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# Advanced Grid Analytics (AGA)
# Portfolio Review

# Interpreting big data and enabling proactive decisions

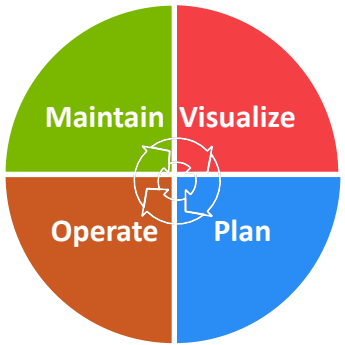
## Introducing Advanced Grid Analytics by Landis+Gyr

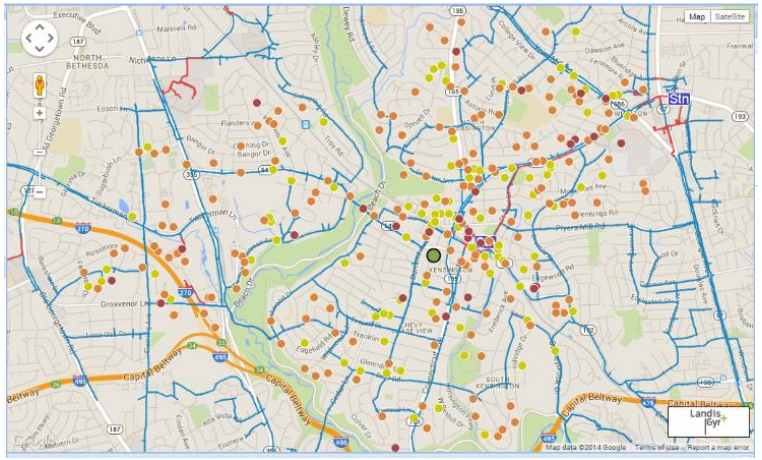
- ❑ Robust & Scalable Enterprise Platform and Applications
- ❑ Web-based, Geospatial Network Visualization
- ❑ Model-Based Advanced Analytics for Planners and Operators
- ❑ Integrate, Simulate, Predict, and Optimize Data
- ❑ Leverage Data Investments for Grid Management
- ❑ Cloud-Based or Own & Operate
- ❑ Pre-integrated to Landis+Gyr Solutions

# What are Advanced Grid Analytics?

**L+G's Advanced Grid Analytics imports a "static" distribution electric model (from GIS), displays it on web-based Google Maps and layers on top near real-time or real-time data from AMI/MDM, OMS, SCADA, then runs complex optimization, analysis and physics- based algorithms making it a "dynamic" grid performance, analysis and management application suite:**

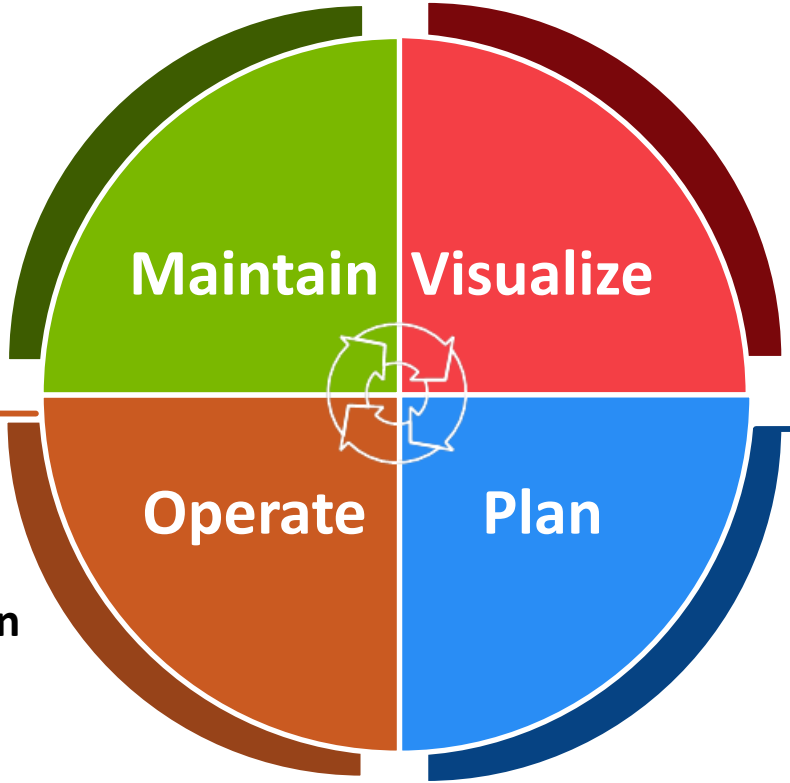
- ***Visualize***
- ***Plan***
- ***Operate***
- ***Maintain***



# Advanced Grid Analytics Lifecycle

Leverage Big Data to Maximize & Extend Asset Life



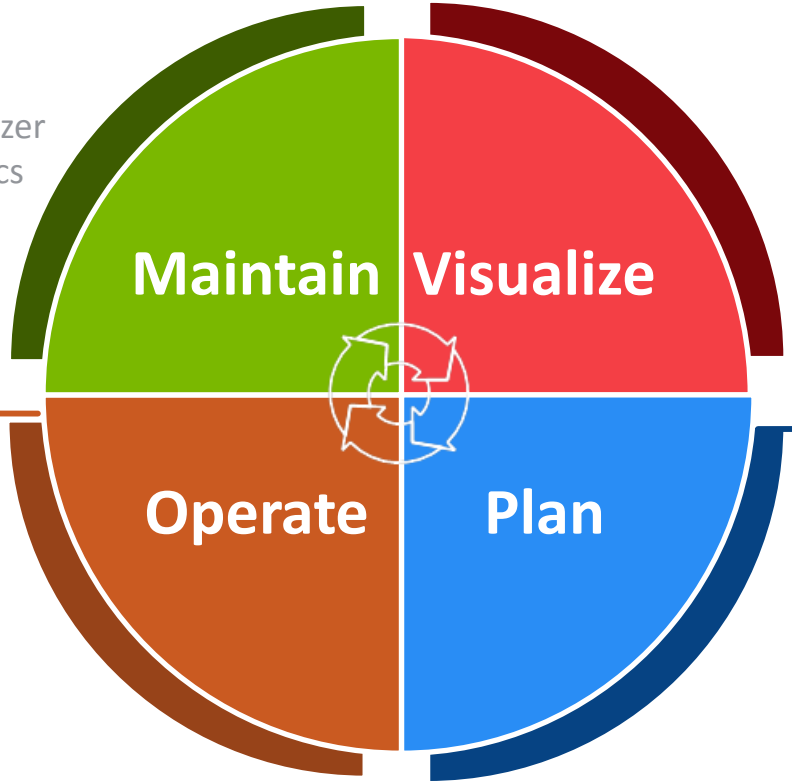

Identify System Health & Performance Issues

Advanced Analysis for Real-Time Decision Support

Improve and Optimize System Planning

# Advanced Grid Analytics Lifecycle

**GRIDassets**
- Asset Placement Optimizer
- Predictive Asset Analytics
- Asset & Work Manager

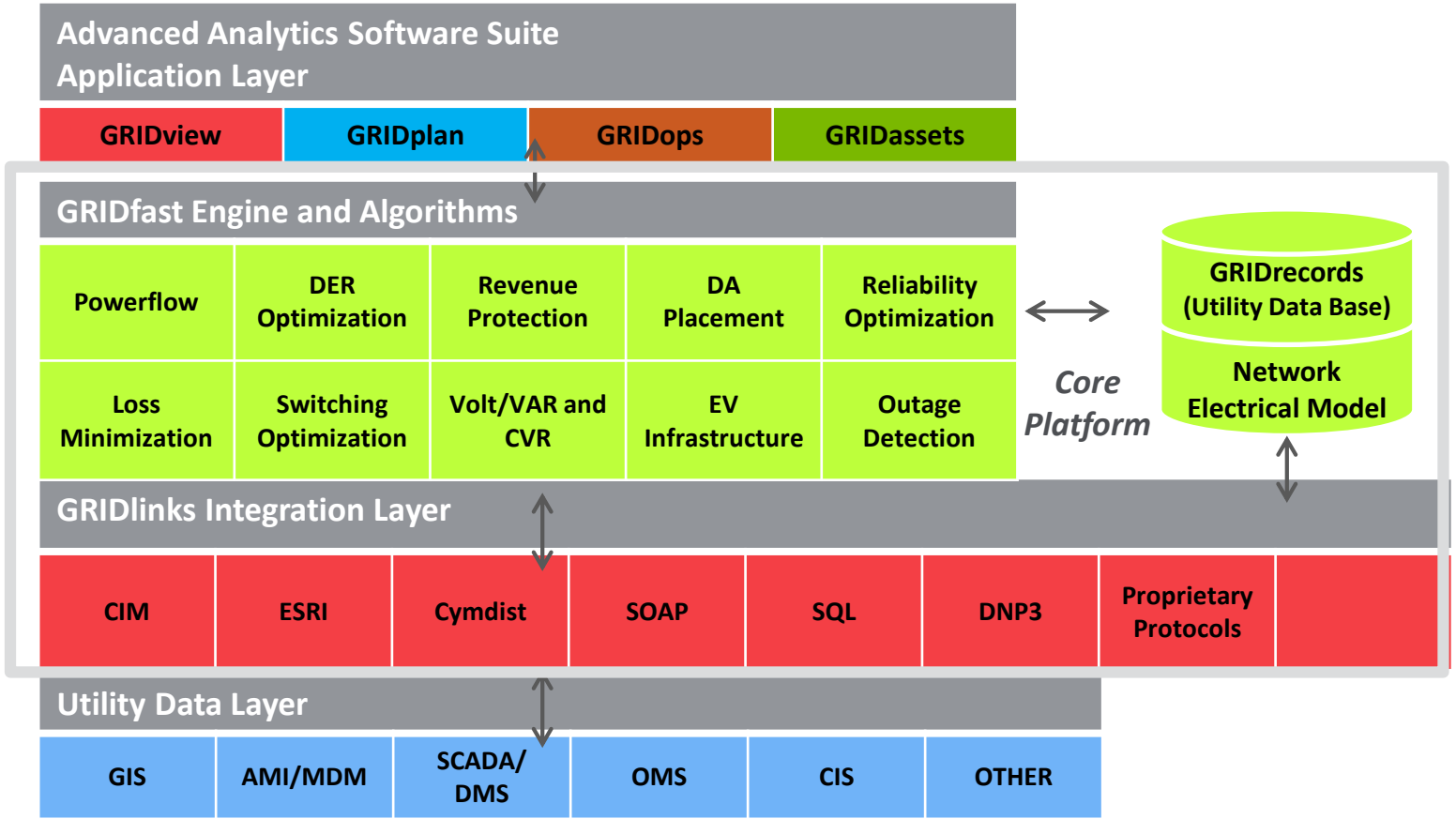



**GRIDview**
- **Asset loading**
- **Voltage Visualization**
- Capacity Contribution
- Revenue Protection
- Energy Diversion

**GRIDops**
- Outage Detection w OFISR
- **Voltage Monitoring**
- **Volt/VAr Manager**
- DER Optimized Dispatch
- Reliability Manager
- Dynamic State Estimation

**GRIDplan**
- **Reliability Planner**
- **DER Optimizer**
- FCI Optimization

# Solution Architecture & Taxonomy



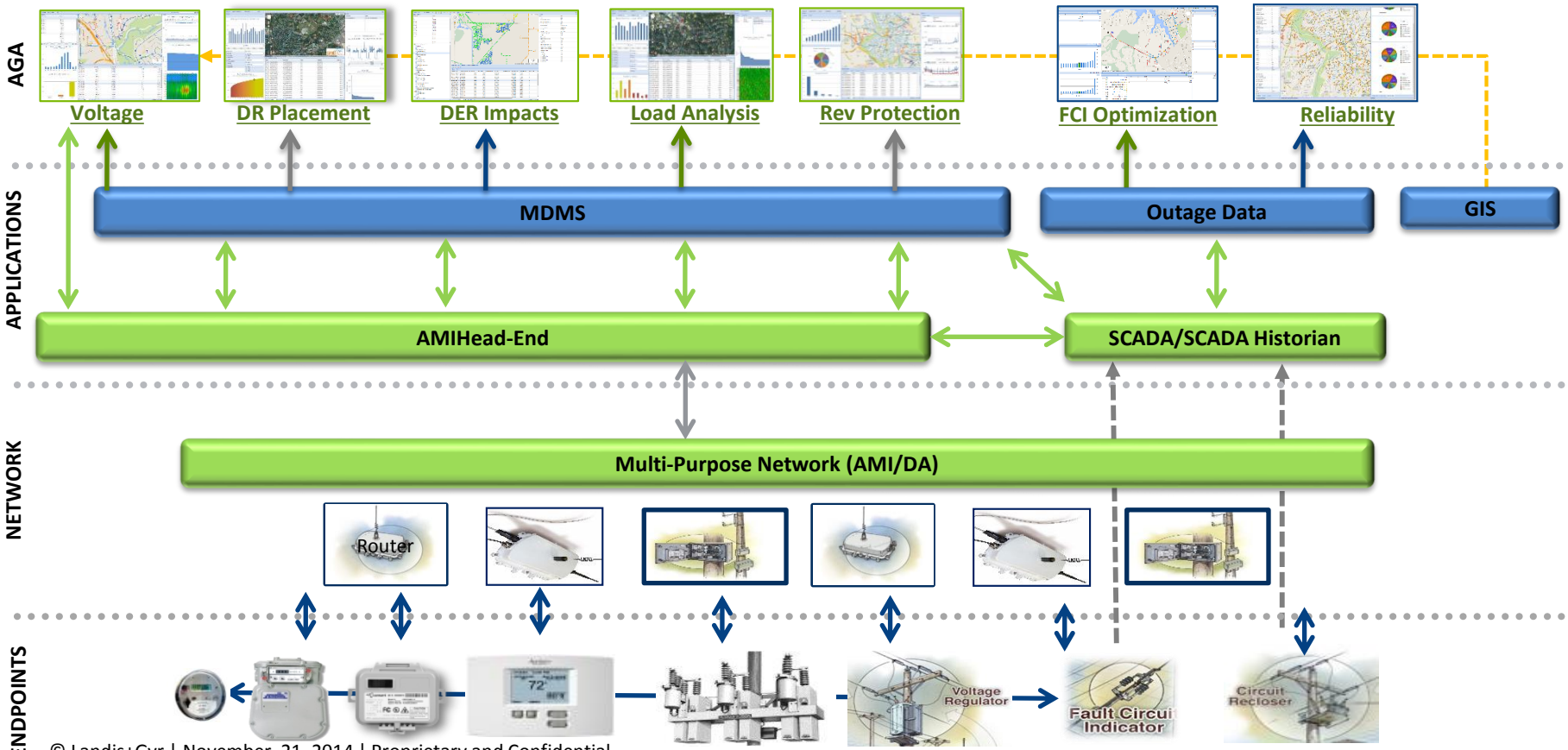

Modular, Web-based, User Friendly, Applications

Powerful Enterprise Platform - Tested & Validated over 12 years

Pre-developed Adapters for Simplified Integration

Leverage Existing Data Investments

# Leverage Data Investments for Distribution Grid Management



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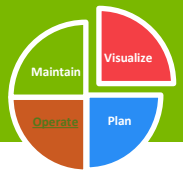
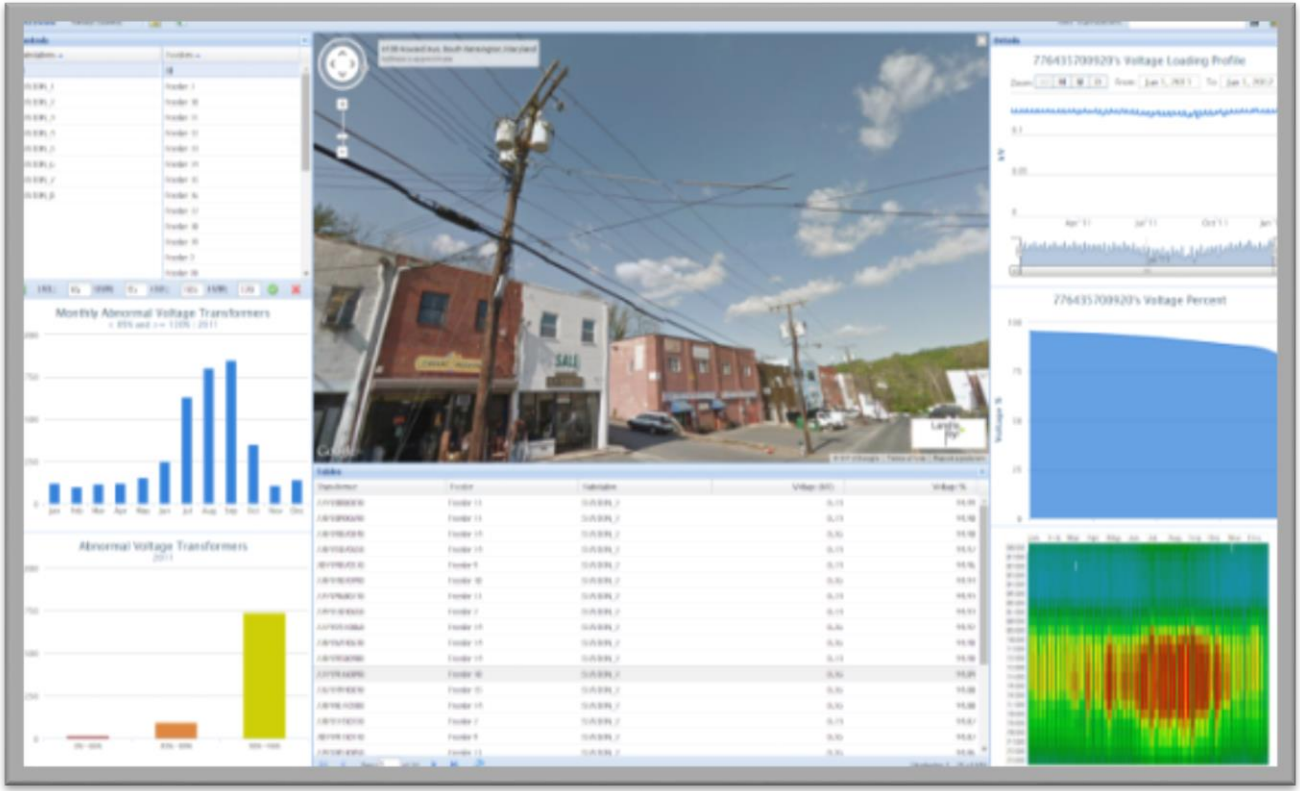
# AGA Application Review

# Improve Power Quality

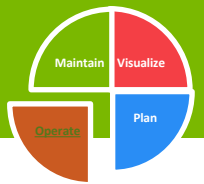



## Voltage Visualization

- System-wide historic visualization of voltage issues
- Displays meter voltages measurements on the web-based distribution map
- Aggregates AMI/MDM data and calculates voltages where they are not being measured
- Provides monitoring and consistent system wide visibility of over and under voltages.
- Helps determine and prioritize areas for CVR and/or Volt/VAr optimization programs

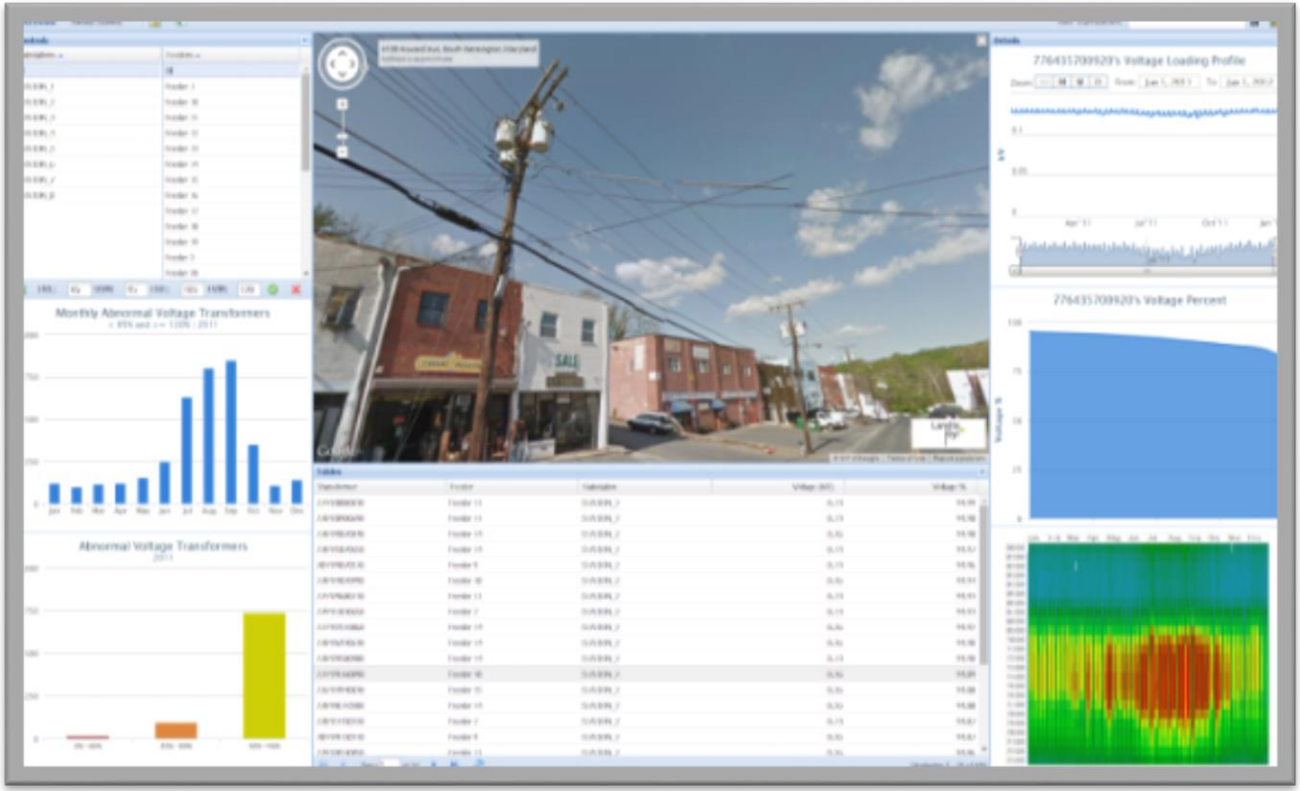


# Monitor Voltage Issues

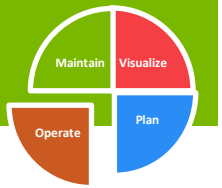



## Voltage Monitoring

- Displays important meter real-time voltage (5-15 minute) measurements on geo-spatial distribution map for distribution system voltage management
- Provides services to perform a complete system voltage analysis to recommend important meters for each distribution circuit.
- Provides over the air reconfiguration of field meters to become important meters (if AMI can support).
- CIM real-time adapter
- GA – Q2 2015

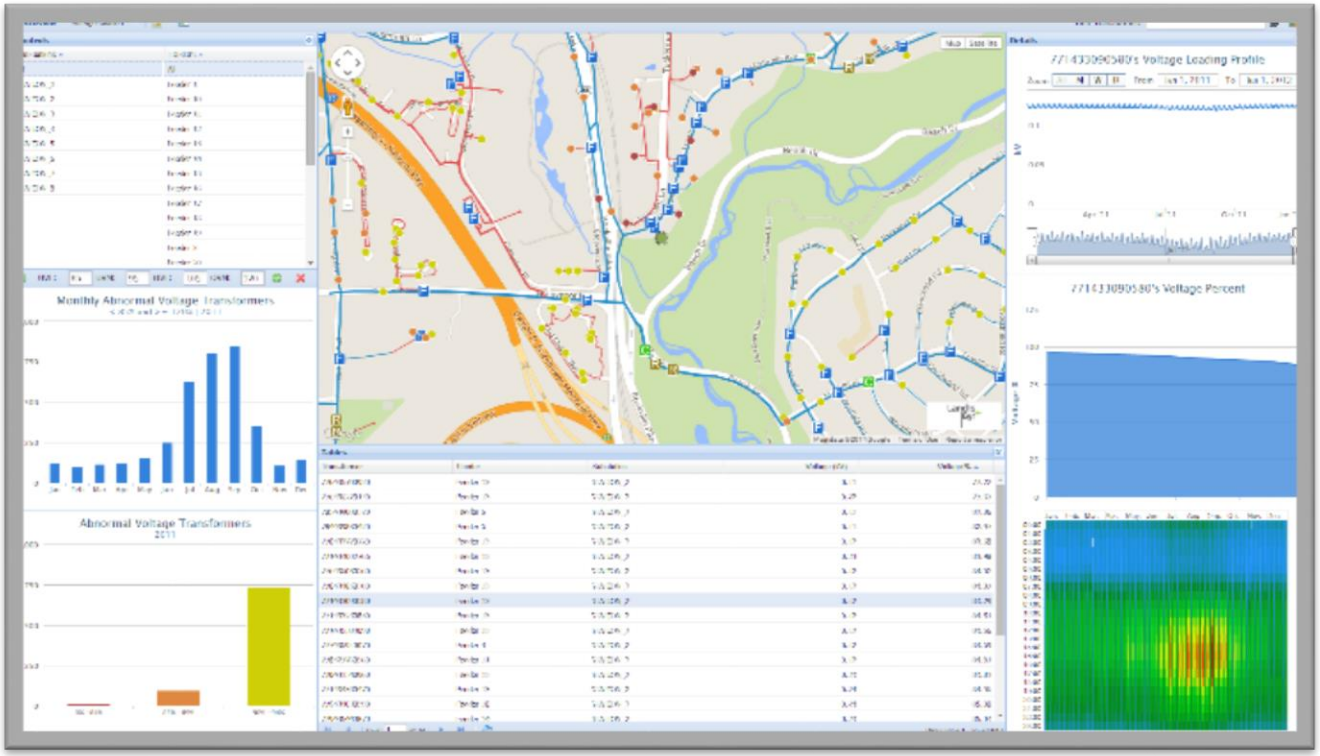


# Control & Manage Voltages

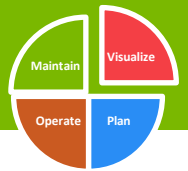



## Volt/Var Manager

- Analyze real time voltage data from important meters and coordinates with a utilities DMS/SCADA to optimize circuit Power Factor and deliver either DR or energy conservation
- Provides a complete system analysis of important meter groupings using voltage data with each meter data to determine necessary adjustments needed in any circuit important meter set
- Coordinates with Command Center to automatically (over the air) remove certain bellwether meters and add new meters to serve as bellwether meters
- GA Q1 2016

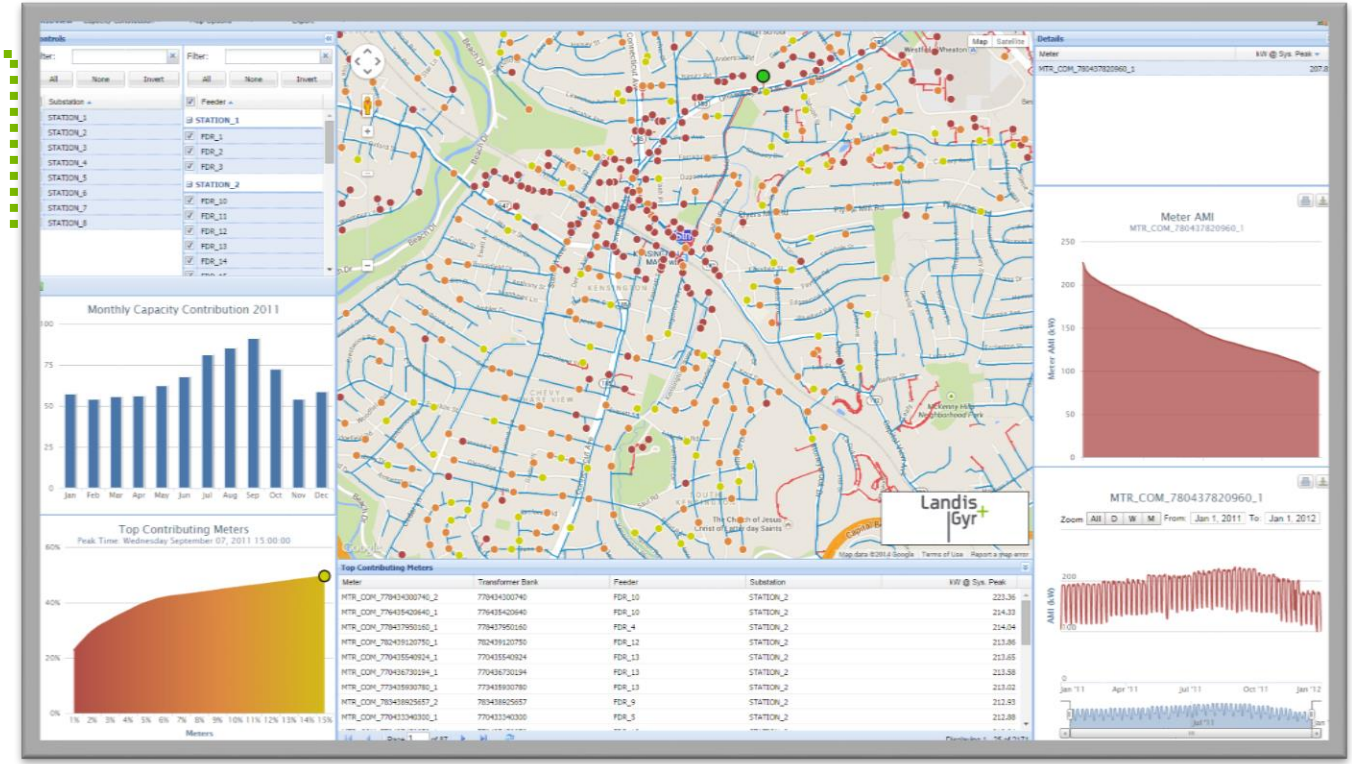


# Reduce Peak Loads

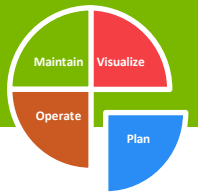



## DR Placement

- Uses MDM or AMI head-end data to identify customers that contribute most to peak loads
- Calculates coincident peak demand for all the customers and ranks them based on their contribution
- Prioritizes customers that would affect system capacity charges
- Analyzes the best customers for demand management
- Improves ability to manage loads of customers affecting system capacity during peak



# Manage Renewable Integration

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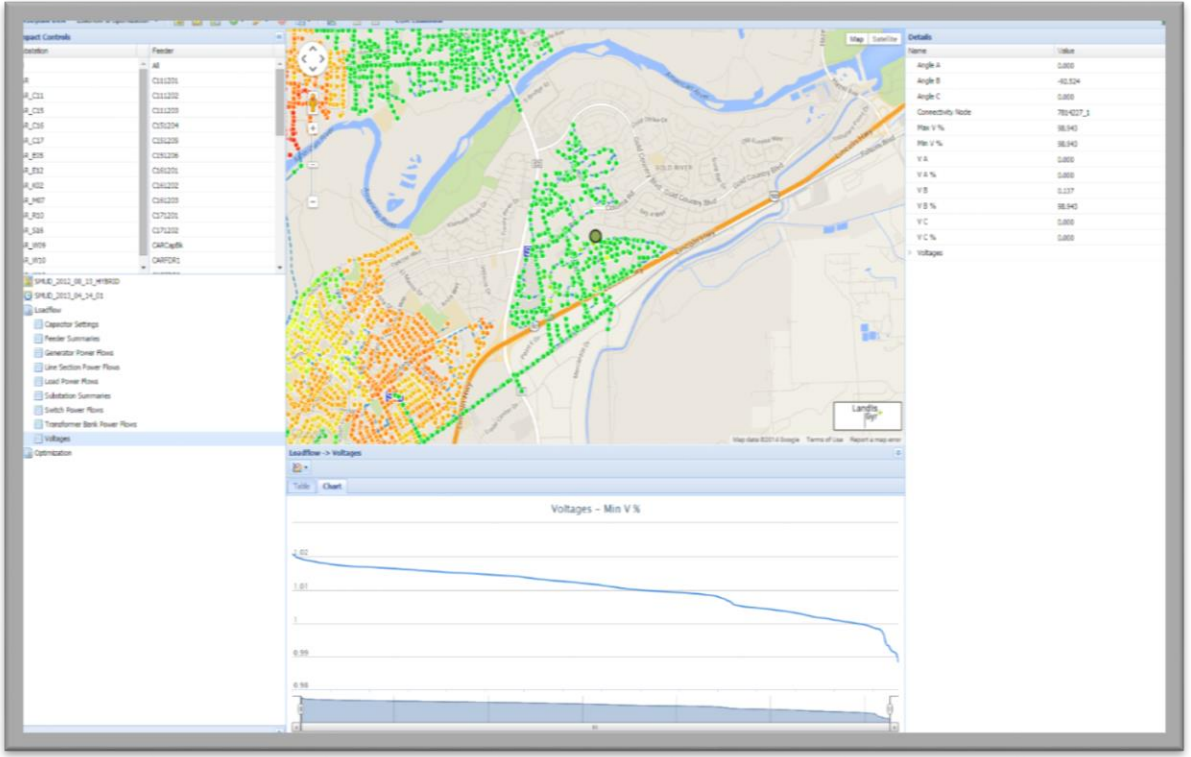
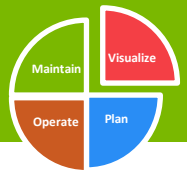
## DER Optimizer

- Combines AMI and Sensor measurements
- Analyzes Impacts of DER
  - Impact on power flows & voltages
  - Voltage flicker on sudden loss of generation
- Superimposes PV/wind generation on load profiles from AMI/Sensors to analyze changes in load profile
- Optimizes integration of PV/wind into distribution system
- Analyze limits of PV/wind/DR the network can handle without adverse power quality or reliability impacts

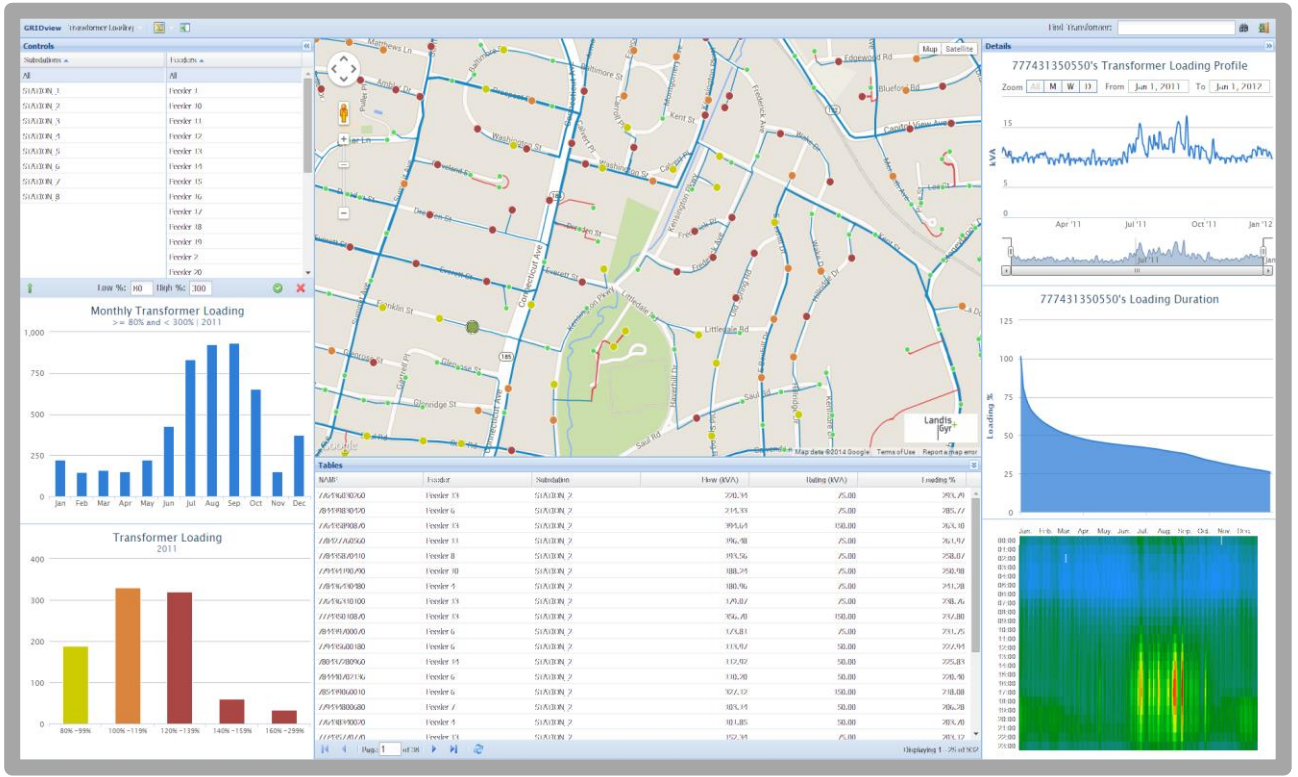


# Optimize Life & Value of Grid Assets

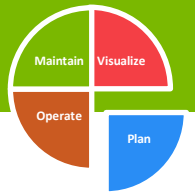



## Asset Loading

- Uses AMI/MDM or Sensor Data
- System health and performance analysis
- Identifies over loading to minimize outages due to equipment failure
- Identifies under loading for better asset utilization
- System planning and placement/sizing of transformers
- Performs loss of life calculations

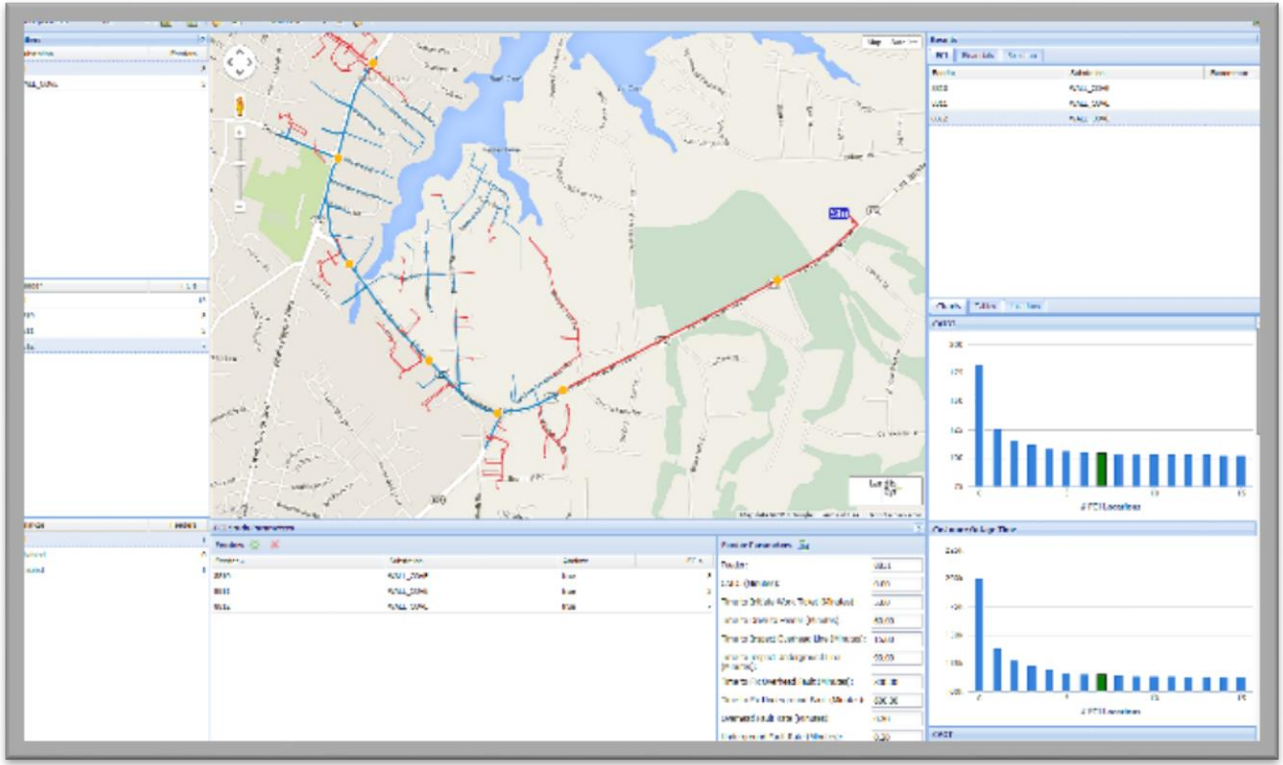


# Reduce Outages & Justify Investments

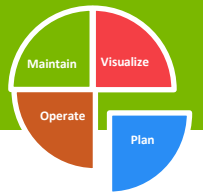



## Asset Placement Optimizer

- Identifies optimal type, number and placement of Sensors
- Performs cost-benefit analysis, including discounted cash flow analysis on the return on investment
- Quickly identifies how many devices to purchase and where to place them for maximum benefit
- Quickly and easily develops and justifies a business case
- Reduces the time, resources, and cost necessary to identify faults along the feeder
- Leads to significant improvement in fault restoration times

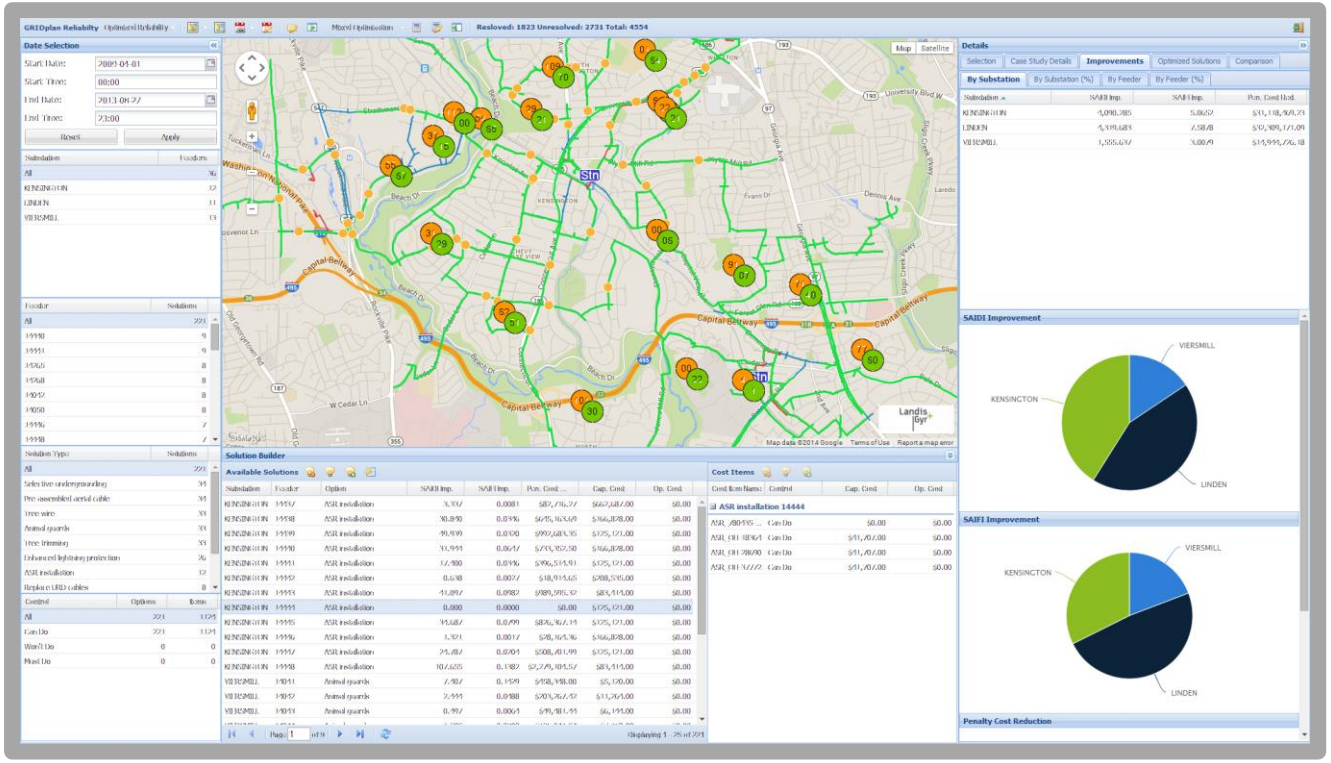


# Improve Reliability – SAIDI, SAIFI, CAIDI

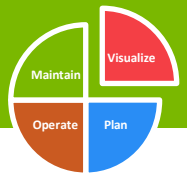



## Reliability Planner

- Uses OMS data to provide planning & upgrade advice
- Analyzes outages by feeders, substations and outage types
- Reviews impacts of outages on SAIDI, SAIFI, and Costs
- Optimization analysis determines remedial actions
- Reviews and fine tunes remedial actions and impacts on SAIDI, SAIFI, and Costs
- Performs and compares cost/benefit analysis of remedial actions

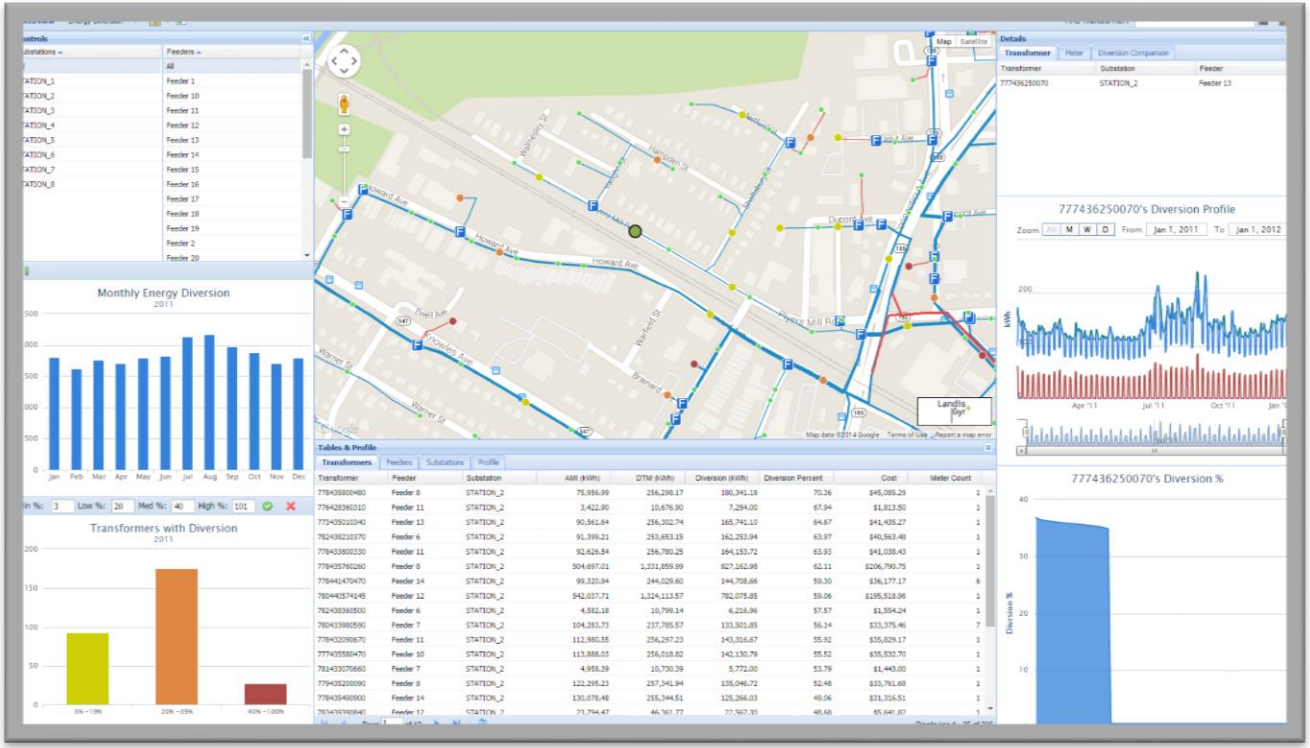


# Reduce Losses




## Revenue Protection

- ❑ Analyzes meter profile to determine power theft
- ❑ Displays inactive meter consumption
- ❑ Displays zero consumption/slow/stopped spiking meters
- ❑ Analyzes and identifies technical vs. non-technical losses
- ❑ Uses AMI and/or sensors to detect energy losses
- ❑ Combines sensors data on the feeder to narrow losses to location



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# References

# Reliability Planner - Benefits

- ❑Estimate the budget for the optimal improvements
- ❑Determine the optimal improvements for a pre-determined budget
- ❑Examine specific programs (e.g., tree trimming) and determine the improvements on SAIDI/CAIDI versus cost of the program
- ❑Analyze cost of program implementation versus KPI improvements against savings
- ❑Make economic and improvement decisions based on actual data

## Improve Reliability

PHI provides service to over 1.8M customers in Washington D.C., Maryland, Delaware, and New Jersey. Reliability Planner provides PHI with a forward looking multi-year benefit prediction and optimized case study recommendations for maximizing various KPIs and minimizing costs as well as the ability to provide future reliability plans to the Commission and other Stakeholders.

# Sacramento Municipal Utility District – Customer Reference

## DER Optimizer - Benefits

- ❑ Ensure system reliability and power quality are not adversely impacted by high penetrations of variable distributed generation
- ❑ Predictive analytics and technology comparison for forecasting, economic effectiveness, and performance
- ❑ Distributed energy storage procurement planning
- ❑ Reduce system losses
- ❑ Improve reliability through DG and DR

**Manage Renewable Integration**

**SMUD is the 2nd largest Municipal Utility in the United States serving 600K customers located in Northern Central California. DER Optimizer provides SMUD with a high fidelity, system-wide T&D system model to reflect system topology and loads with the ability to site and dispatch DG, DR, CVR, energy storage, and DA assets.**

# Asset Loading - Benefits

- Visual representation of transformer loading calculated purely from smart meter data
- Ability to properly size transformers based on accurate loading data
- Calculate “loss of life” at each time interval and sum up over the analysis period to predict the actual life of the transformer
- Provide estimated cost of owning the transformer over its lifetime
- Led to preventative transformer maintenance program and ZERO transformer outages during peak season
- Reduced Labor Costs
- Economic based decision making

## Optimize Asset Life & Value

BWP provides service to 55k customers in Burbank, California. Goals were to gain more value from AMI data and gain visibility of network system performance. Asset Loading enabled them to identify overloading on the network and at the distribution transformer level as well as determine cost of owning assets, risks due to overloading and impacts on transformer life.

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# Thank you for your attention