



**Hawaiian Electric**  
**Maui Electric**  
**Hawai'i Electric Light**

## Modern Grid Technology Workshop

May 10, 2017

# Integral Analytics: Profile



Utility Customers

40+

Customer Load Shapes

500 million+

- Market leader in Distribution Grid Analytics software for Planning, Operations, Demand-Side Management, DER Valuation
- Products deliver **granular, actionable intelligence** to utilities and others to bridge long-range forecasting with near-term operational needs
- Patented architecture and methodology, based on least-cost principles
- Scalable platform for emerging system regulations in California, New York, Massachusetts, Texas, Arizona, Hawaii and other jurisdictions
- **2016 Greentech Media Grid Edge Winner/2015 Fierce Innovation Award**



# Comprehensive Grid Planning for Hawaii

## HPUC Order:

- “...necessary to look at the grid in the context of the **entire value chain** of the electric system”
- The aim of this process is for the HECO Companies to file a **detailed, holistic, and scenario-based** Grid Modernization Strategy for each of the utilities
- “Such investments must be **strategically calibrated** and prioritized to meet clearly defined goals in order to achieve the vision for Hawaii’s integrated grid of the future. Each project or series of projects must **methodically and cost-effectively** advance this ultimate objective.”

## Business Requirement:

- A **granular, dynamic** distribution planning and valuation application through which HECO may forecast, capitalize and visualize network growth and manage reliability, inclusive of DER proliferation.

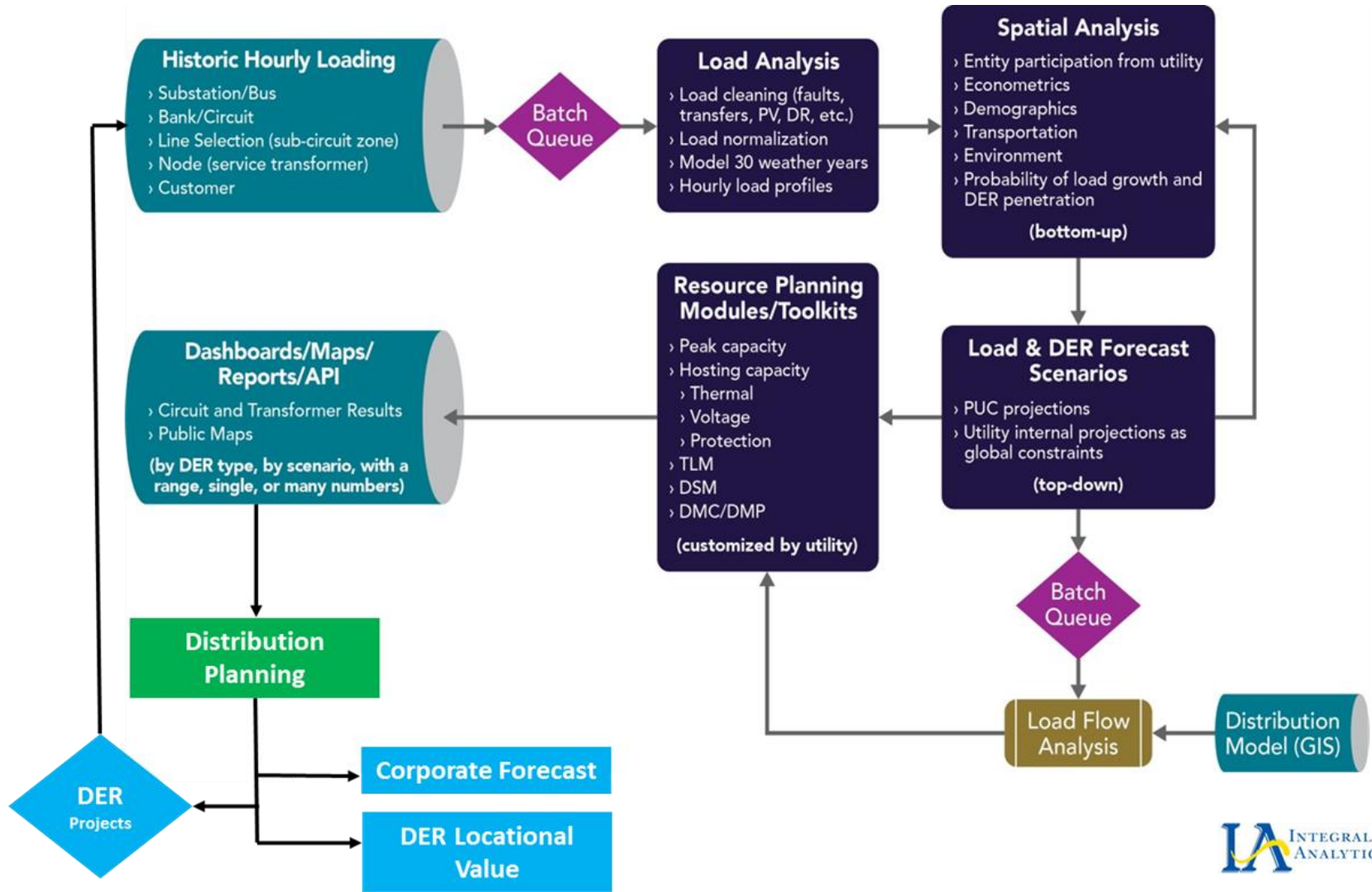
# Emerging Planning Requirements: 2017

- “It’s all about the load shape”
- Corporate/System Forecasting must change
  - Top-down must reconcile with granular/feeder-level
- DER proliferation requires nodal valuation, constrained by grid ops/powerflow
- Data-to-Intelligence loop must be closed
  - 1 million customer utility may produce > 500 million records per day
- Planning-to-Ops Analytics bridge must be built
  - “4 seconds to 20 years”
- Dynamic forecasting requires elastic computing

# Attributes of Future-Proof Grid Edge Planning

1. Built-to-Scale: Software, not Studies
2. Dynamic: IRPs to DRPs to ICAs to DERMS
3. Scenario Engine at the Core
4. Interoperability with powerflow/GIS/SCADA
5. Unified Platform to support many stakeholders:
  - Transmission/Distribution/Ops/Fuels
  - Corporate Forecasting
  - Regulators
  - Market Participants
6. Drive to the Premise

# Integrated Planning Software-Enabled Flow



# Result: Intuitive, Multi-Stakeholder Platform

The screenshot displays the LOADSEER platform interface. On the left is a dark sidebar with navigation options: Home, Explorer, Forecast, Grid, Scenario, Valuation, Tests, Portfolios, Operations, Optimizations, Library, Reports, Settings, Data, and FAQ. The main area is split into two panels. The left panel, titled 'GIS Data: SYCAMORE CREEK 1101', shows a map of a city area with roads and a network of blue and red lines. The right panel, titled 'GIS Data: SYCAMORE CREEK 11C', shows a network diagram with nodes and connections. At the bottom is a table with project details.

Project	Category	Status	Project Name	Start Date	End Date	Location
Alameda St. Urban and Development	100	Completed	Alameda St.	10-0-2012	06-01-2015	San Francisco
Arts Center	100	Completed	Arts Center	10-15-2012	06-01-2015	San Francisco
Car and Light Rail	100	Completed	Car and Light Rail	10-0-2012	06-01-2015	San Francisco
East Bay Rapid Transit	100	Completed	East Bay Rapid Transit	10-1-2012	11-01-2015	San Francisco
IT System Transition	100	Completed	IT System Transition	20-7-2013	02-28-2016	San Francisco
Phase 1, Market and Development	100	Completed	Phase 1, Market and Development	10-1-2014	06-11-2015	San Francisco
Phase 2, Market and Development	100	Completed	Phase 2, Market and Development	10-1-2015	06-11-2015	San Francisco
Phase 3, Market and Development	100	Completed	Phase 3, Market and Development	10-1-2016	06-11-2015	San Francisco
Phase 4, Market and Development	100	Completed	Phase 4, Market and Development	10-1-2017	06-11-2015	San Francisco
Phase 5, Market and Development	100	Completed	Phase 5, Market and Development	10-1-2018	06-11-2015	San Francisco
Phase 6, Market and Development	100	Completed	Phase 6, Market and Development	10-1-2019	06-11-2015	San Francisco
Phase 7, Market and Development	100	Completed	Phase 7, Market and Development	10-1-2020	06-11-2015	San Francisco
Phase 8, Market and Development	100	Completed	Phase 8, Market and Development	10-1-2021	06-11-2015	San Francisco
Phase 9, Market and Development	100	Completed	Phase 9, Market and Development	10-1-2022	06-11-2015	San Francisco
Phase 10, Market and Development	100	Completed	Phase 10, Market and Development	10-1-2023	06-11-2015	San Francisco



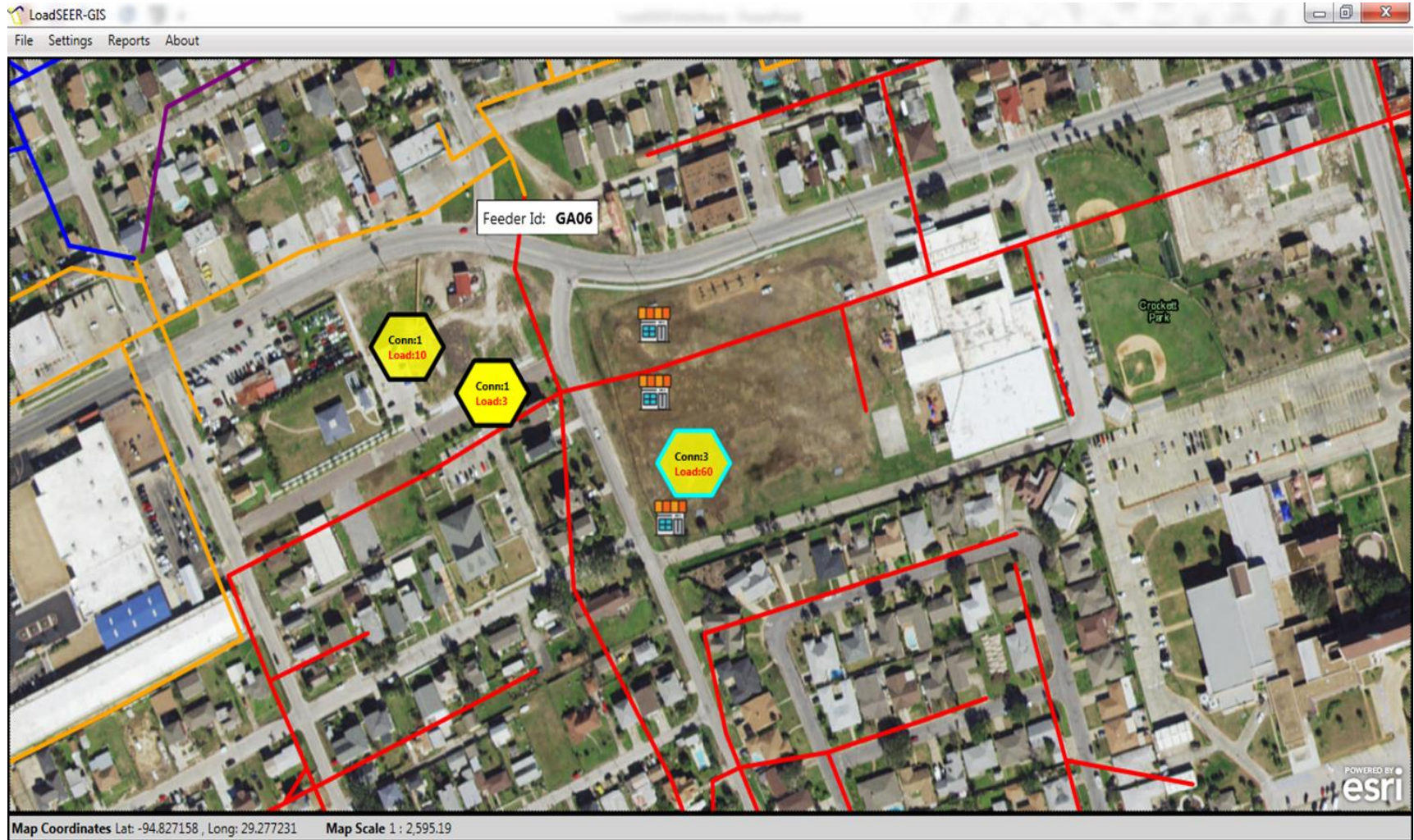








# Nodal Growth + DER + Powerflow = Holistic





# Scenario-Driven DER Planning

The screenshot displays the LoadSEER-GIS application window. The main map shows an aerial view of a residential neighborhood with several orange solar panel icons. A central icon is highlighted with a yellow hexagon and labeled "Conn:5 Load:50".

**Configuration Panel (Left):**

- Add Polygon**
- CUSTOMER CLASS:** PV (User Confidence: 70)
- HORIZON TIME:** Short Term: 3 - 5 years (User Confidence: 70)
- LOAD ESTIMATE:** LOW MEDIUM HIGH (User Confidence: 70)  
Load Per Connection (kW): 10
- CONNECTIONS:** LOW MEDIUM HIGH (User Confidence: 60)  
Number of New Connections: 5  
Parcel Size Per Connection (Acres): 0.3288206208326740
- FEEDERS:** Each point its nearest feeder (User Confidence: 50)  
 All points the same feeder  
GL01
- COMMENTS:** [Empty text box]
- Validated
- Known Adjustment
- SAVE** **CANCEL**

**LoadSEER Scenario Probability Gauge (Top Right):**

The gauge shows a probability range of 41 - 51%. The needle is positioned between the 40 and 50 marks on the scale, which ranges from 0 to 100. The gauge is color-coded: green for 0-30, yellow for 30-60, and red for 60-100.

**Map Coordinates:** Lat: -94.805018, Long: 29.291634 **Map Scale:** 1 : 1,328.74

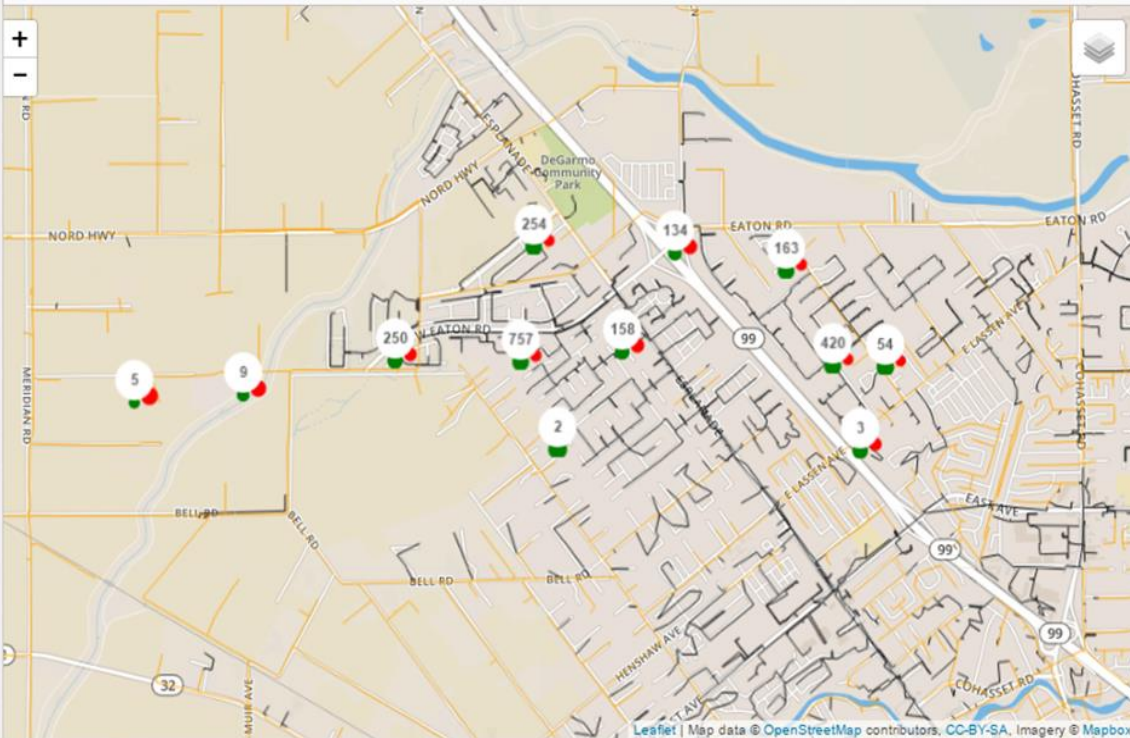
**POWERED BY esri**

# Nodal Value of DER...Integrated to Planning



## Node Viewer

Node Financials Zoomlevel: 14 active Layer:



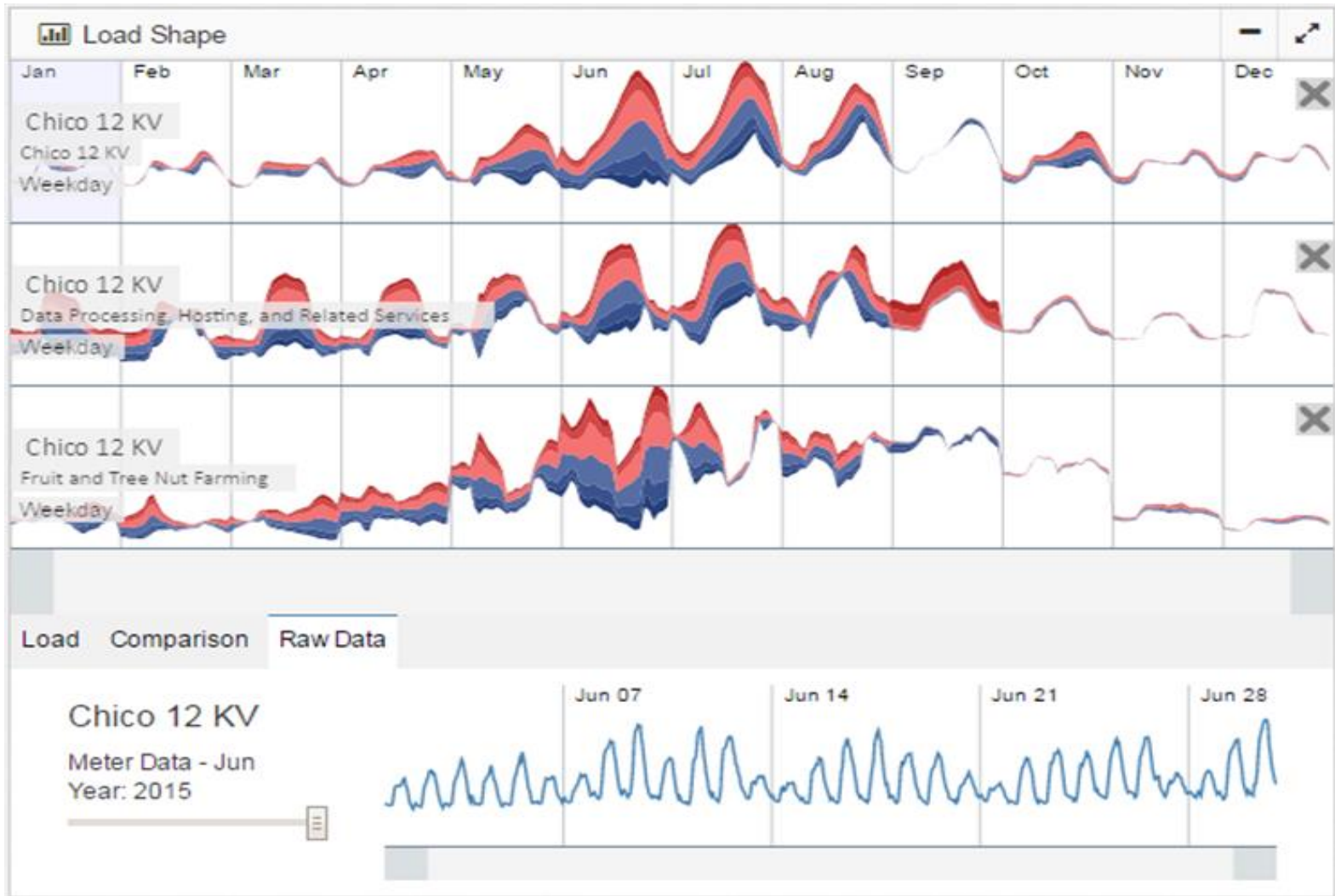
Visible Extent

Measures

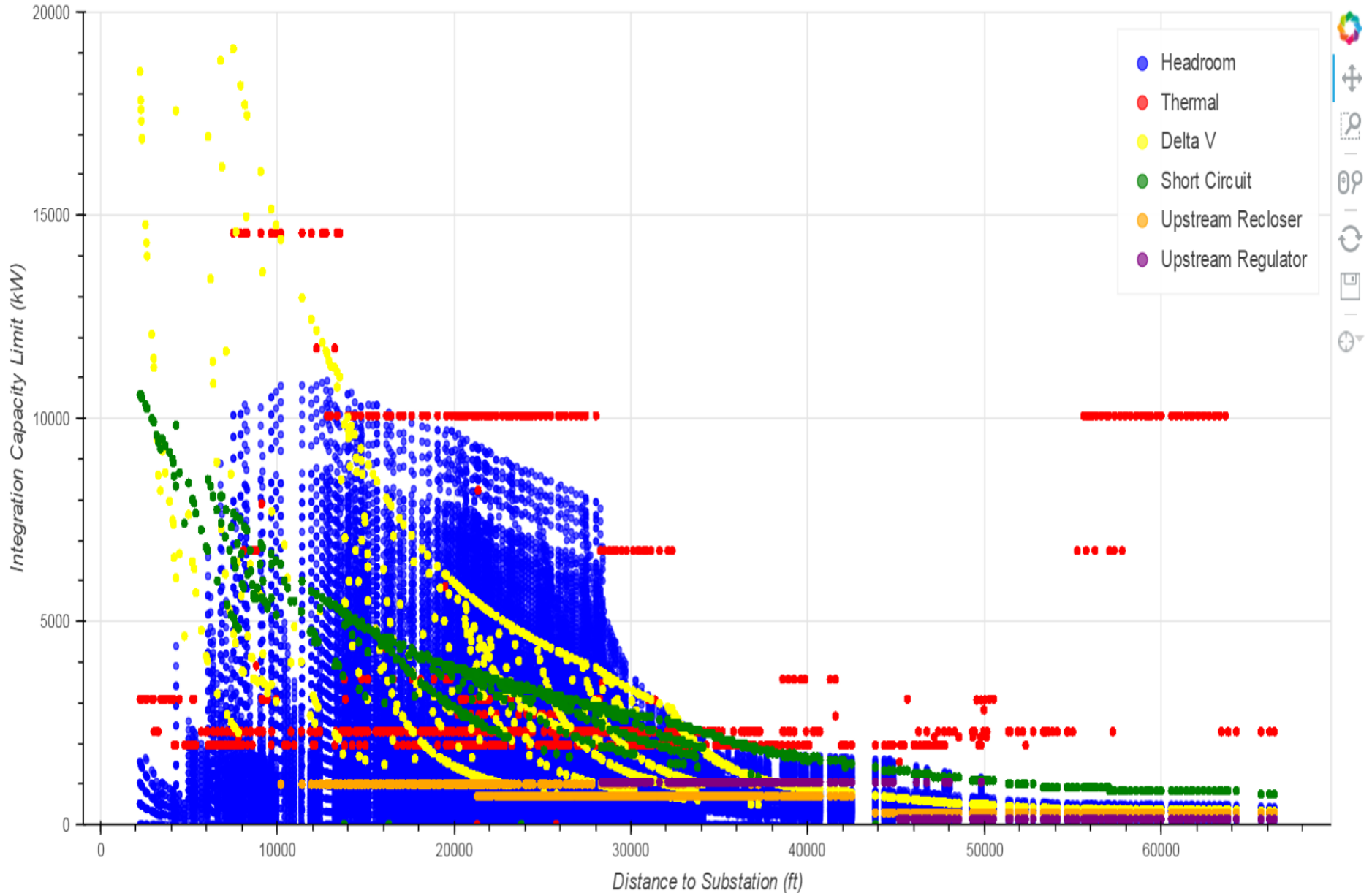
	Solar	HVAC	Lighting	Total
Avoided Capacity Cost (\$Kw):	2,094,950	2,254,595	2,512	4,352,057
Avoided Energy Cost (\$Kwh):	937,762	857,790	26,830	1,822,382
Avoided Kwh (x yrs):	1,578,374	1,411,724	41,235	3,031,333
Avoided T&D (\$):	411,843	666,980	1,224	1,080,047
Bill Savings (\$):	7,133,133	7,232,972	157,677	14,523,782
Participant Test (Avg):	0.42	1.24	24.60	8.75
Trc Test (Avg):	0.53	1.70	29.07	10.43
Adoption Probability (Avg):	0.63	0.64	0.39	0.56



# Importance of Load Shapes



# Hosting Capacity: Single Feeder, Hourly Impact



# Integrated Planning Tenets

- Flexibility
- Interoperability
- Scalability
- Driven by Cost-Effectiveness/Valuation
- Serving Multiple Stakeholders