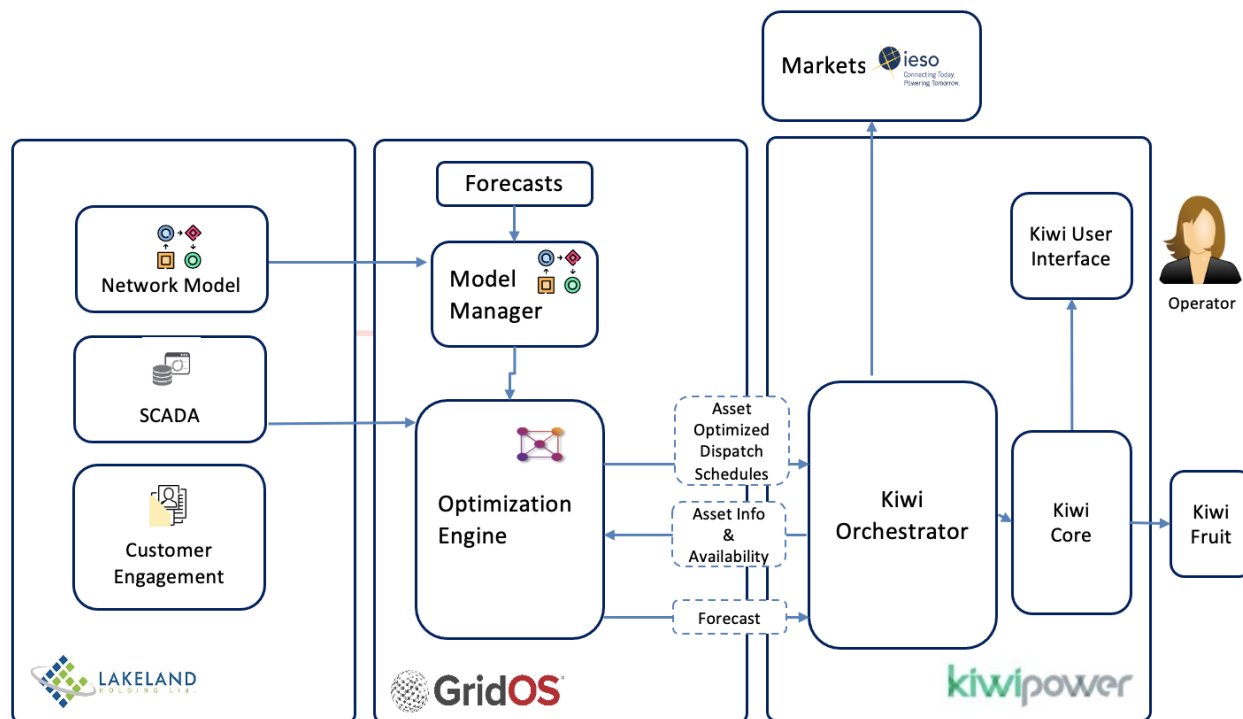
DER operators

Aggregators

Program managers

BTM solutions providers

Reference: Lakeland Power Flow Optimized DERMS



Objective: Providing gridawareness and aggregation of DERs and optimize their dispatch simultaneously for bulk services and DNO system needs

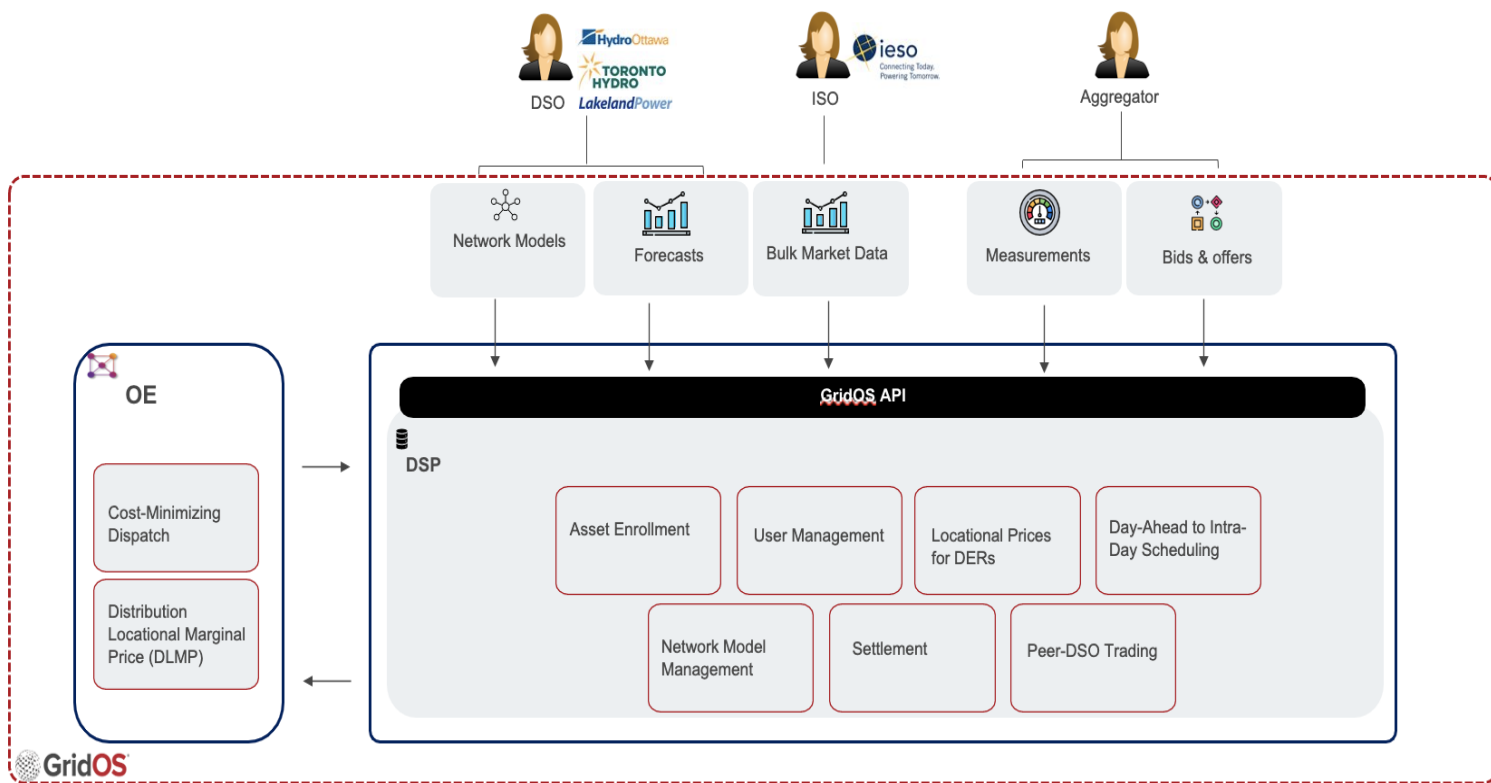
PROJECT OVERVIEW

- Management and control of various DERs – hydro, hot water heaters, demand response, solar, EVs, BTM/FTM batteries, and VPP
- DER aggregation/orchestration with GridOS optimization engine that manages DERs’ grid impacts as well as optimizing services it can provide to the grid
- Complete situational awareness and system coordination from DER, aggregator, utility, and IESO

OUTCOME

- Deployment of the first-in-kind utility wide implementation of grid/DER modeling, impact analysis and grid services optimization
- Tight coordination between utility and IESO
- Creation of new revenue opportunities for utilities and customers
- Non-wires solutions to CapEx and lowering customer bills

Reference: IESO Integrated ISO/DSO Markets



Objective: The creation of value of DER based local energy markets to ensure that DER dispatch signals are based on bulk and distribution system constraints and service opportunities

PROJECT OVERVIEW

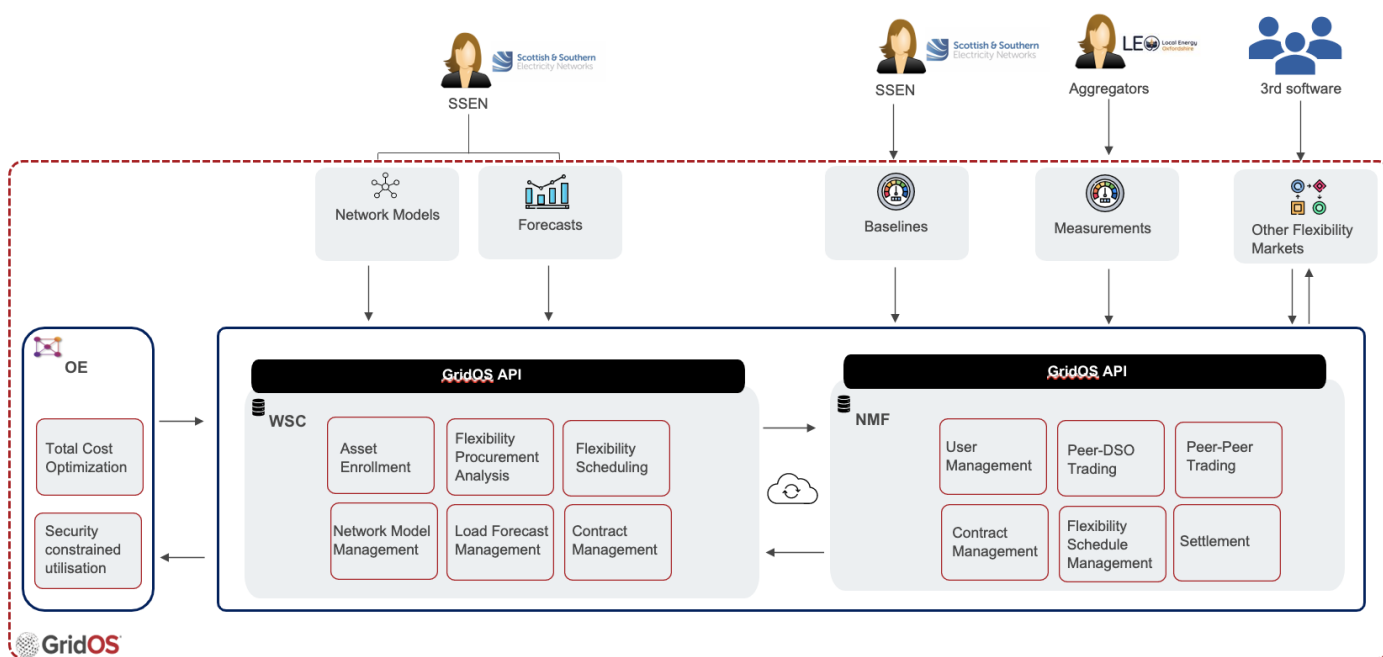
- Generate time and location specific price signals for DER operation based on their net benefit to the grid as determined by a combination of regulator, DNO, and participant input.
- Evaluate effectiveness of using DERs to provide energy and ancillary services
- Assess the benefits of more granular DER signals over current programs
- Creation of Distribution Locational Marginal Prices (DLMP)
- Development of DNO-TSO communication and coordination mechanisms

OUTCOME

Creation of three shadow markets representative of Ontario's broader distribution system:

- Granular assessment of DER value to IESO, DSOs, DER owners, and non-DER owning rate payers
- Energy efficiency targeting through dispatch schedules for DERs evaluated at a granular level
- System value and rate mitigation potential through optimal dispatch of distribution connected resources

Reference: Scottish and Southern Energy TRANSITION



Objective: Local energy flexibility and facilitation of peer-to-peer trading. Increased aggregator participation through utility-led open, non-discriminatory auctions for DER services. Aggregator services optimization for fair operation of DER.

SCOPE

- Local energy flexibility through the deployment of a Neutral Market Facility (NMF) and Whole System Coordination (WSC) services
- The NMF provides a market for trading in the use of DERs - flexible energy resources connected to distribution network the including D/R, generation and communication
- The WSC component provides the DSO's point of interaction with the NMF. Where the DSO has identified a constraint, the WSC provides the assessment of the mitigation options including:
 - Use of Active Network Management or Distribution Management Systems where available
 - Calling off from existing contracted options for the use of suitably located flexible energy resources or contracting for additional flexibility via the NMF.
 - Assess potential grid impacts of peer-to-peer trades through their visibility via the NMF.

OUTCOME

- DSO services, peer-to-peer services and ESO services contracted and utilized through an automated process rooted in power system optimizations and analyses
- Oxfordshire region aggregator participation and flexibility contract procurement and management through the NMF
- Flexibility cost reduction; automation and time savings for utility staff evaluating and utilizing flexibility through the WSC



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