Leveraging AI To Optimize Grid Operations

NextEra Analytics

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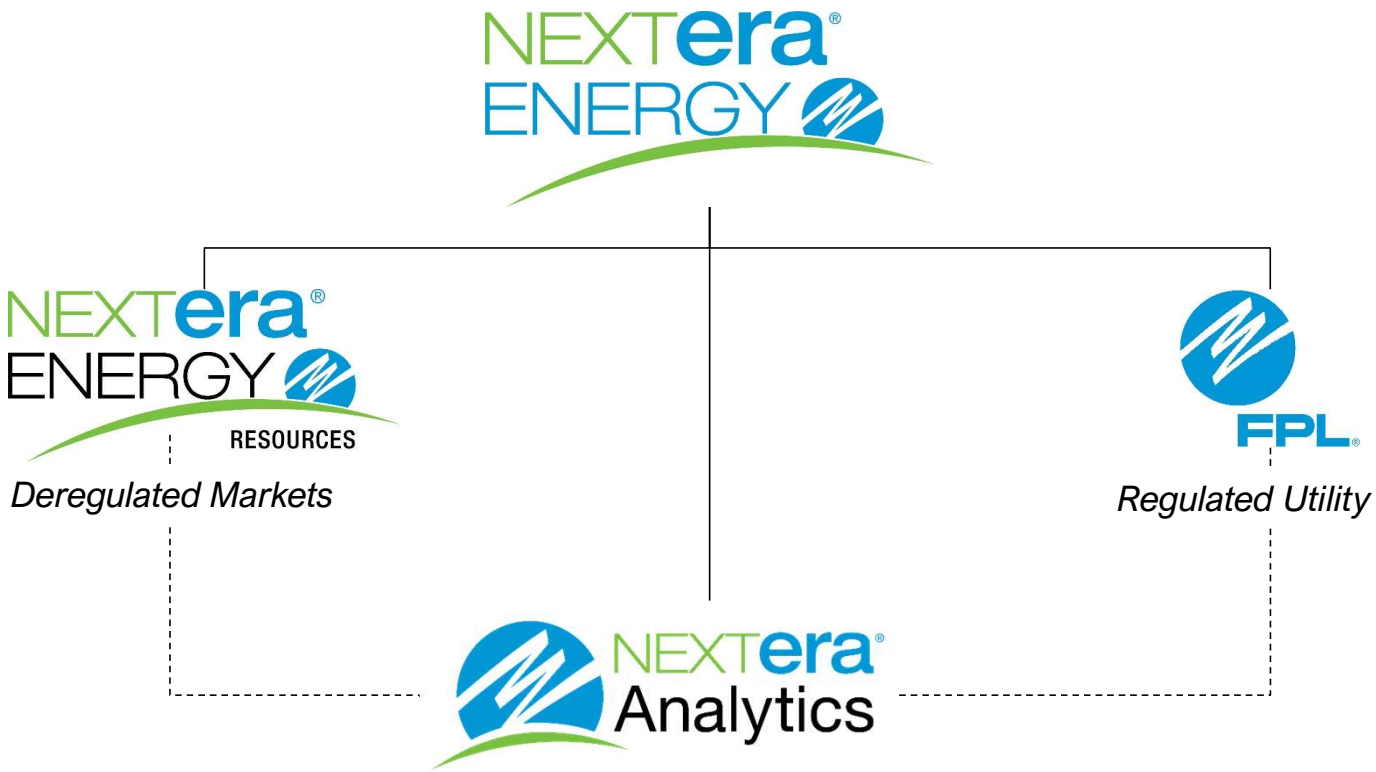
NextEra Analytics is a wholly-owned subsidiary of NextEra Energy



NextEra Analytics is a start-up from within

- Founded in 1989 as a supercomputing company to work on some of the world's toughest physical science problems
  - Customers include NASA, the National Oceanic and Atmospheric Administration (NOAA), Department of Energy (DOE)
- Acquired by NextEra in 2006 to support the renewable business
  - R&D teams in Minnesota (Math, Data Science, and Software)
  - Business development teams in Florida
    - Utility and Market Analytics
    - Resource Assessments
    - Asset Performance

Our mission is to provide innovative forecasting and optimization solutions that enable low cost, reliable and sustainable power systems

Our solutions support multiple aspects of power generation and power delivery

- Power generation
- Asset management
- Fuel procurement
- Power trading
- Power quality and delivery
- Storm restoration
- Billing Anomalies

Solutions from NextEra Analytics support multiple aspects of power delivery

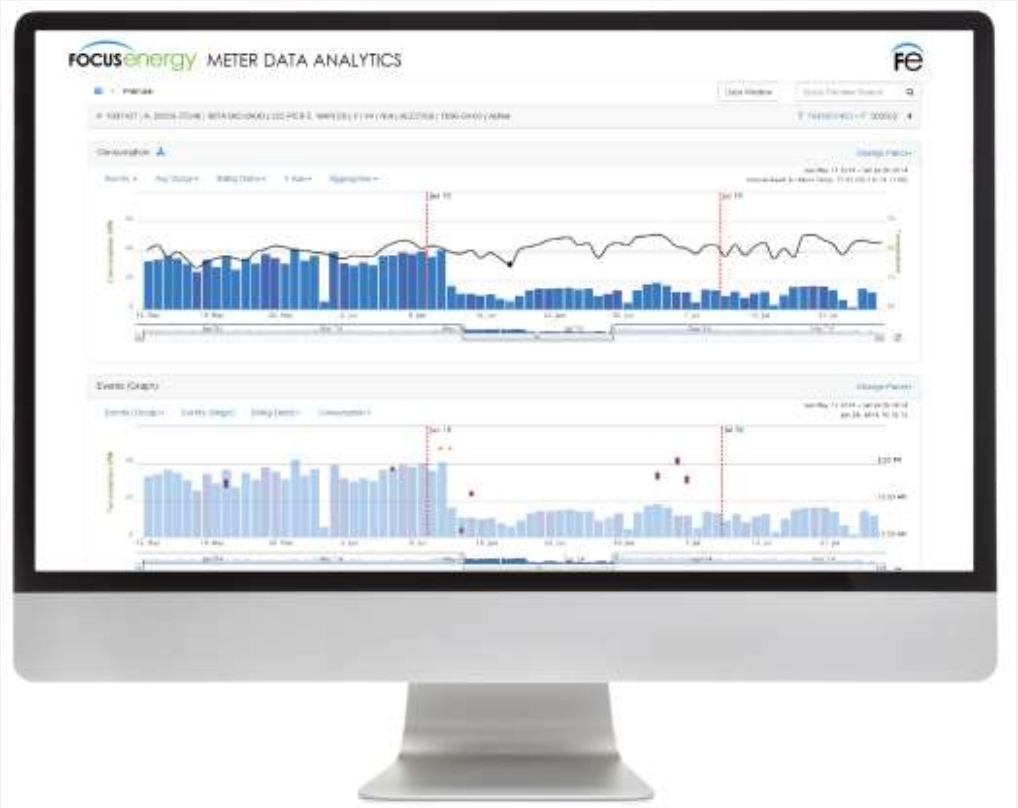
Customer Service Solutions

Meter Data Analytics

AI unlocks the value of the smart grid by leveraging smart meter data, integrating grid and distributed energy operations to drive efficiency and innovation

GridLogics View (GLV) supports:

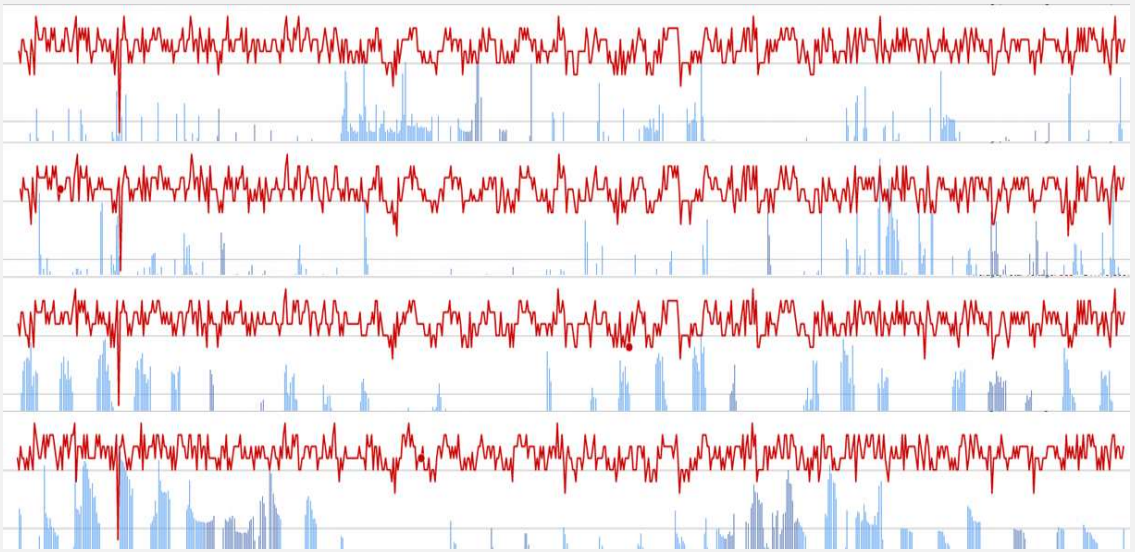
- Topology Correction
- Theft Detection
- Billing Anomalies

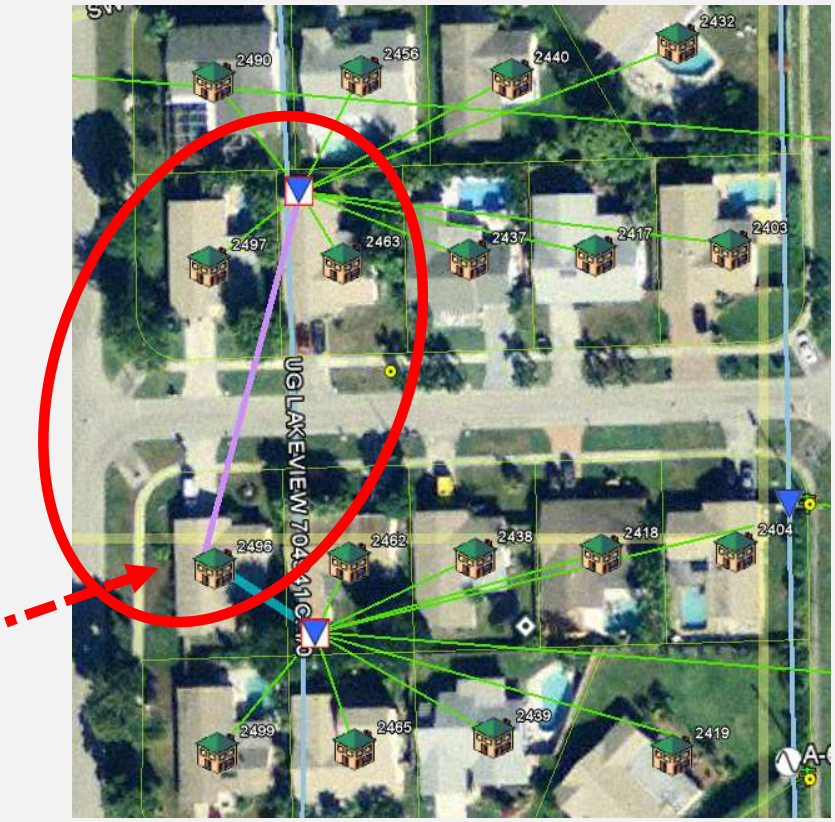


Voltage Pattern Analysis (VPA) through machine learning algorithms improve meter to transformer association accuracy

Meter to Transformer Association

- Voltage patterns are analyzed by machine learning algorithms
- Subtle differences in the voltage data trends establish a correlation between meters on a transformer



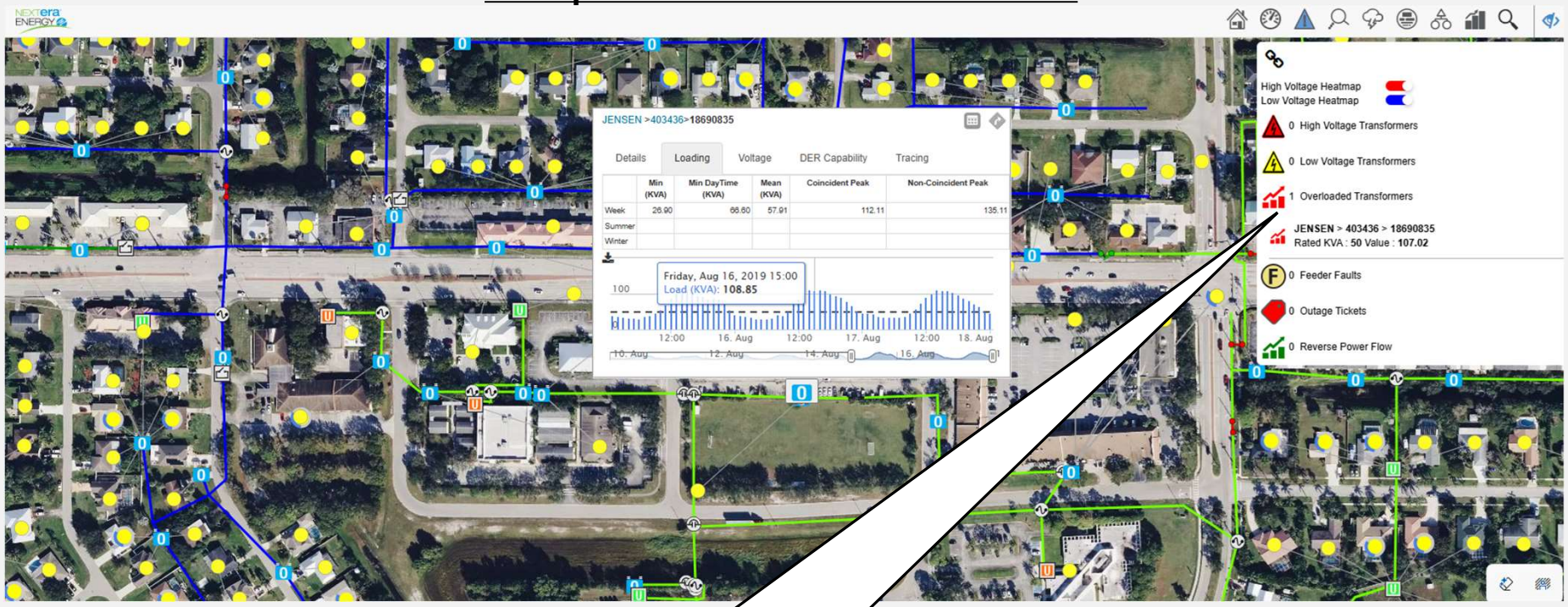


GLV assists Customer Service with initial high bill investigations

Example of comparing power draw within GLV

Meter aggregation enables load analysis for transformers and proactive maintenance on overloaded devices

Examples of overloaded transformers

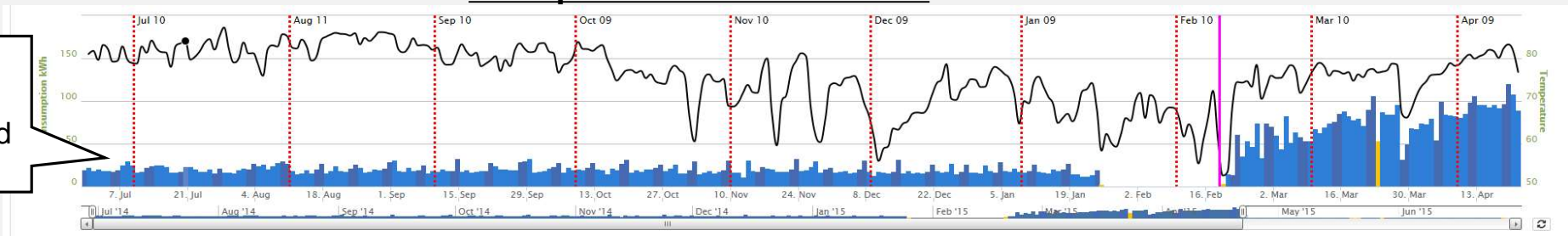


Overloaded transformers are automatically flagged and proactively upgraded to accommodate load growth

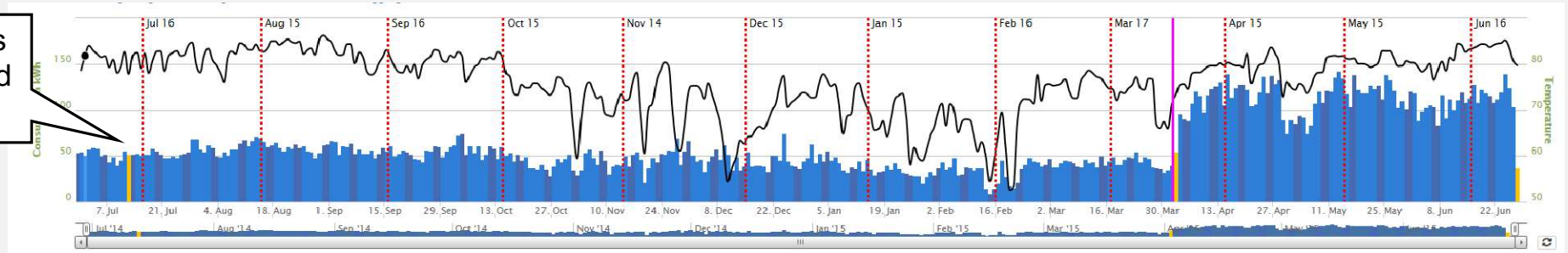
Machine learning algorithms identify usage anomalies and help Revenue Protection perform initial investigations

Examples of Theft within GLV

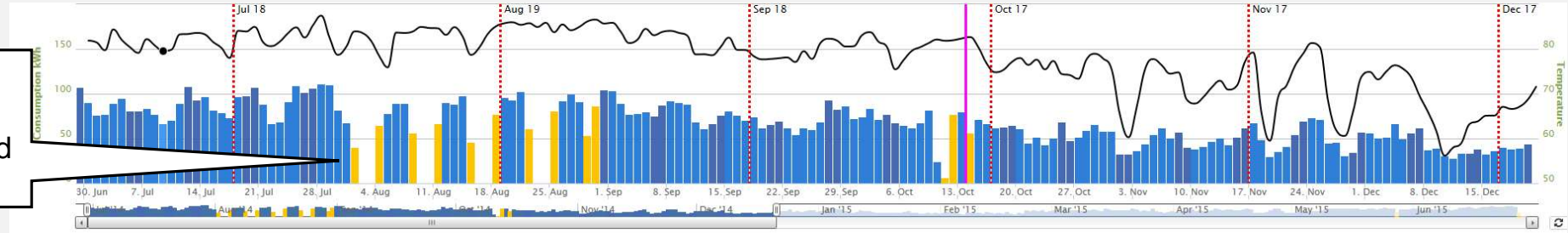
Jumpers in Meter Customer Billed $12,000



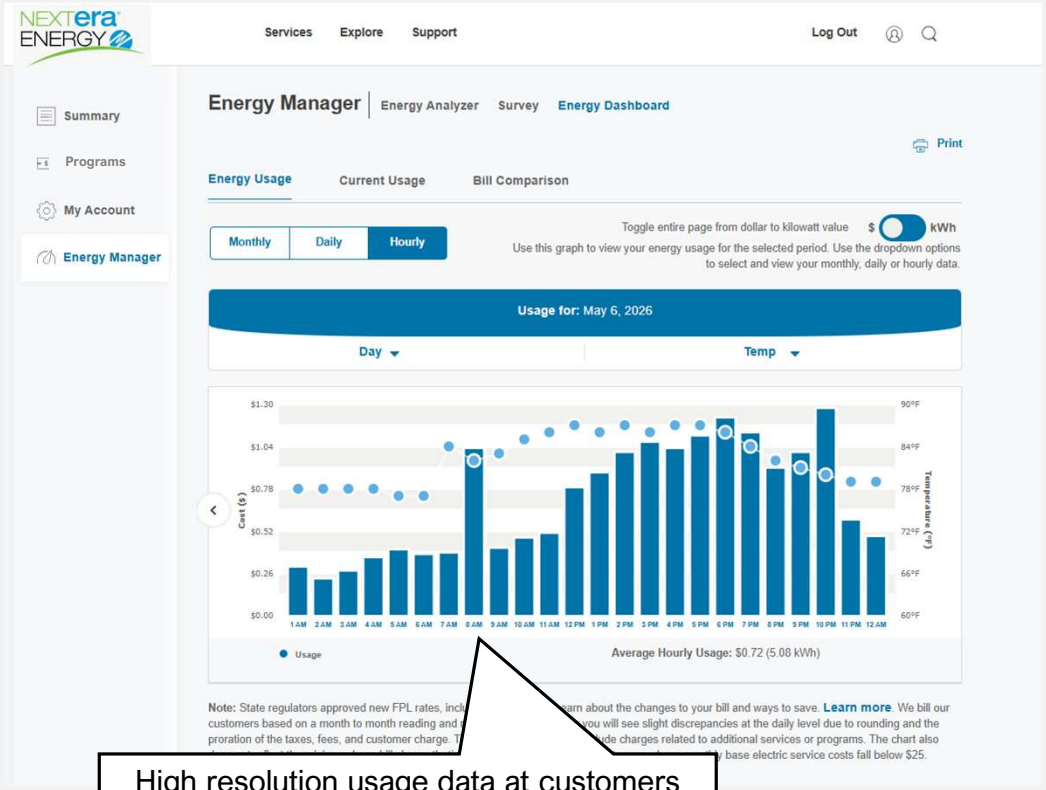
Tampered CT's Customer Billed $6,000



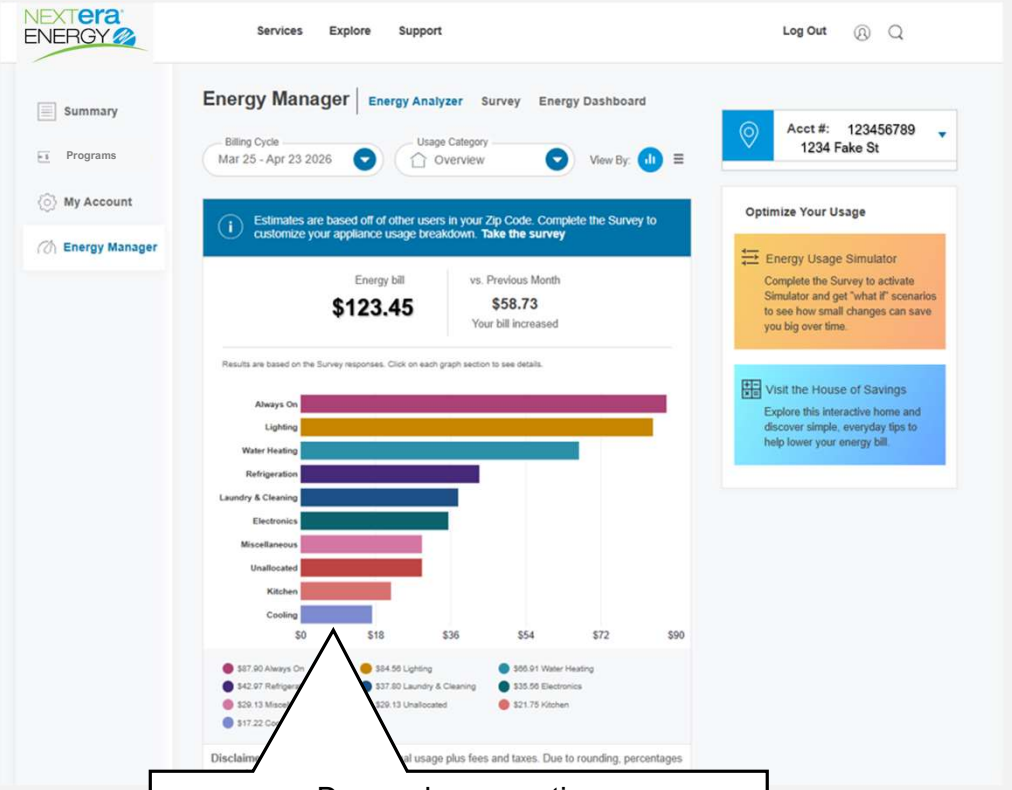
Unauthorized Meter Customer Billed $1,500



The infrastructure which supports GLV also provides customers with high resolution insights into their own power usage



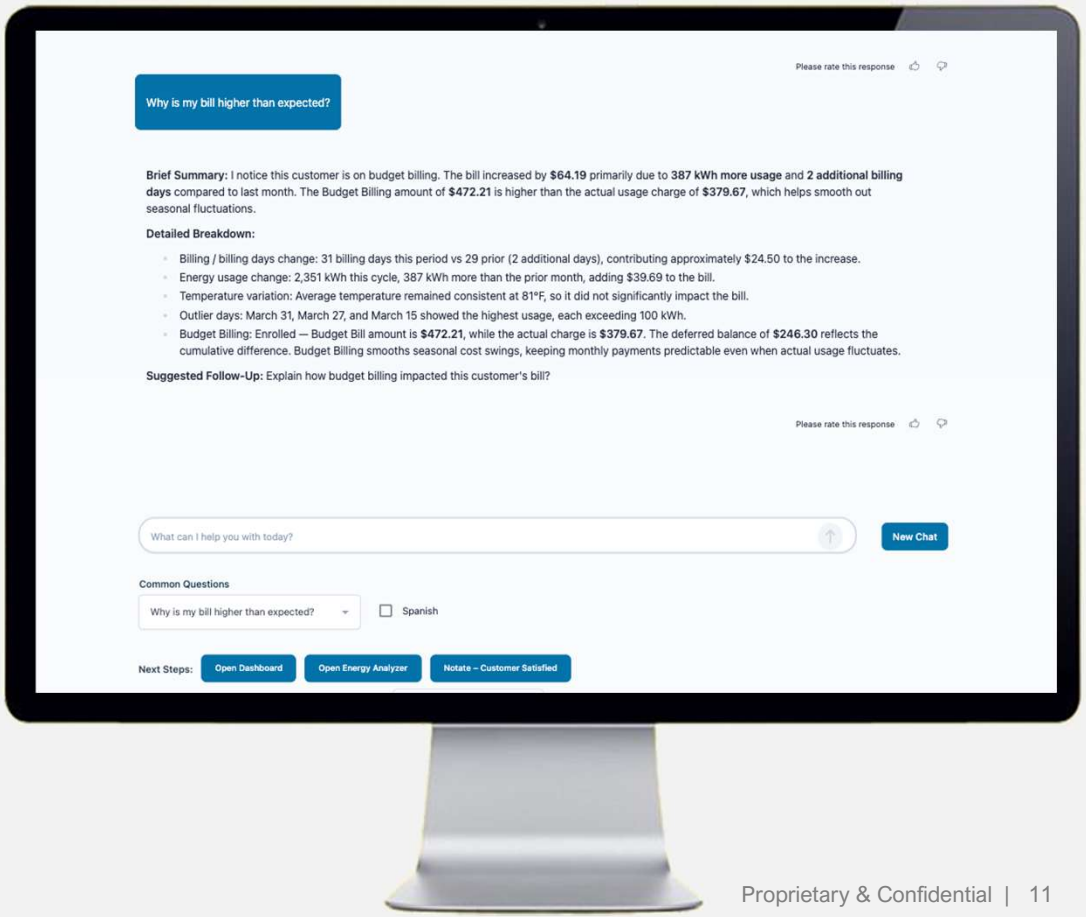
High resolution usage data at customers fingertips



Demand aggregation
(Lighting, Water Heater, Refrigeration, etc.)

AI Chatbot helps customer service agents quickly answer questions for topics ranging from complex billing to general account questions

- **Internal-facing chatbot for our Agents**
  - Used ~21K times/month
- **Topics:**
  - General questions
  - Billing
  - Account
  - Outage (coming soon)
- Foundational to our efforts to **enable customer facing chatbot**



Examples of how AI chatbots can assist customer service agents in handling different types of inquiries include:

- Provide **basic account information** such as balance or due date
- Provide **personalized energy efficiency tips** based on the customer's usage patterns
- Provide instructions on **resolving service suspensions**
- Guide customers through securely **updating billing information**
- Guide customers through basic security steps if they believe their account was compromised
- Can **diagnose basic issues and recommend fixes**, such as restarting devices

- Benefits of AI chatbots include:
  - 24/7 support
  - Reduced wait times
  - Ability to handle peak periods - easily scales
  - Customized service
  - Ticket routing
  - Predictive support
  - Multilingual support
- Risks which need to be managed include:
  - Bots could loop endlessly
  - Responses are too robotic
  - AI misunderstands topic
  - Hallucination (making stuff up!)

Solutions from NextEra Analytics support multiple aspects of power delivery

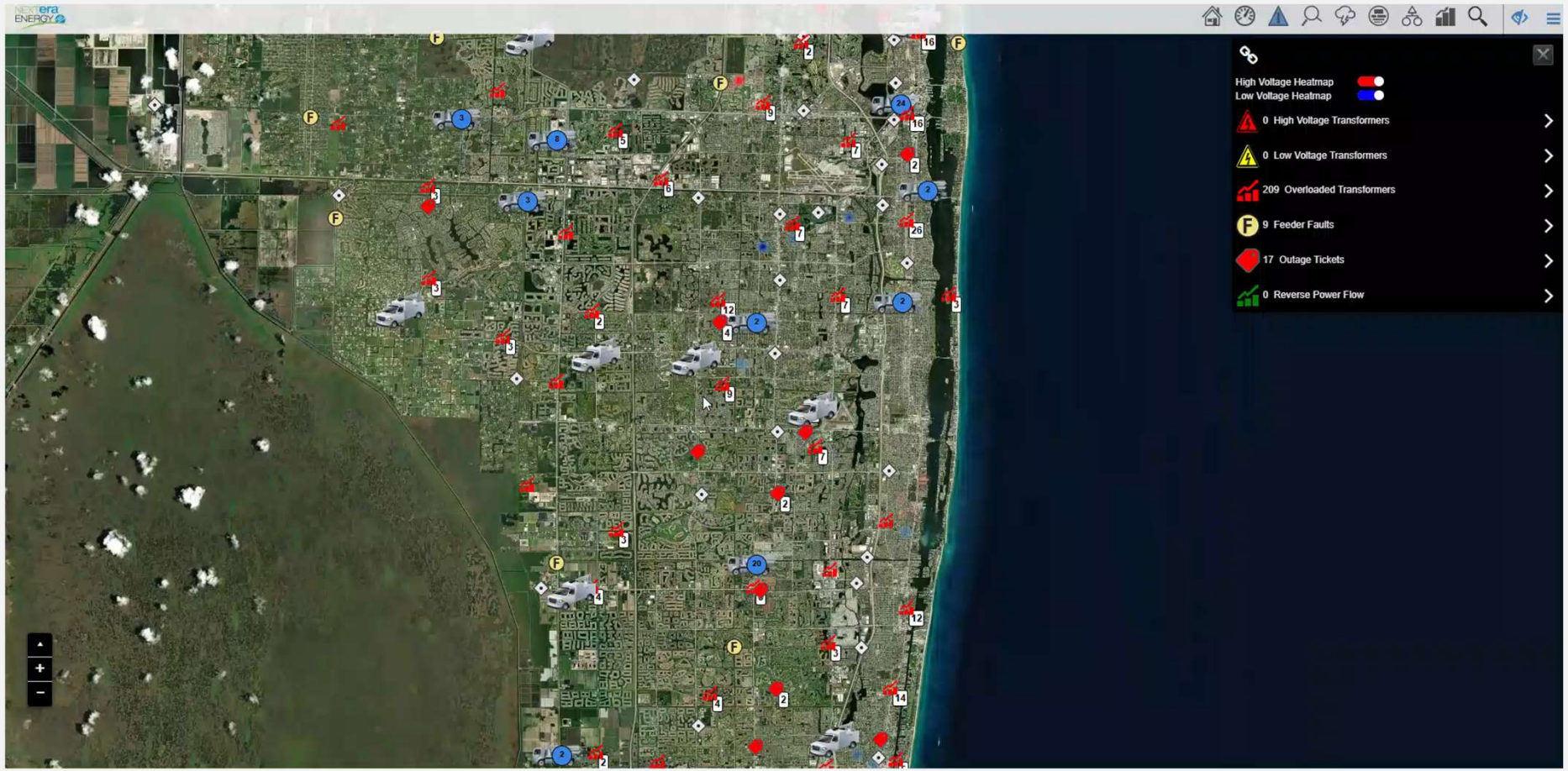
Power Delivery Solutions

GridLogics Vision Platform (GLV)
State-of-the-art grid visualization tool that brings together data from multiple systems in an easy to use, mobile-friendly application

GLV Provides Grid Solutions

- Reliability
- Outage Management
- Power Quality

GLV provides spatial awareness of outage locations and restoration crews

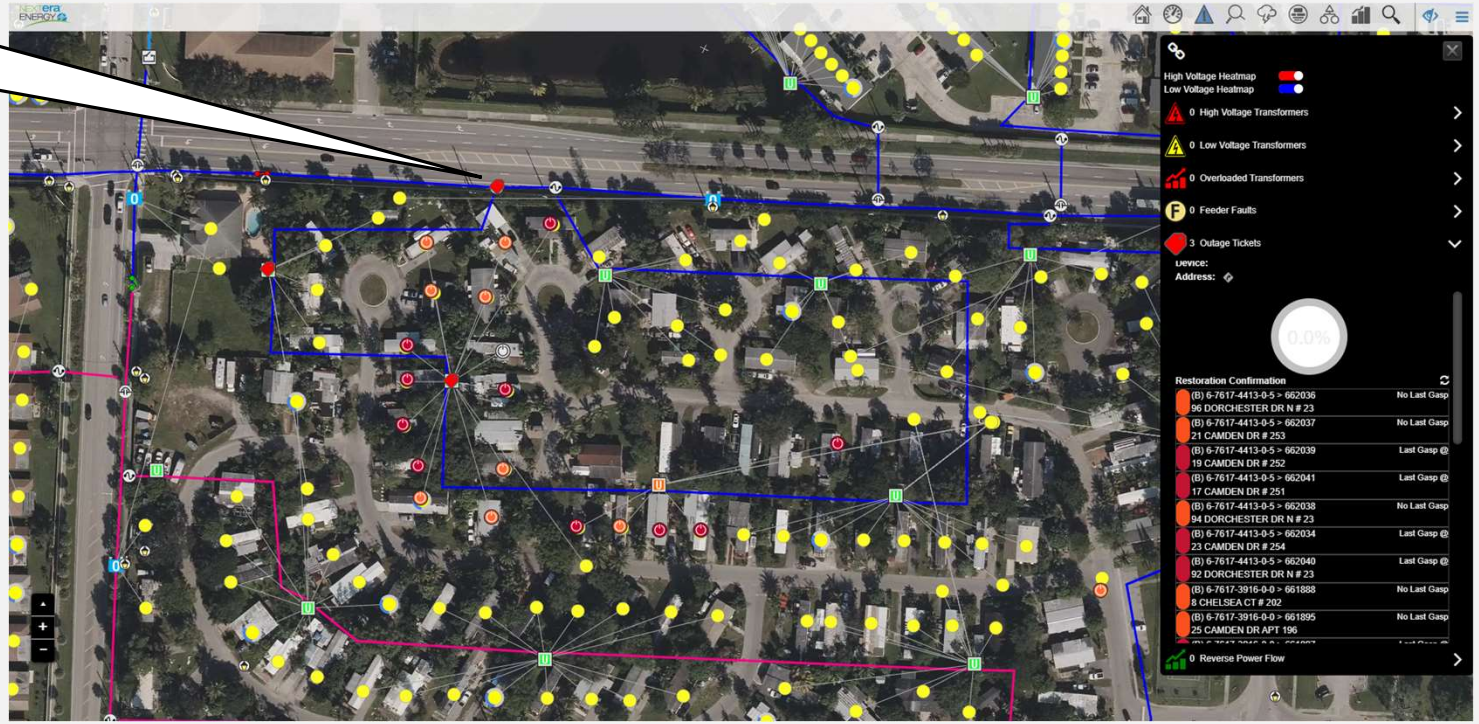


GLV transforms outage response with smart meter intelligence, so that every restoration decision is driven by real customer counts, not estimates

Control Center Leads can adjust customer counts in real-time based on recorded outages

Directly impacts reliability indicators and ensures outage prioritization

Example of validating customer counts

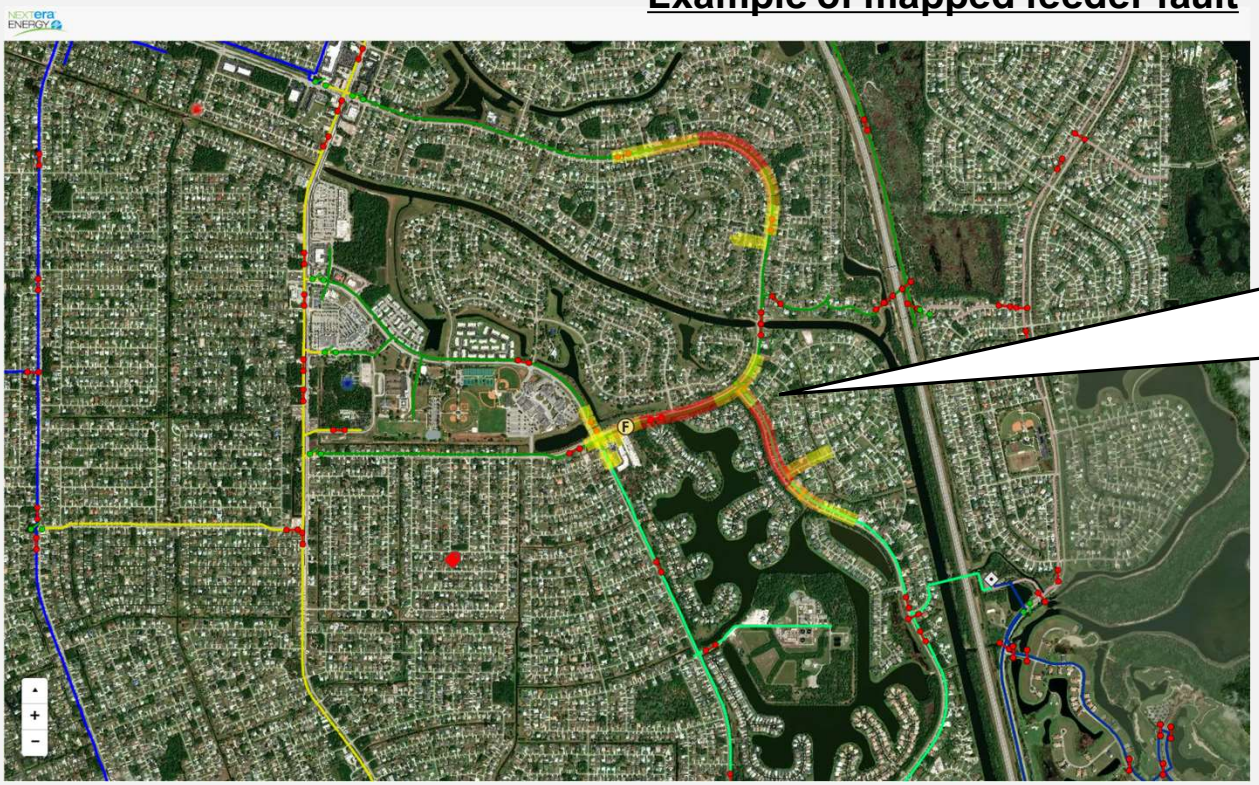


Restoration Specialists use GLV to confirm restoration and prevent repeat calls & additional truck rolls

RSs confirm restoration prior to leaving job site and identify imbedded outages

Feeder faults are automatically mapped to narrow the inspection zone, directing crews to the likely fault location and cutting investigation time

Example of mapped feeder fault



Feeder momentaries are automatically mapped for proactive inspections and

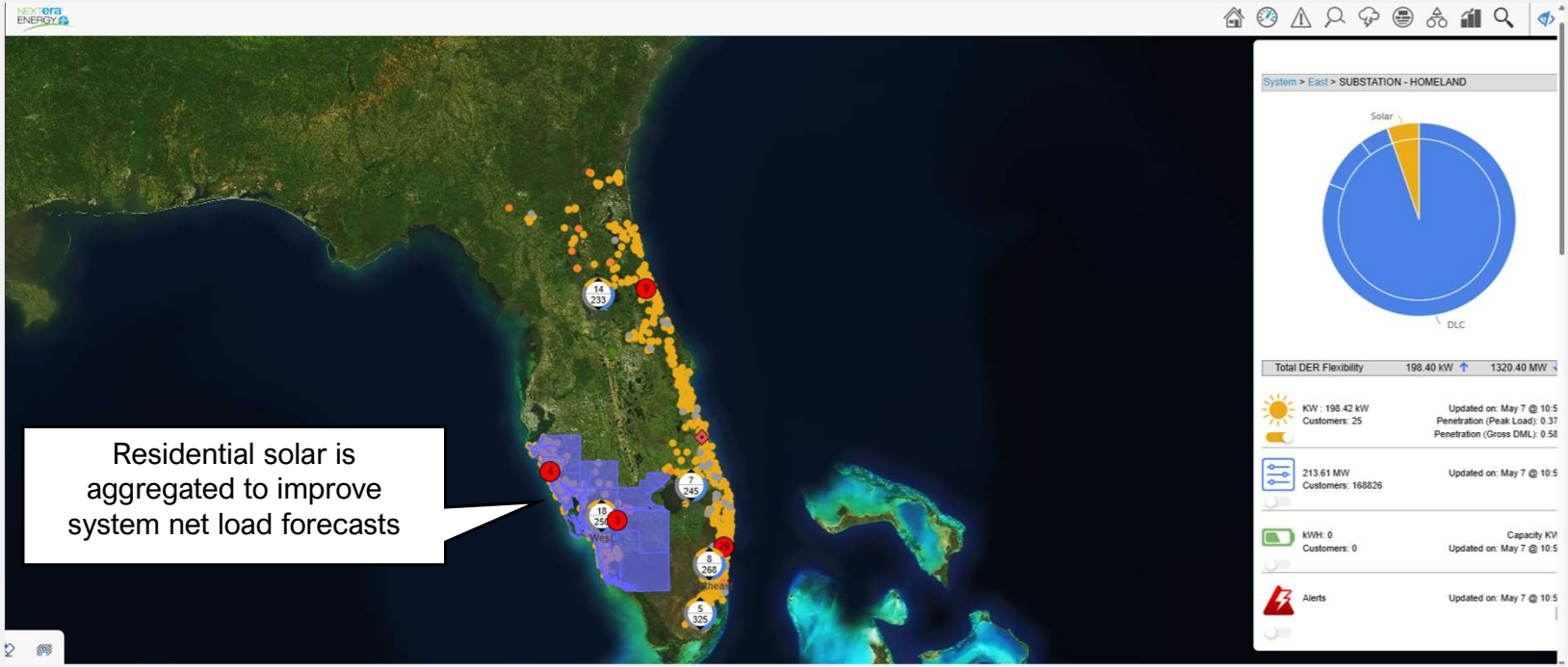
Feeder fault locations assist control center leads and dispatchers with targeted restoration efforts

DERMS aggregation brings distributed generation into focus and delivers zone-level visibility that sharpens net load forecasts

Example of roof top solar aggregation

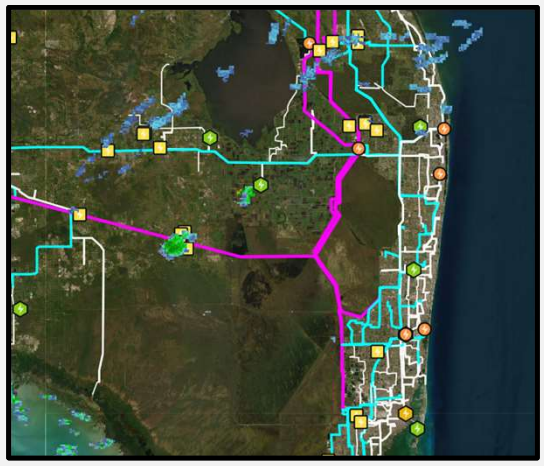
Load & Solar Forecasting

- Accurate forecasting of net demand is integral to reliable, low-cost operations of the utility grid
- NextEra Analytics has worked with power delivery engineers, field crews, retail energy providers and load serving entities to provide them with more accurate and granular forecasts



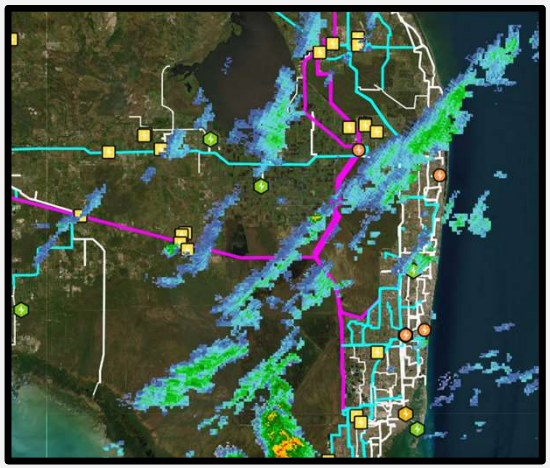
The generation mix for this large utility is increasing in complexity

The spatial and temporal variability of the system makes it impossible for a human to process all variables optimally



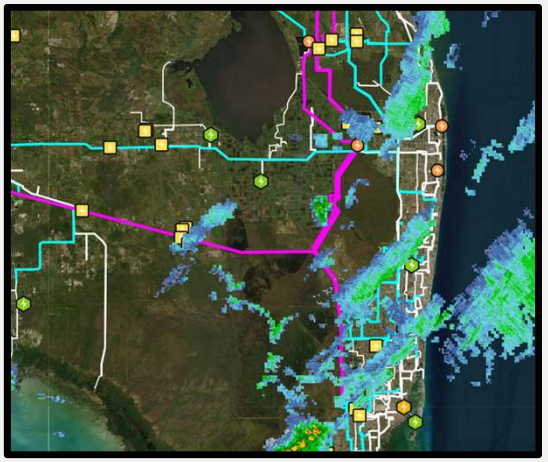
1 PM

- Clear sky
- Solar production peaking
- Load ramping up smoothly
- 75F in load pocket



3 PM

- Storms building inland
- Solar production drops rapidly at some sites
- Load peaking (85F in load pocket)
- Storage & gas units quickly ramping up



5 PM

- Storms propagating through metro areas
- Load rapidly falling (75F in load pocket)
- Solar production nearing zero
- Gas production stabilizing

NextEra Analytics is building a unified AI dispatch optimizer to balance trade-offs across Distribution, Power Generation, and Energy Management teams

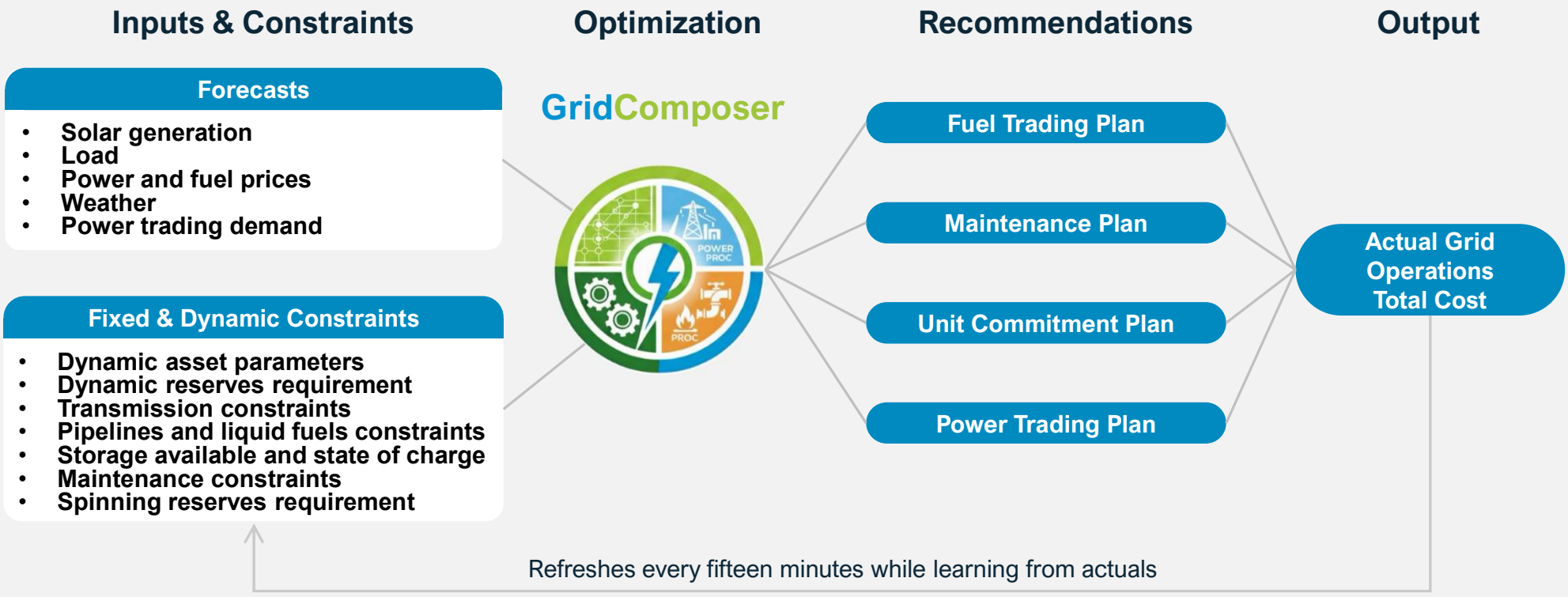
Key decision	Details
Fuel procurement	• How much fuel to buy, sell or store
Power trading	• How much power to buy/sell and at what price
Generator maintenance	• When to perform generators maintenance
Transmission maintenance	• When to take outages (long-term and short-term) and for how long
Unit commitment	• When generation assets should come online and their expected power output
Reserve requirements	• How much extra online generation capacity to carry (per hour and location)
Real-time control and dispatch	• How much power each generation asset produces in real time (instantaneous control) • When to switch to liquid fuels

Future vision

GridComposer

Integrated decision-making with one unifying total cost metric – **Grid Ops Total Cost** – and clear evaluation of trade-offs and **reliability and compliance impacts**

GridComposer unifies unit commitment, trading and maintenance into a single AI-driven optimization engine, reducing operational costs and customer bills



Questions?