

Hybrid Energy Resource Optimizer (HERO)

June 23, 2020

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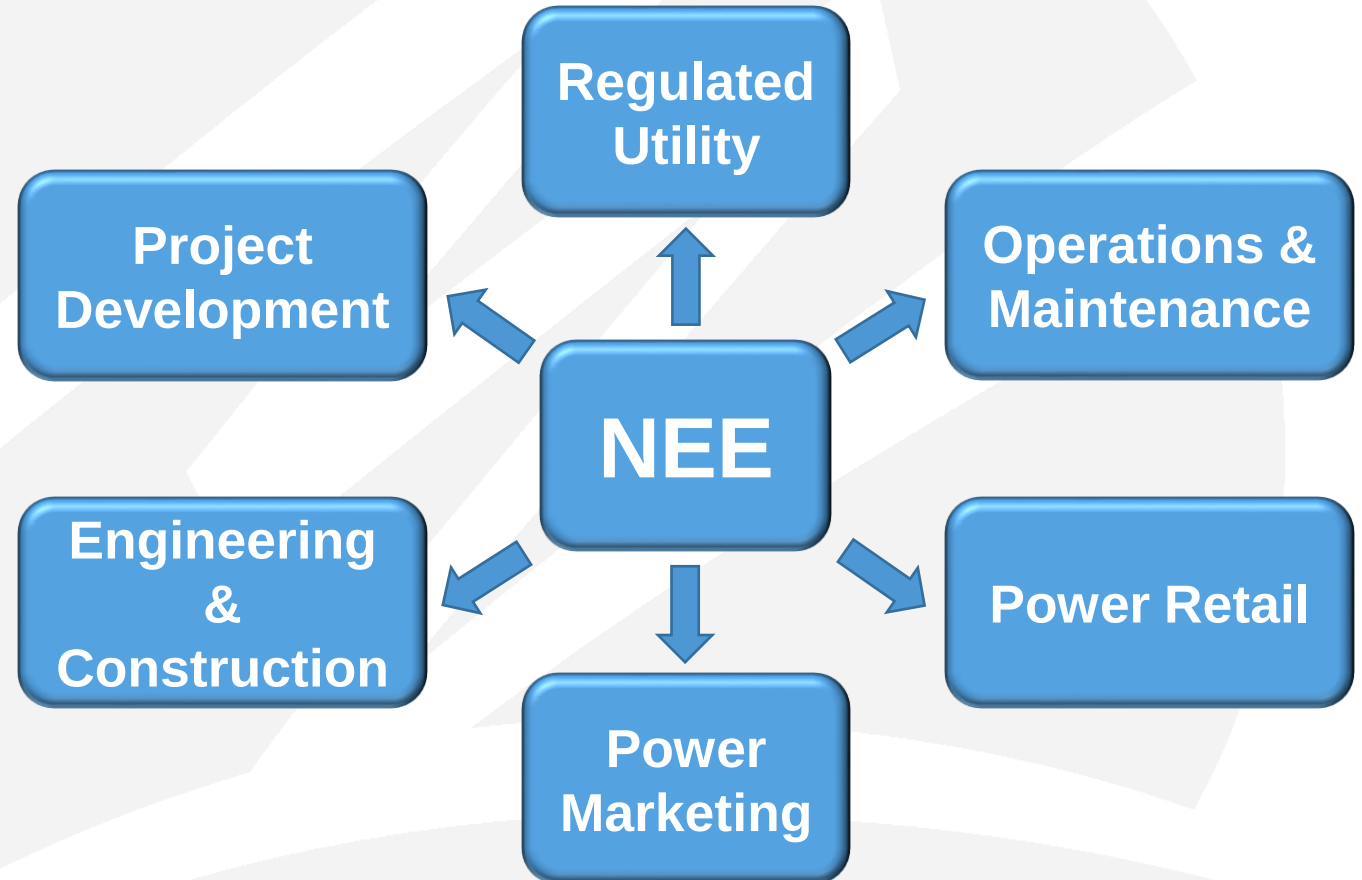
Research &
Development

Agenda

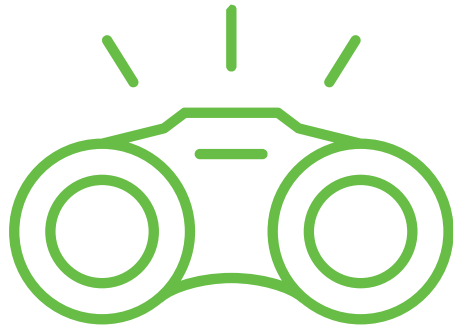
- Company Overview
- HERO Platform
- Operational Examples

NextEra Energy: Overview

- 15,000+ employees
 - NextEra Analytics ~120 scientists, statisticians, and engineers
- Operate renewables in 31 US states and 4 Canadian provinces
- 17 GW of wind and solar



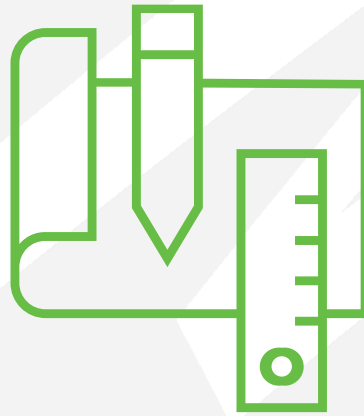
NEA helps NEE find, design, and operate energy resources.



Find

the best locations for developing
wind, solar, and storage projects

customers that could be getting
more from the market



Design

energy resources customers
need for the future

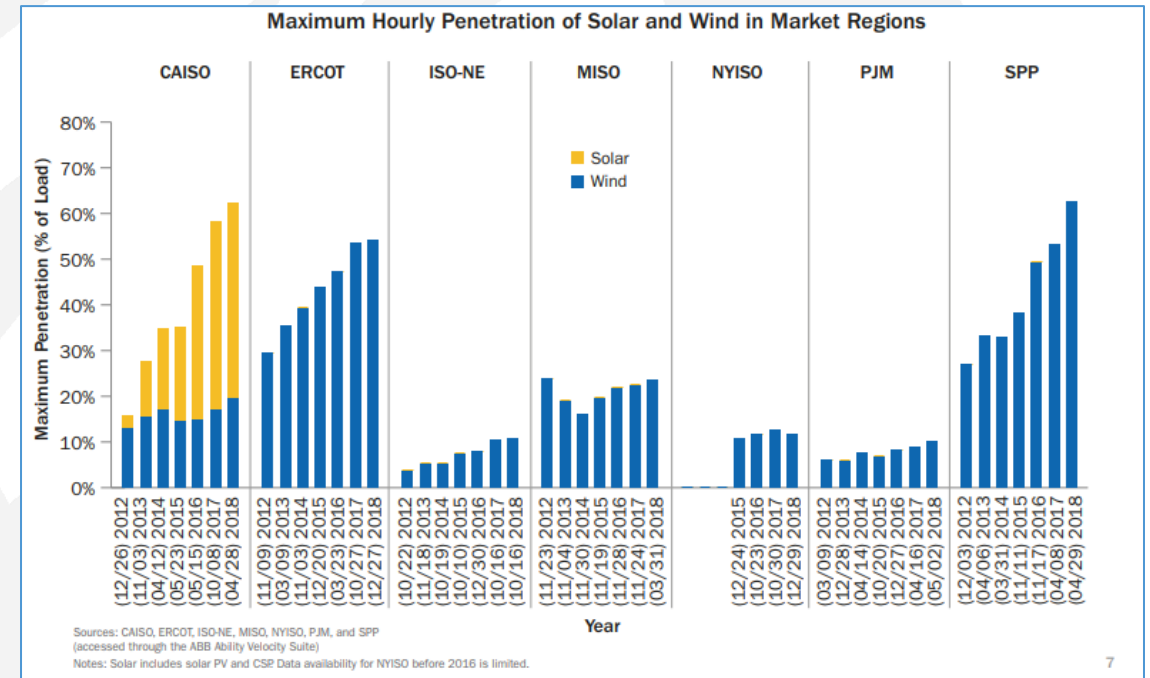
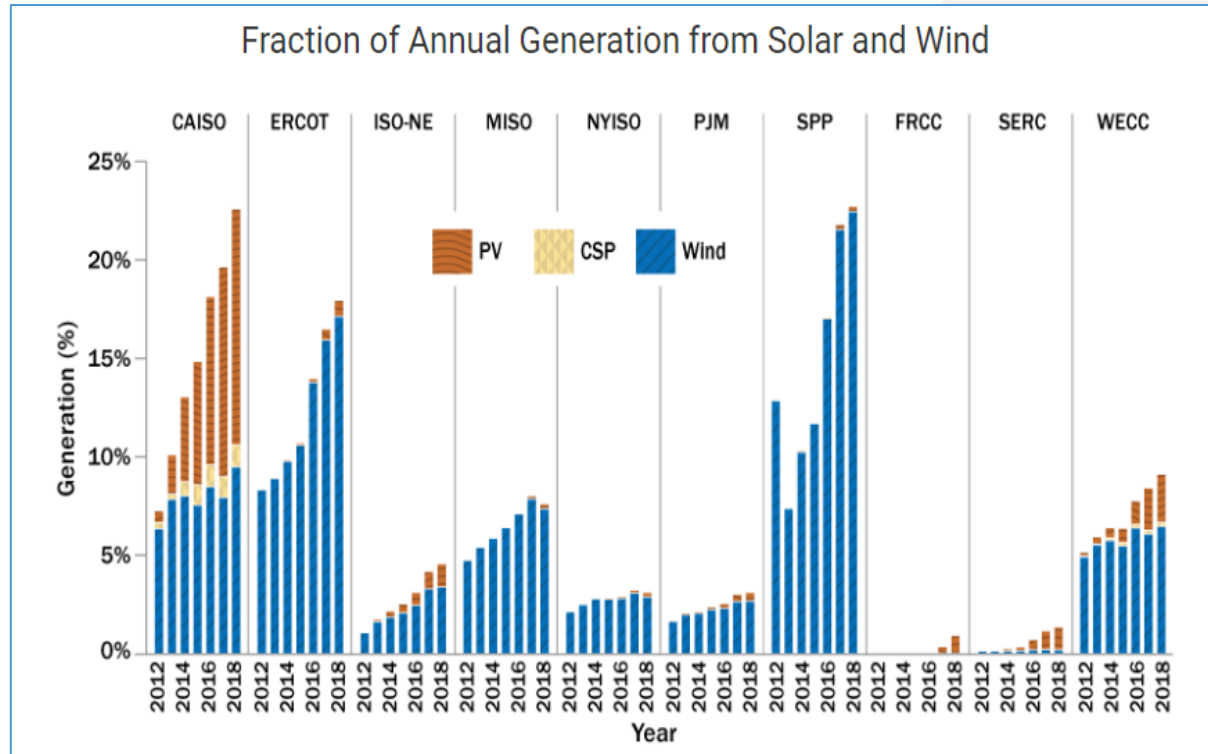


Operate

fleets to get the most
from the market

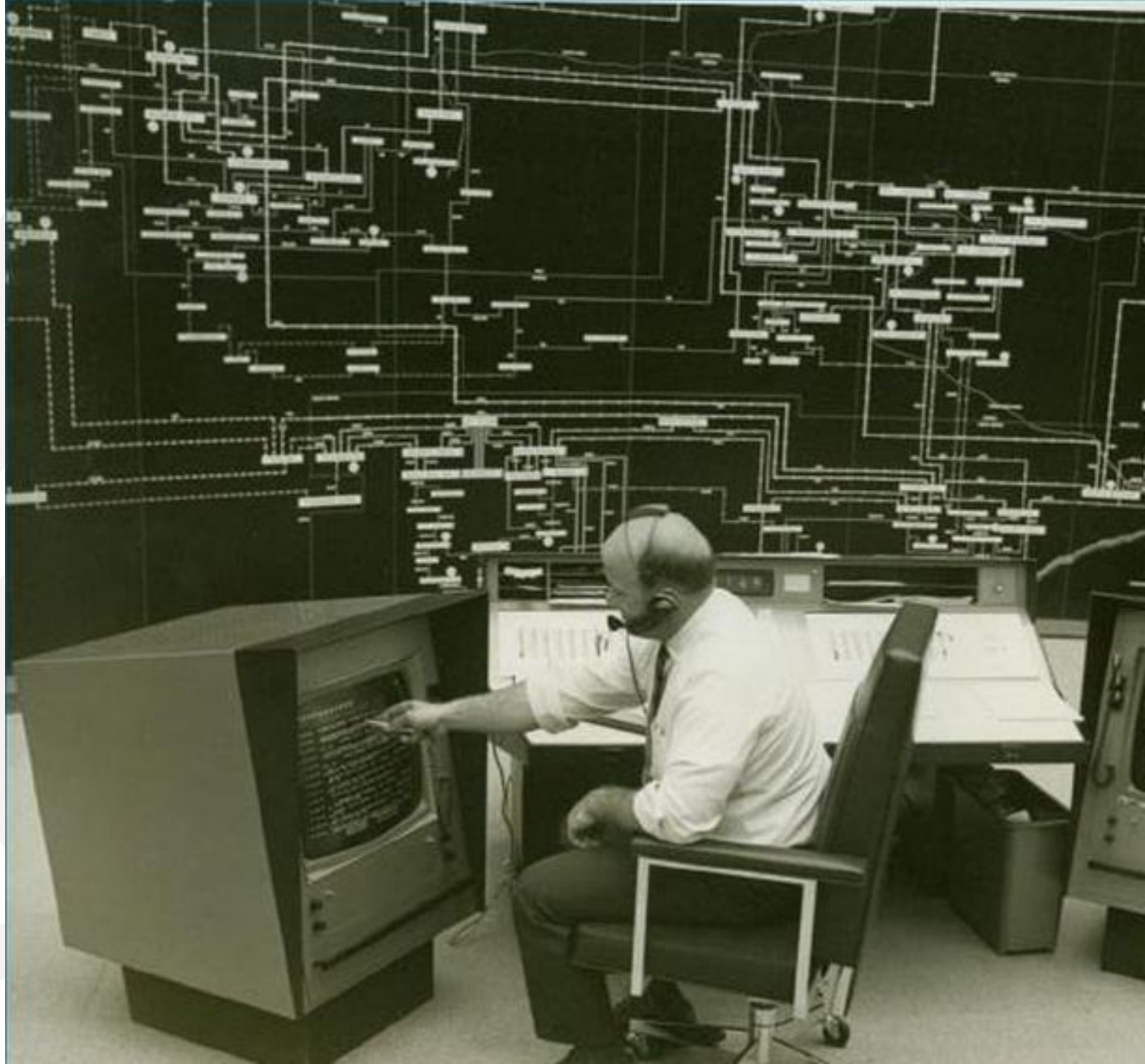
at peak performance to maximize
revenue and renewable energy

Renewable penetration is at record highs across power systems.

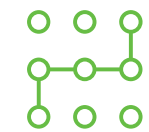
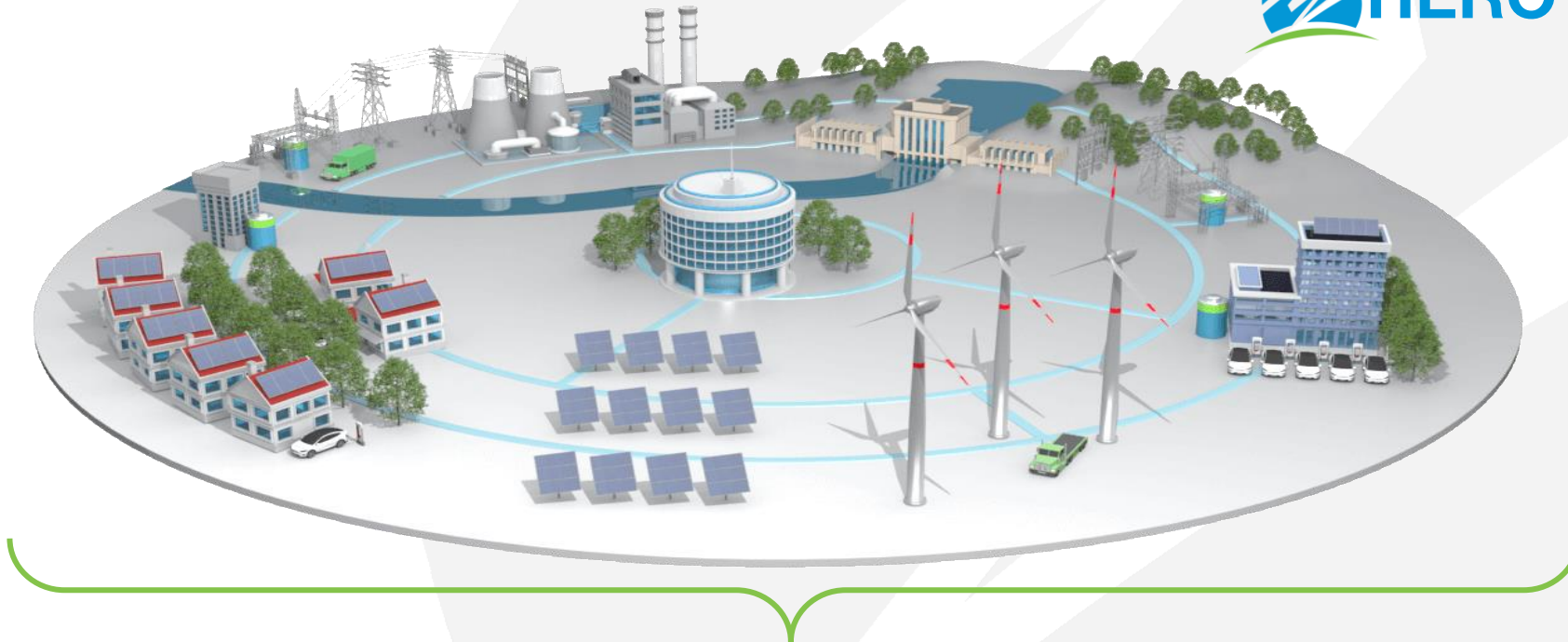


1) 2018 Renewable Energy Grid Integration Data Book; NREL; February 2020

In the past, the primary sources of variability and uncertainty were generator outages and the weather-driven load.



The rise of hybrid renewables and DERs creates an opportunity for a new class of energy management tools



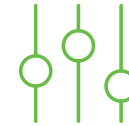
Connect



Forecast



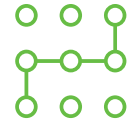
Optimize



Enhance



HERO's capabilities are modular, flexible, and scalable and can be configured based on asset type and market.



Connect

Secure Web API

IOT Edge

HVAC
Systems

EV/V2G Systems

Inverters

SCADA/PLC/OPC
(Wind + Storage)

Building Load



Forecast

Load
(Resi, C&I, ISO)

Wind & Solar
Generation

Price

Equipment
Availability

Weather

Contracts



Optimize

Demand Charge
Management

Contingency
Reserve

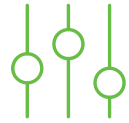
Hedging
Strategies

DART/
Energy Arbitrage

Balancing

Coincident
Peak

Frequency
Regulation



Enhance

Generation
Entitlement

Ops Report

Reconfiguration

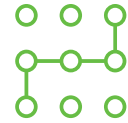
Operational
Assessments

Digital Twins

CWEOS



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Connect

Secure Web API

IOT Edge

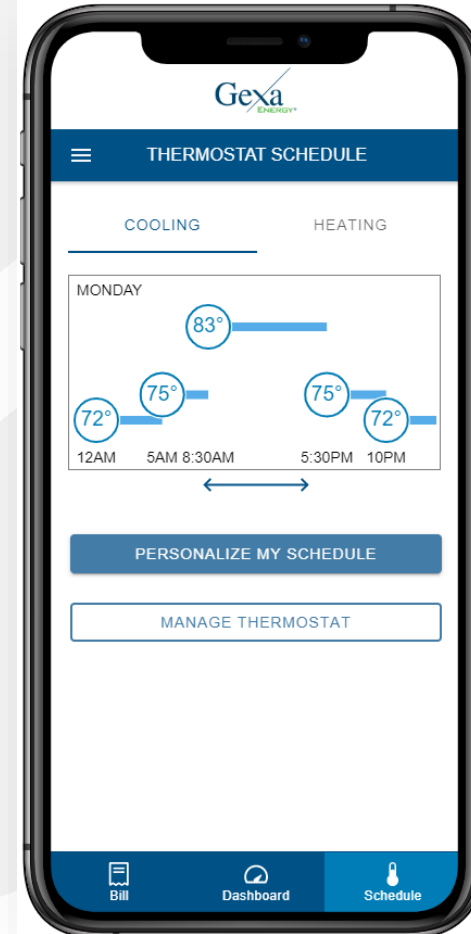
HVAC
Systems

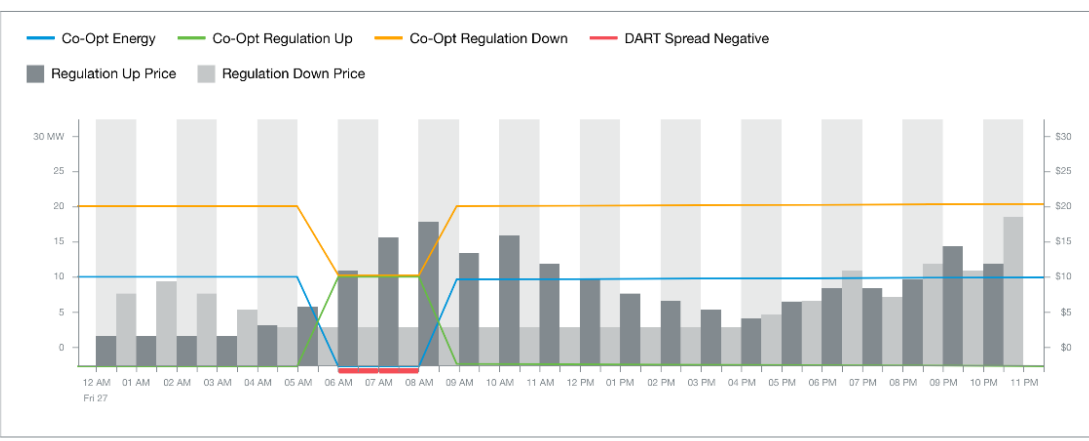
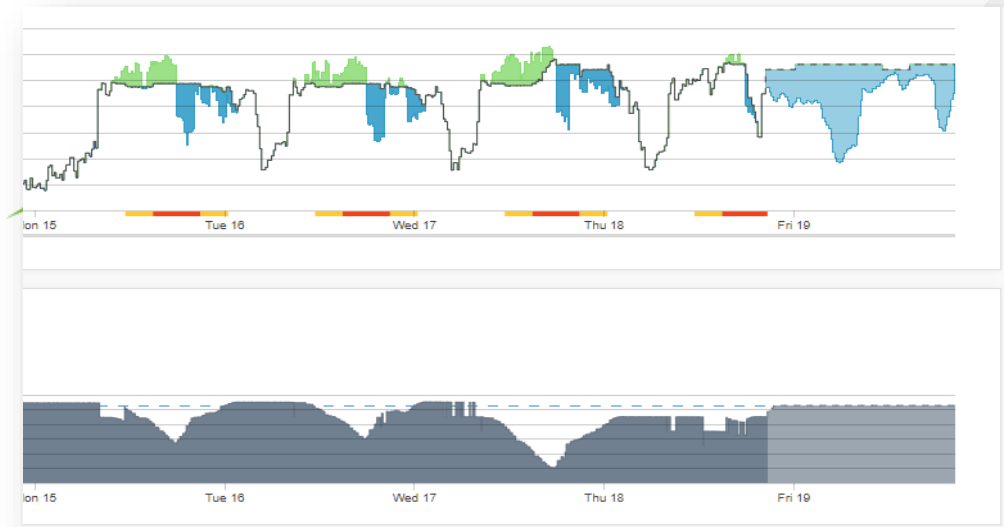
EV/V2G Systems

Inverters

SCADA/PLC/OPC
(Wind + Storage)

Building Load





Forecast

Load
(Resi, C&I, ISO)

Wind & Solar
Generation

Price

Equipment
Availability

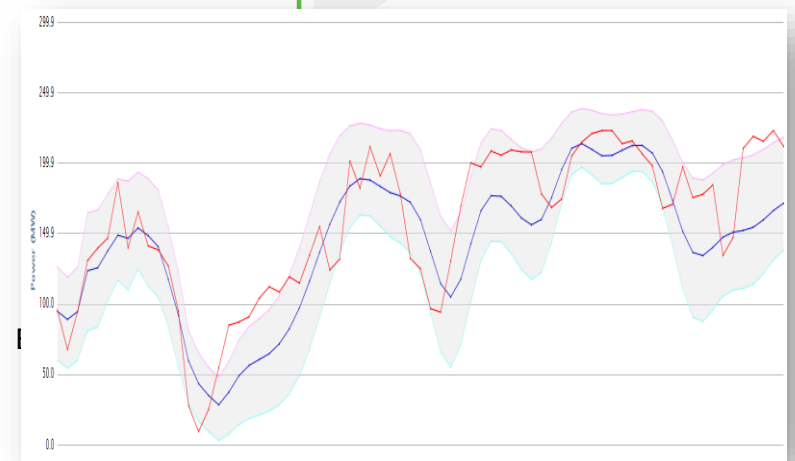
Weather

Contracts



Optimize

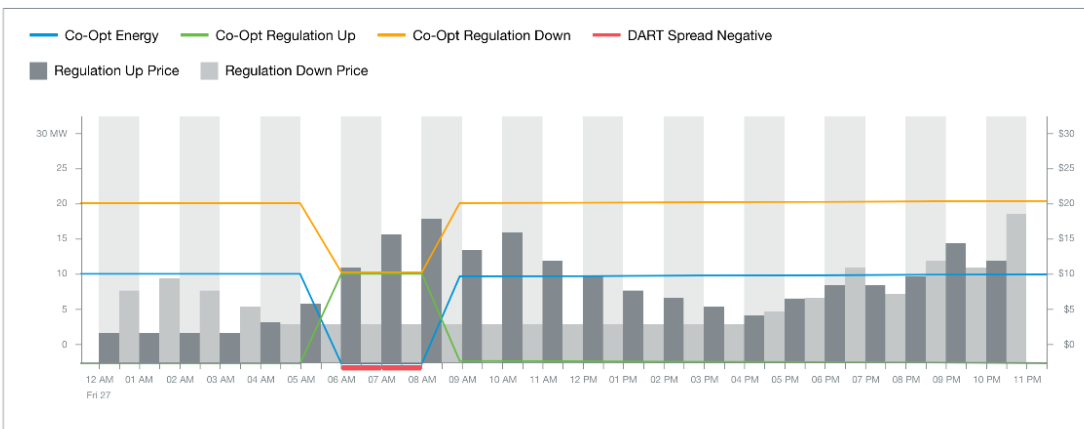
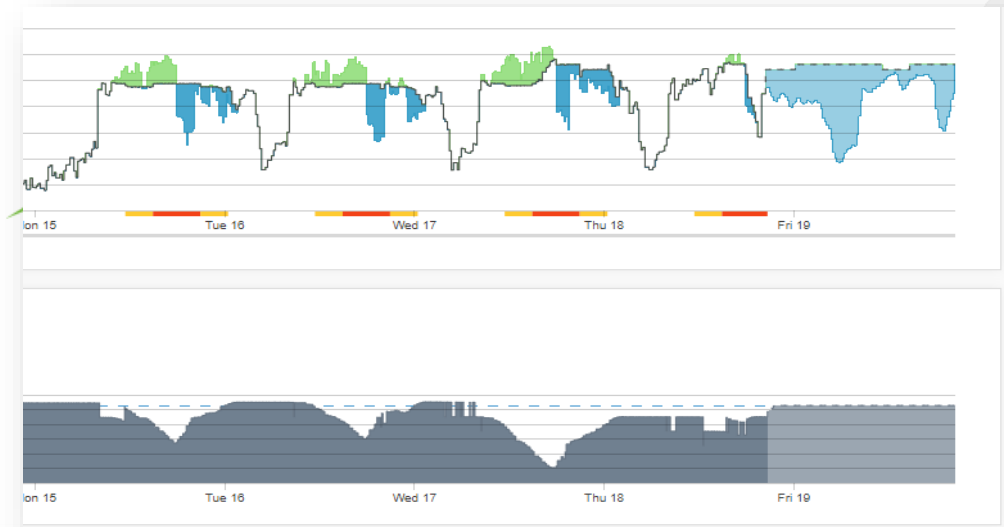
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Management



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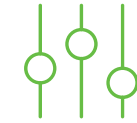
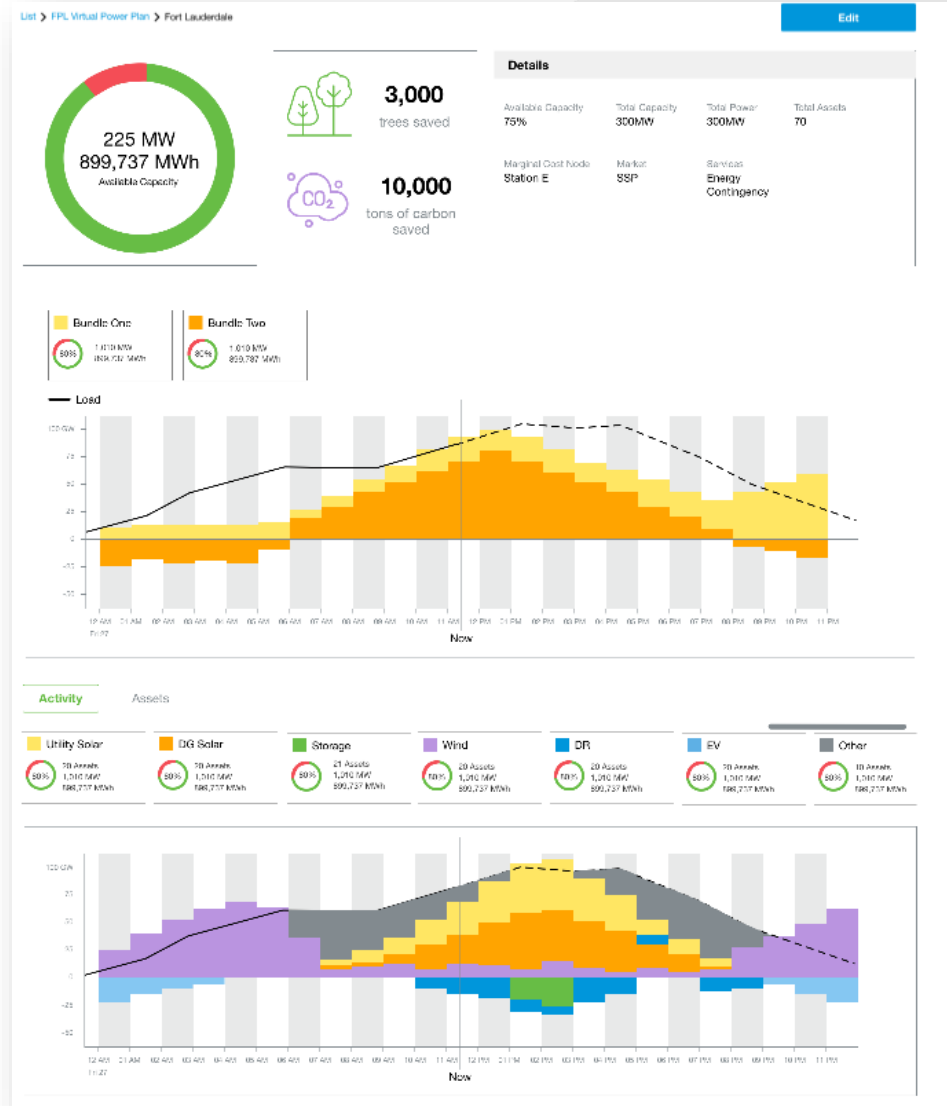
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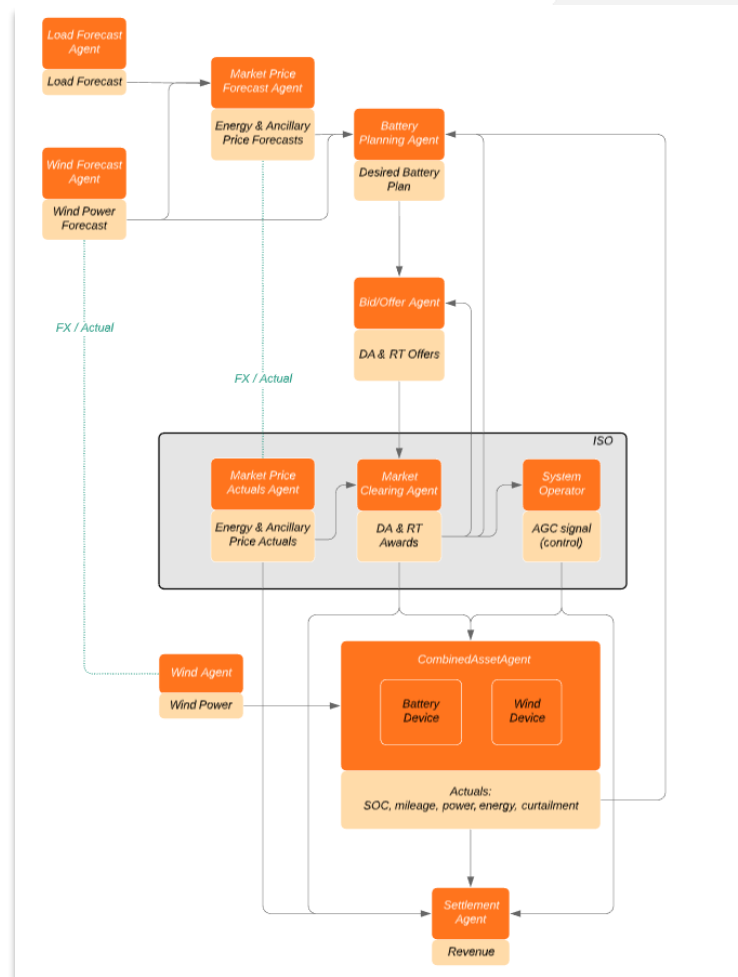
CWEOS

Hybrid Market Participation



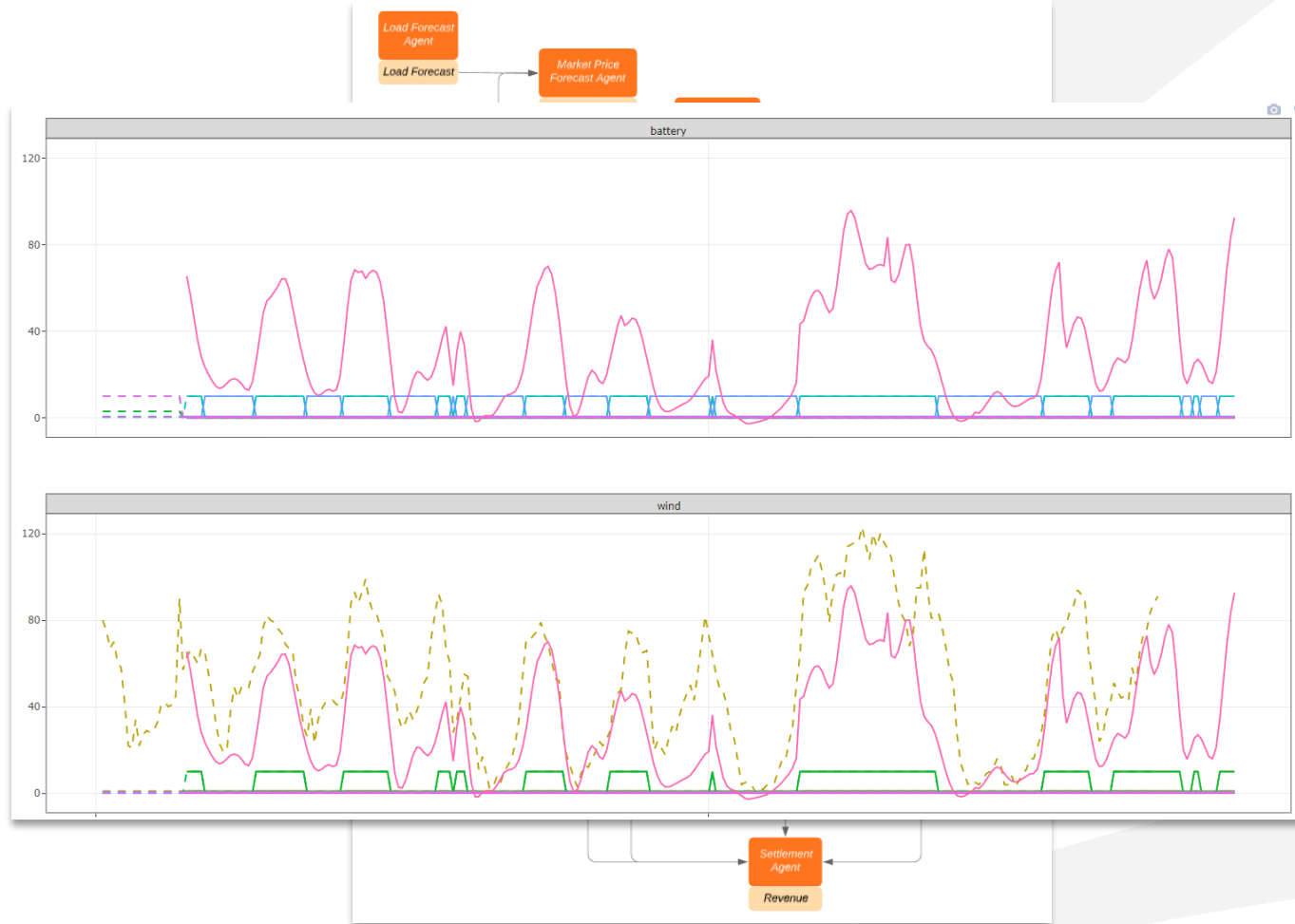
Capacity:	10MW/20MWh – Energy Storage 125MW – Wind
Assets:	1 x 10 MW/2hr Utility Scale Battery 59 x 2.1MW Wind Turbines
Use Cases:	Frequency Regulation Energy Arbitrage Spinning Reserve
Innovation:	Automated Optimized Bidding Common Generator Controls Integration

HERO In Production



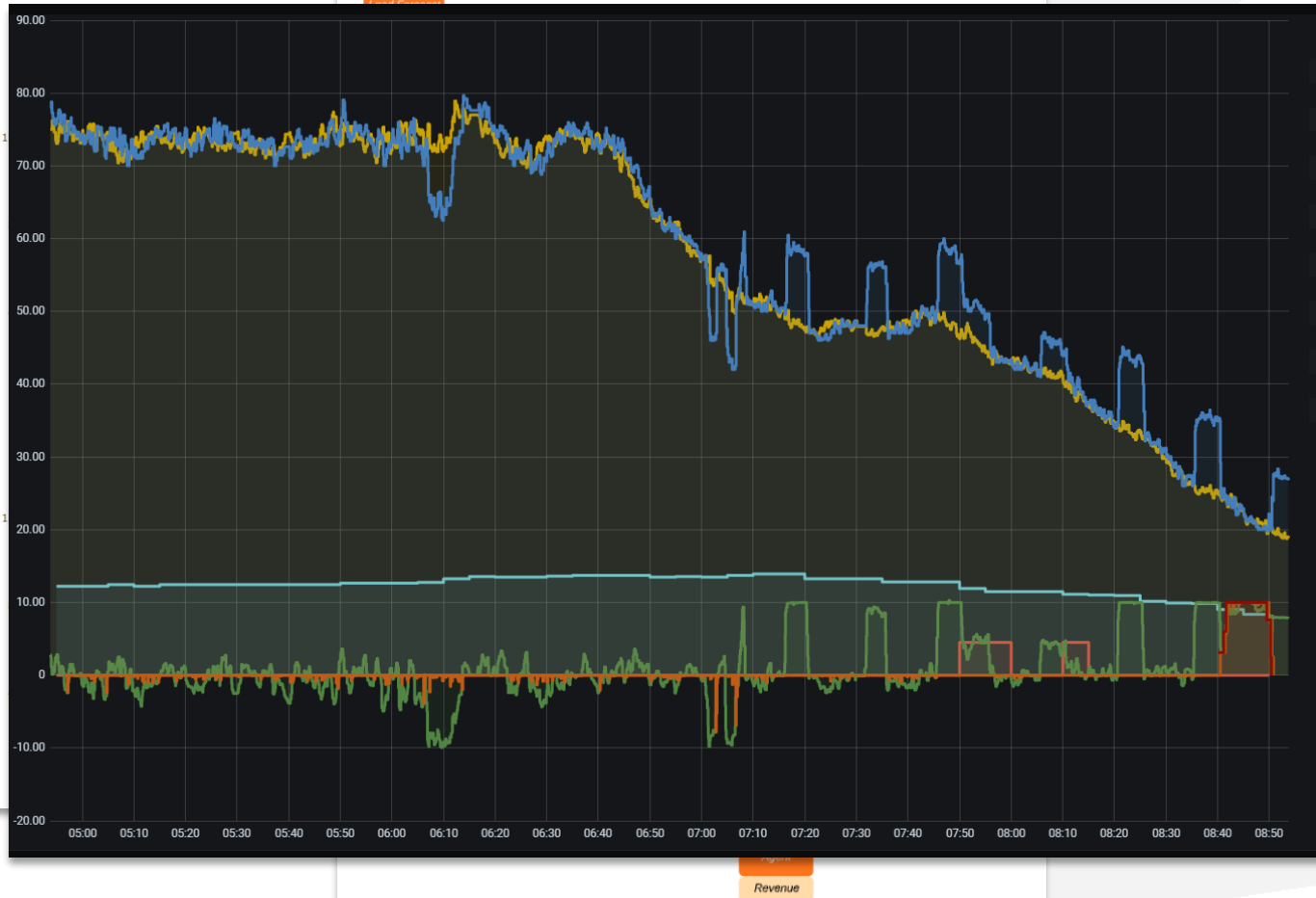
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- Optimization

HERO In Production



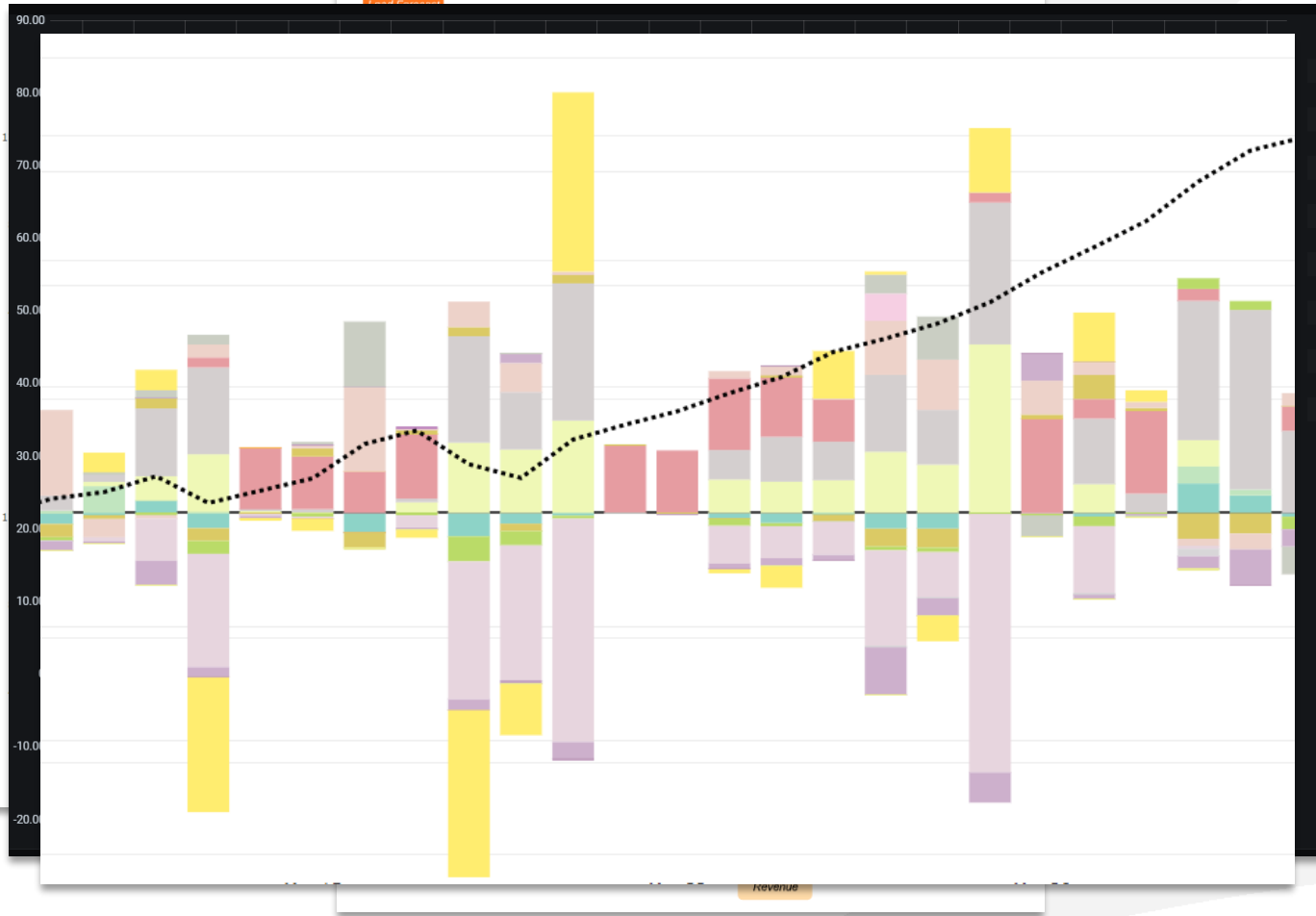
- Forecast
- Optimization
- Automated Offers

HERO In Production



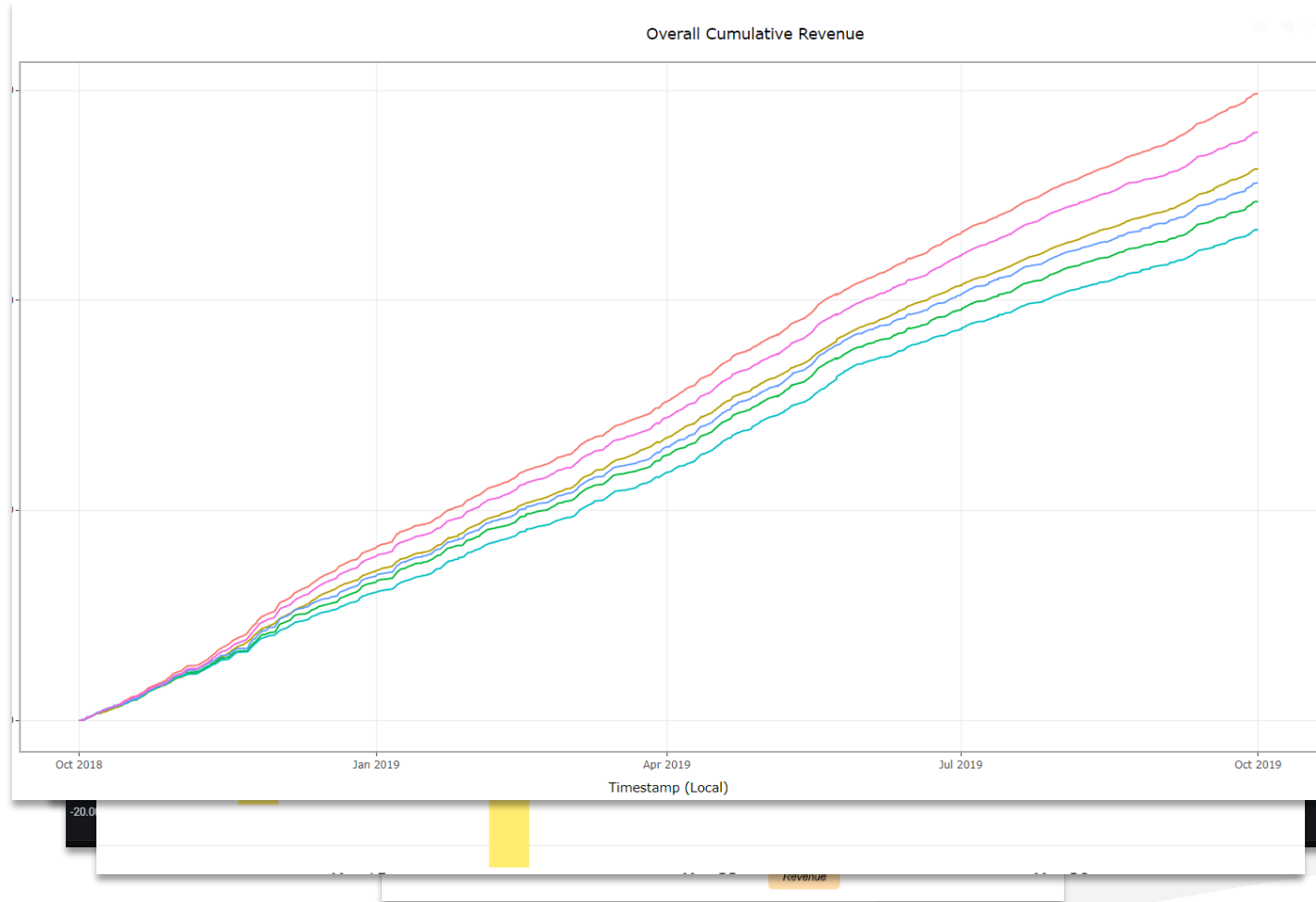
- Forecast
- Optimization
- Automated Offers
- Real Time Management

HERO In Production



- Forecast
- Optimization
- Automated Offers
- Real Time Management
- Settlement

HERO In Production



- Forecast
- Optimization
- Automated Offers
- Real Time Management
- Settlement
- Simulation

Virtual Power Plant



Capacity:

500MW/1150MWh

Assets:

1 x 409MW/2.2hr Utility Scale Battery
1 x 11.5MW/2hr Utility Scale Battery
1 x 10MW/4hr Utility Scale Battery
1 x 5MW/4hr Utility Scale Battery
2 x 30MW/2.5hr Utility Scale Battery
14 x 5kW/2hr Residential Storage
136 x Smart Thermostats
5 x 20kW/8hr EV Busses

Use Cases:

Capacity Firming
Contingency Reserves
Economic Dispatch
Black Start
Distribution Support

Innovation:

Aggregated marginal cost based dispatch
Cooling-as-storage
Vehicle to grid