CADMUS

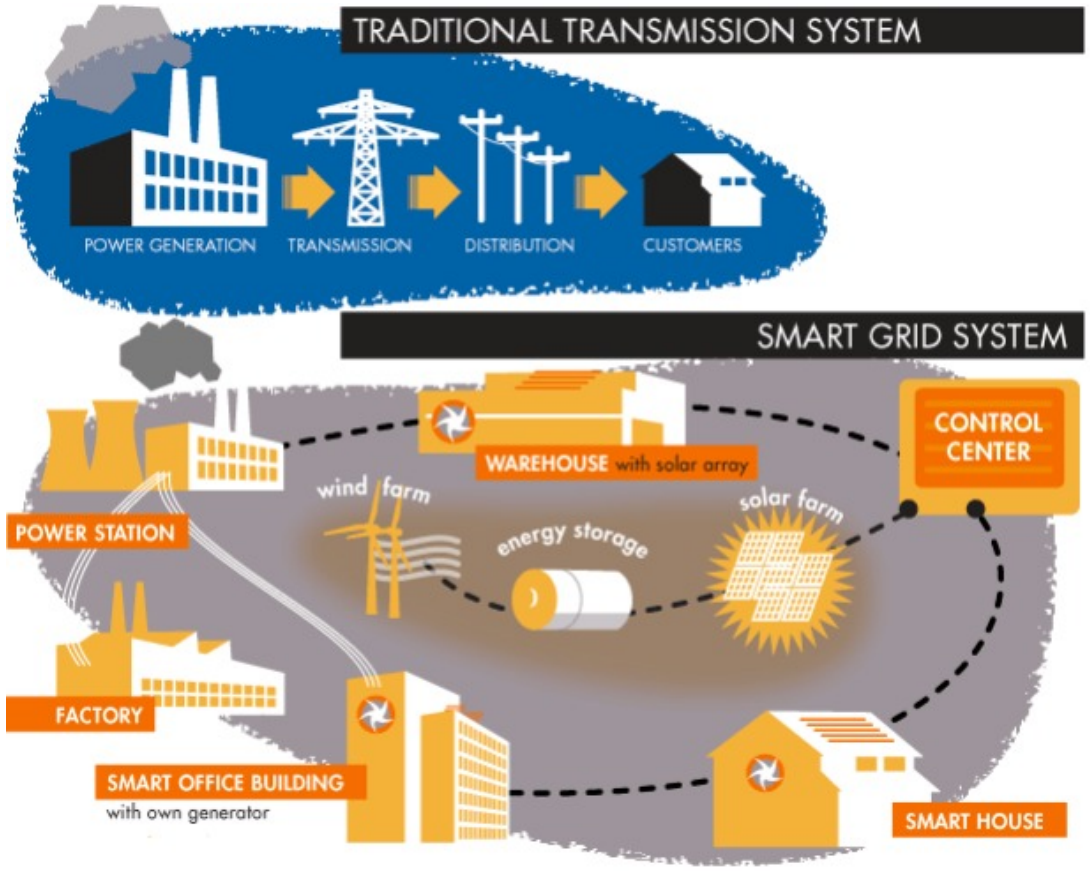
# *Transformation in Distribution Planning and its impact on reliability and GHG reductions*

**National Summit on Smart Grid & Climate Change**

**October 14, 2015**

# Rapid DER adoption requires new practices and tools for thoughtful integration on the distribution system

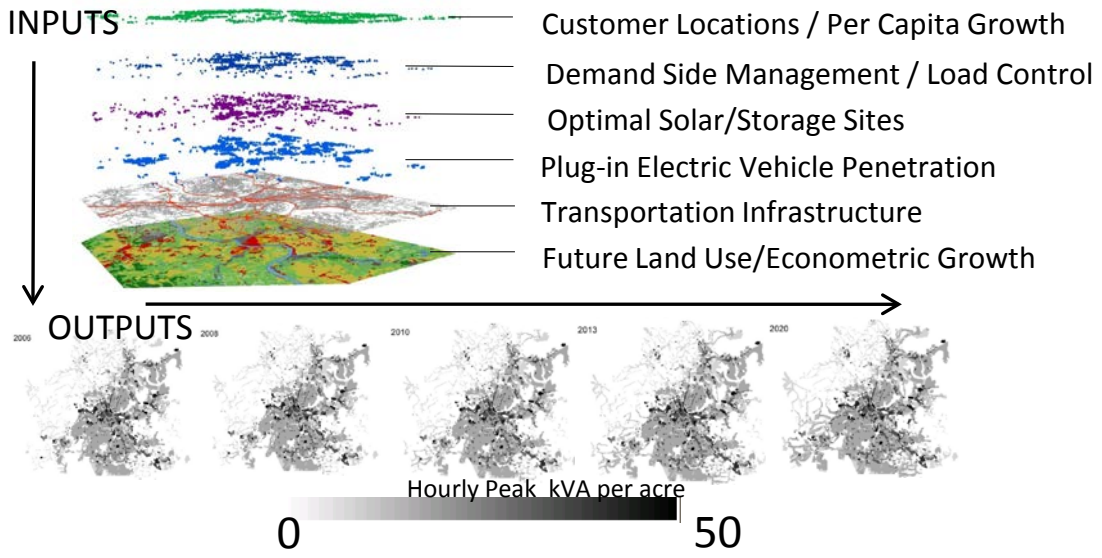
- DER risks and potential benefits can be enormous
  - Risks/benefits do not accrue equally
  - Benefits are not always net positive
- Thoughtful DER integration will
  - Improve reliability and power quality
  - Help meet renewable and GHG reduction mandates
  - Reduce customer power costs




Source: Grist.com, Dillon Thompson Design

DER: Distributed Energy Resources include Distributed renewable generation sources, energy efficiency, energy storage, electrical vehicles, demand response technologies and utility grid modernization (e.g. Volt/VAR optimization (VVO), distribution automation)

# Next generation grid requires specificity for adequate planning and optimization




Source: Integral Analytics

- Planners need much more specific geographic understanding of the changes in load patterns
  - Instantaneous demand acceleration and reduction due to DERs
  - Concentrated activity magnifies reliability challenges for the distribution system
- Grid planning requires advanced tools and methods. Now includes spatial scales

# Optimal distribution resource planning process requires the ability to identify where DER's provide best value

**Forecast**

**Where & When**

- Forecast Load at Grid Edge by Year
- Know 10 Year Needs/ Impacts/ Risks
- Find Circuits where DER has value

**Cost Analysis**

**Benefits & Costs**

- Calculate Cost Down to Grid Nodes (DMC)
- Quantify Integration Costs of DERs
- Streamline/automate DER interconnection

**Optimization**

**DER Mix & How Much**

- **Optimize** DER at Grid Edge
- Calculate least cost DER mix
- Consistent with system IRP

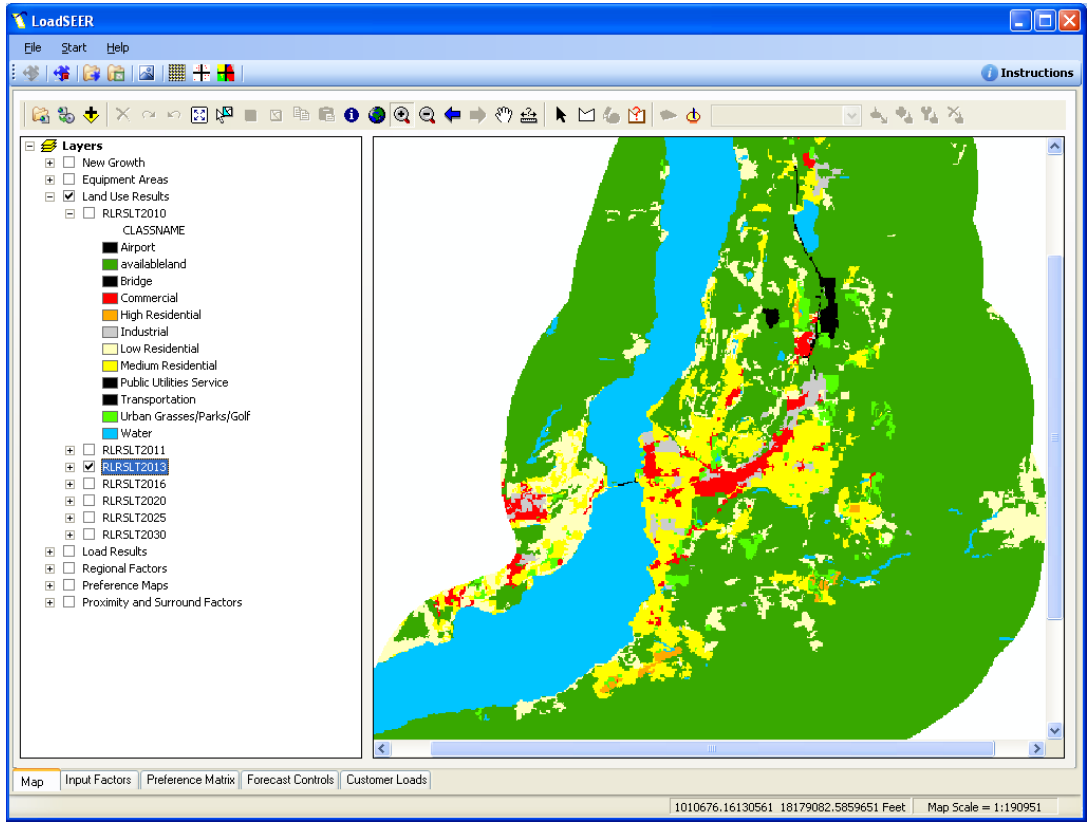
**Market Signal**

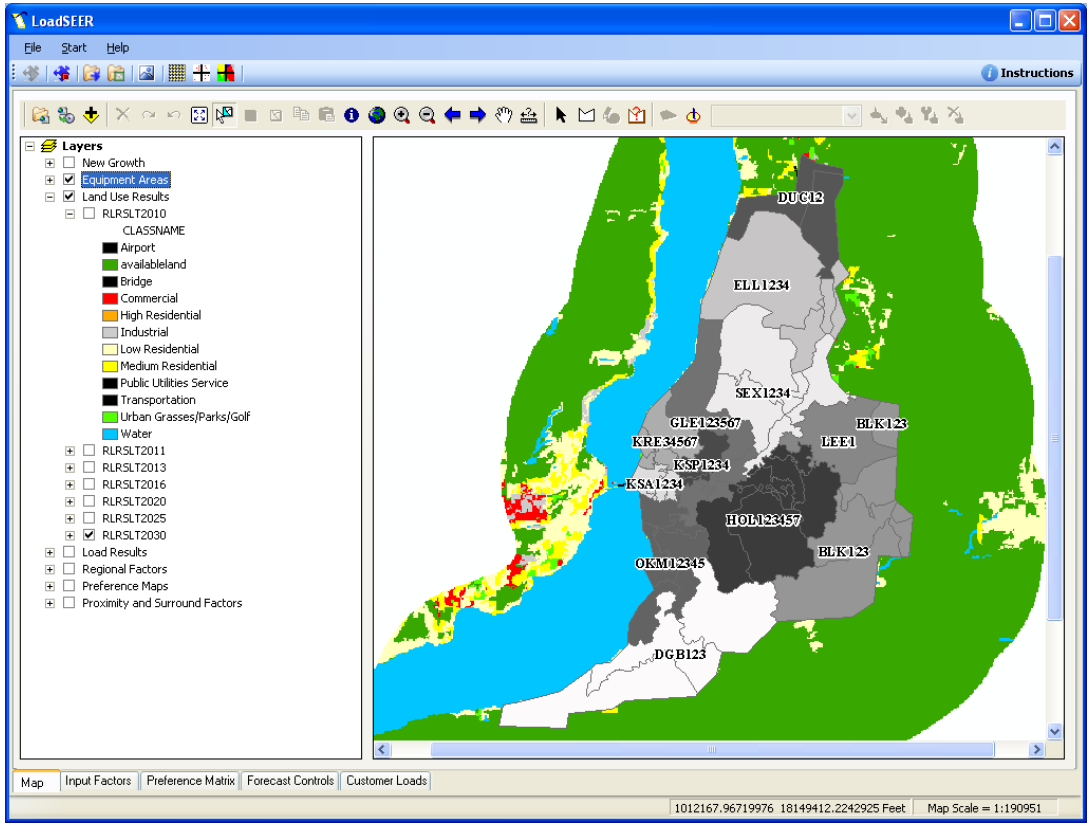
**Optimally Manage**

- Choreograph DER using DMC

**AT THE GRID EDGE**

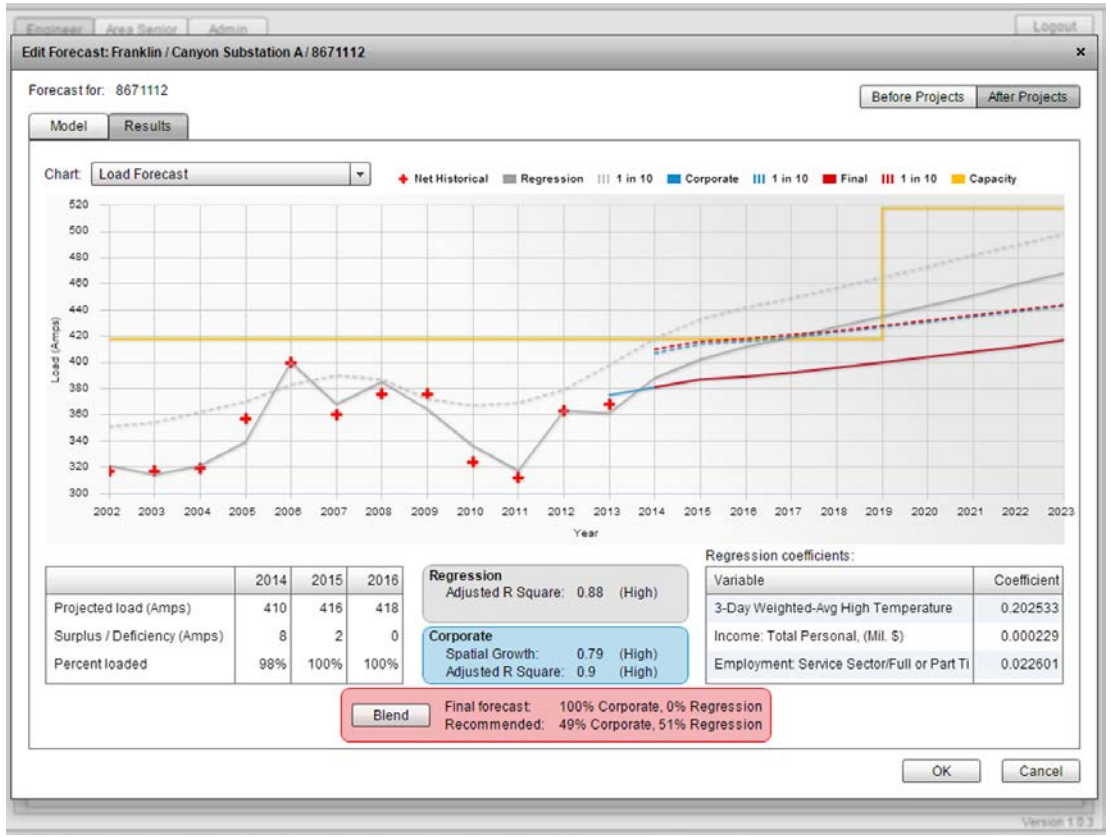
# Land use data matched with circuit level information allows for better understanding of localized load growth and impacts

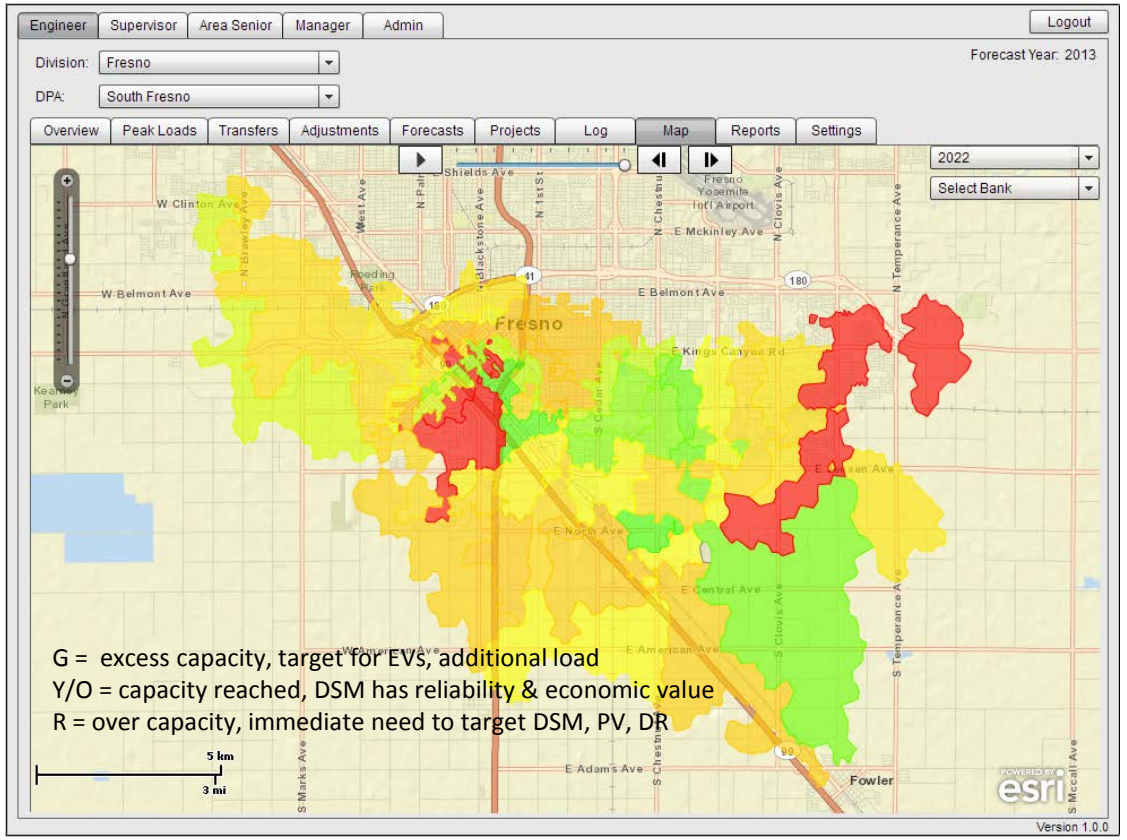



Source: Integral Analytics

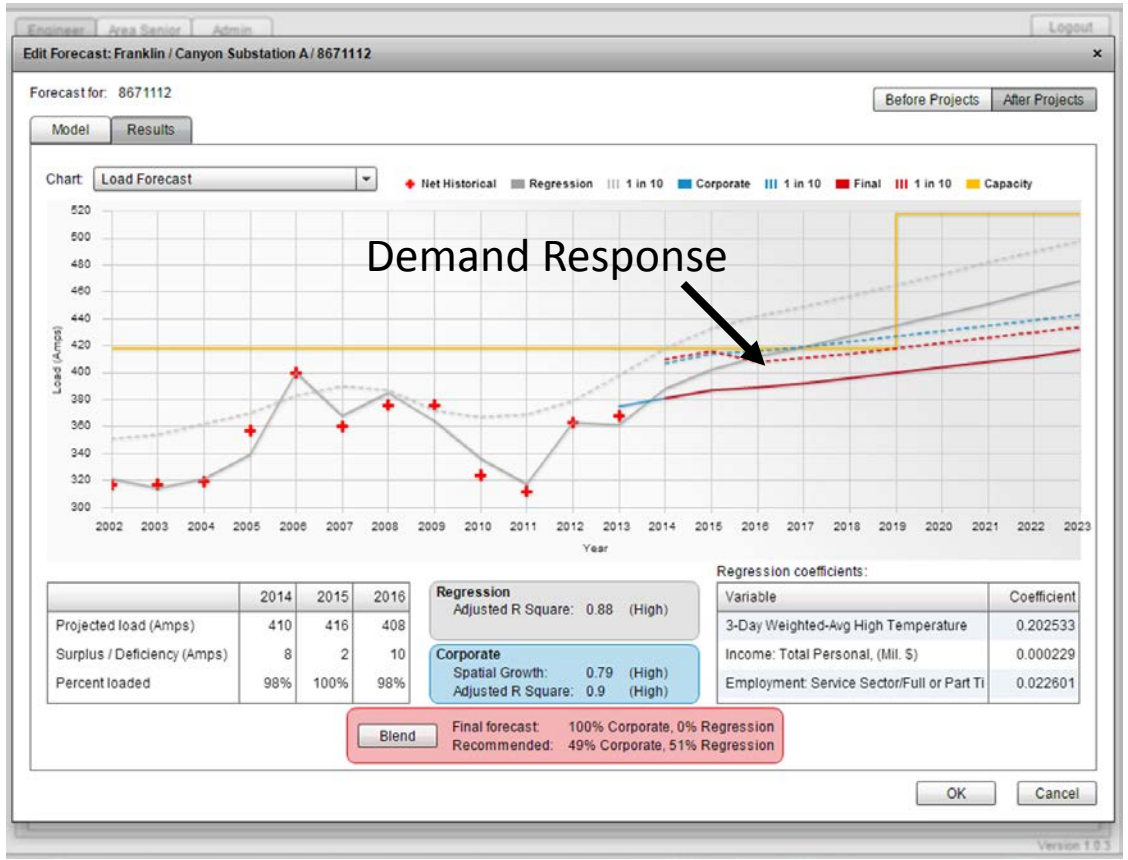
# Circuit by circuit load forecast allows for accurate assessment on where circuit upgrades or alternative investments are needed

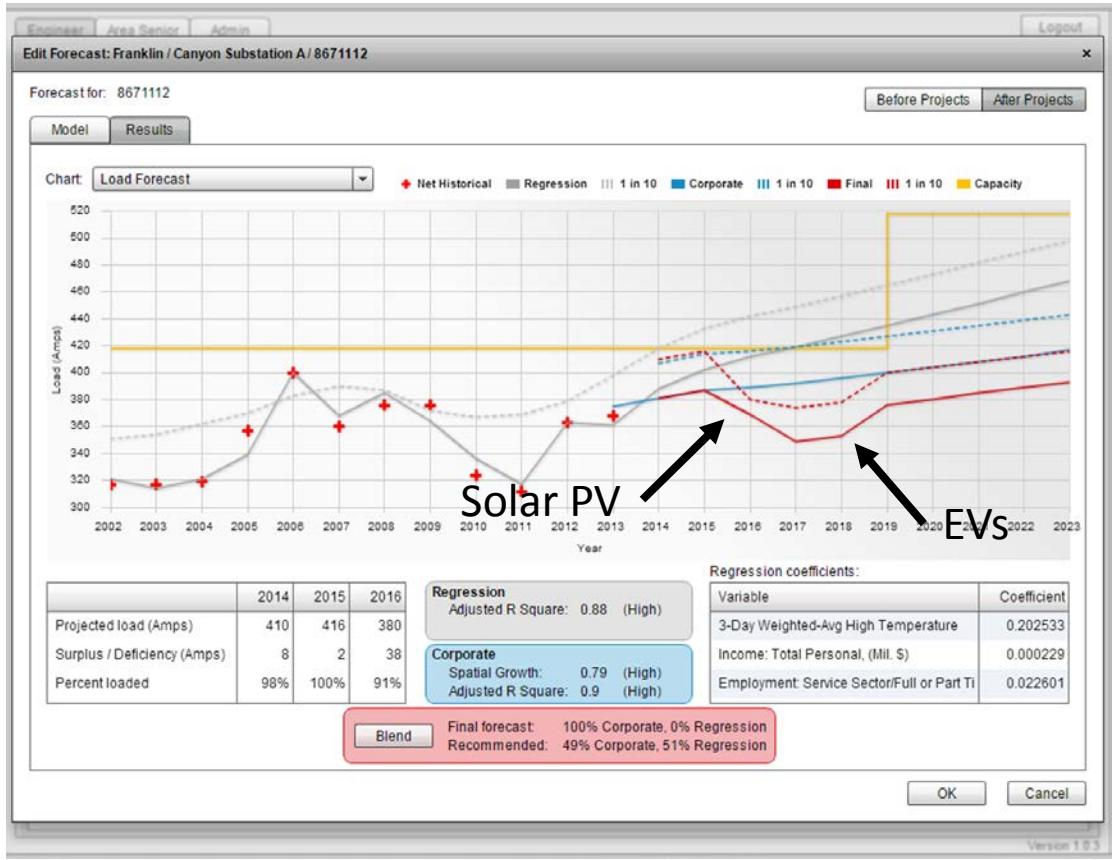



Source: Integral Analytics

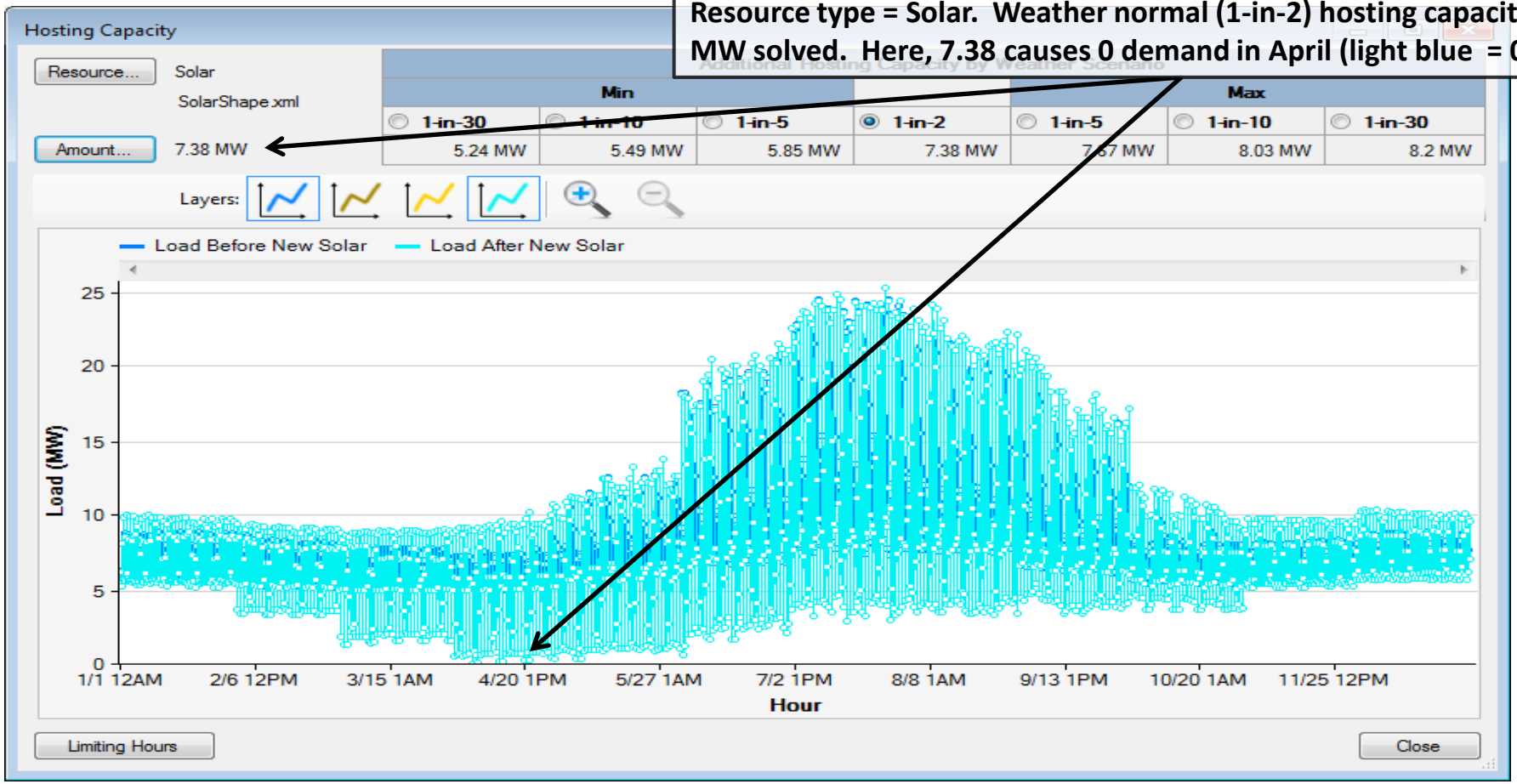
# Simulating alternative scenarios identifies best technological alternatives to defer capacity upgrades



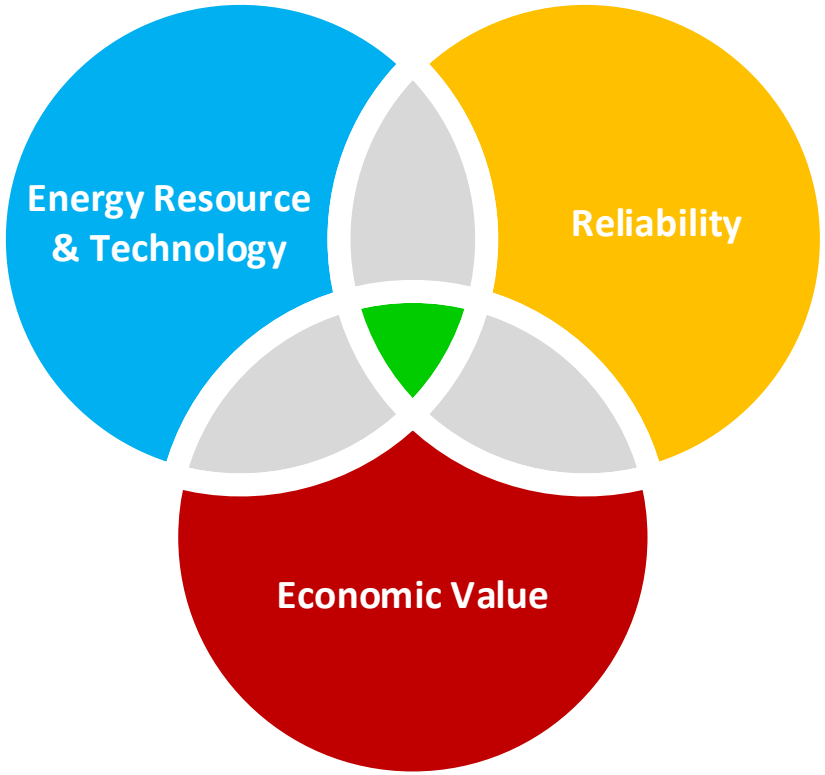

Source: Integral Analytics

# Maximum penetration analysis of hosting capacity helps utilities optimize investments in the grid




Source: Integral Analytics

# Distribution planning will require merging resource diversity, reliability and avoided cost to optimize markets, grid operations and investments




In order to increase reliability, reduce system costs and incorporate resource diversity:

- Identify full value of DERs
- Specify where on the system DERs provide best value
- Determine which DERs optimize the system best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