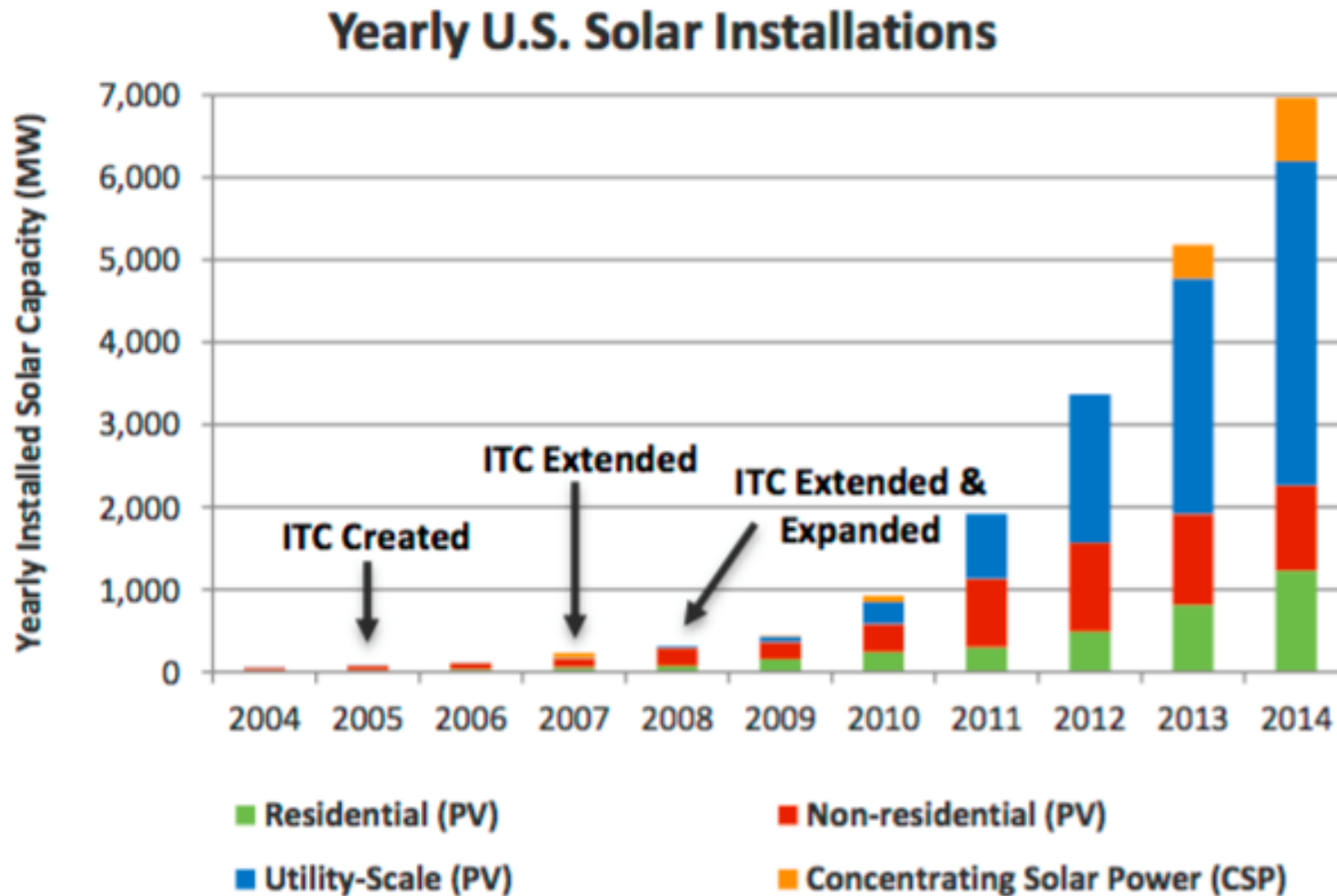


The ITC Fueled Dramatic Growth in Solar Installations

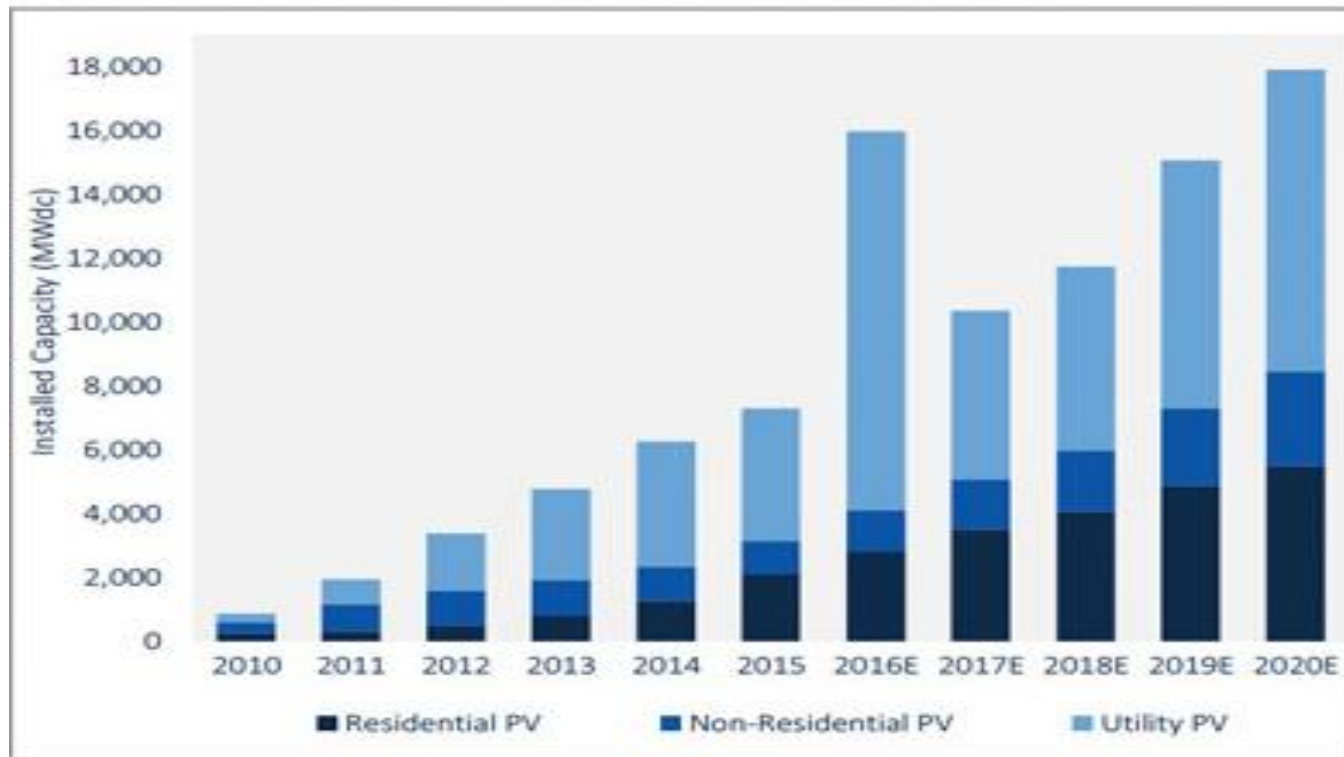


GROWTH TIED TO “PUSH” & “PULL” MARKET INCENTIVES

Renewable Portfolio Standards & Carbon Reduction Policies (Market Push)

Investment Tax Credit /Net Energy Metering (NEM) Policies (Market Pull)

Figure 1.5 U.S. PV Installation Forecast, Current

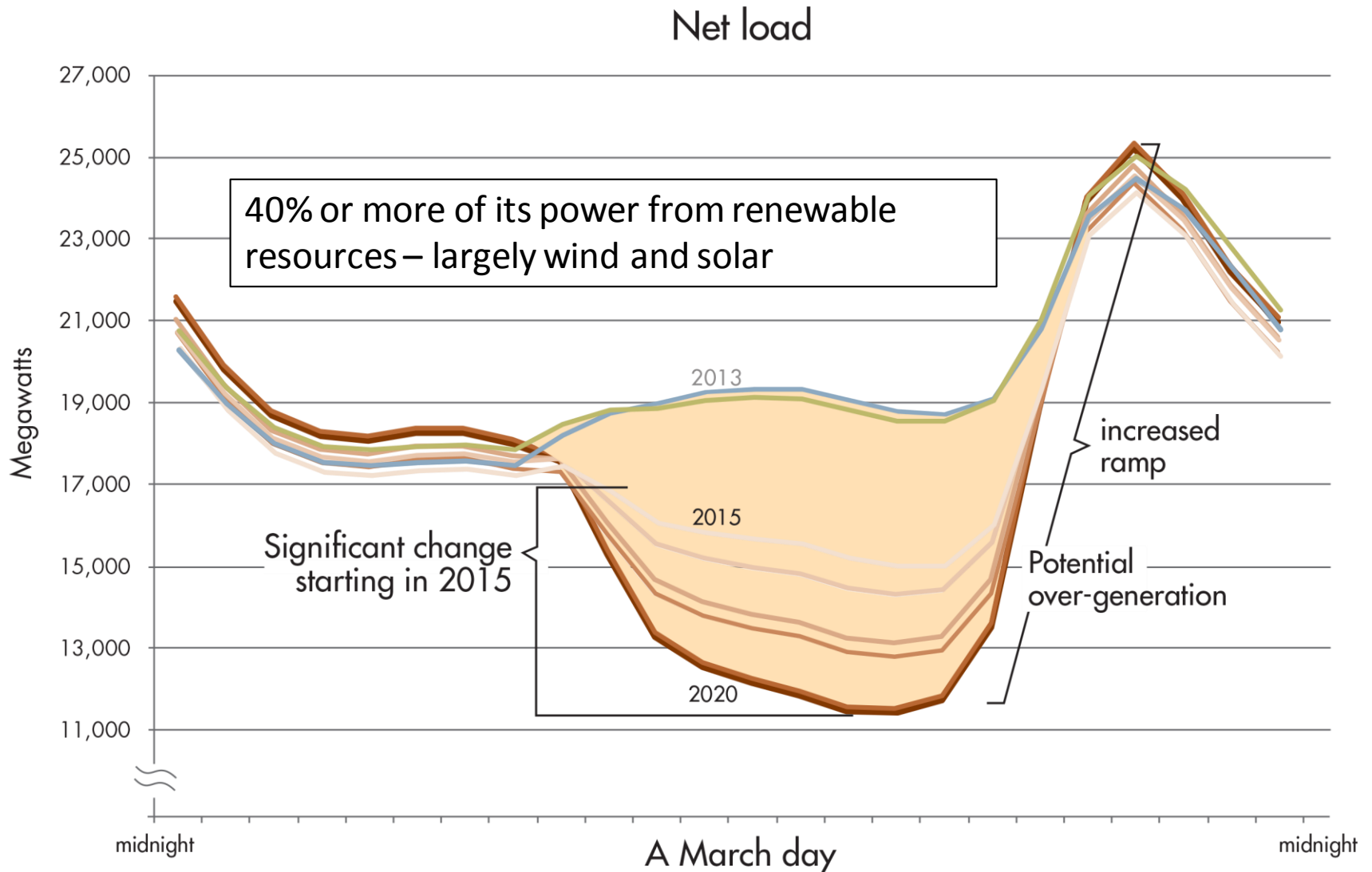


gtmresearch

SEIA Solar Energy Industries Association®

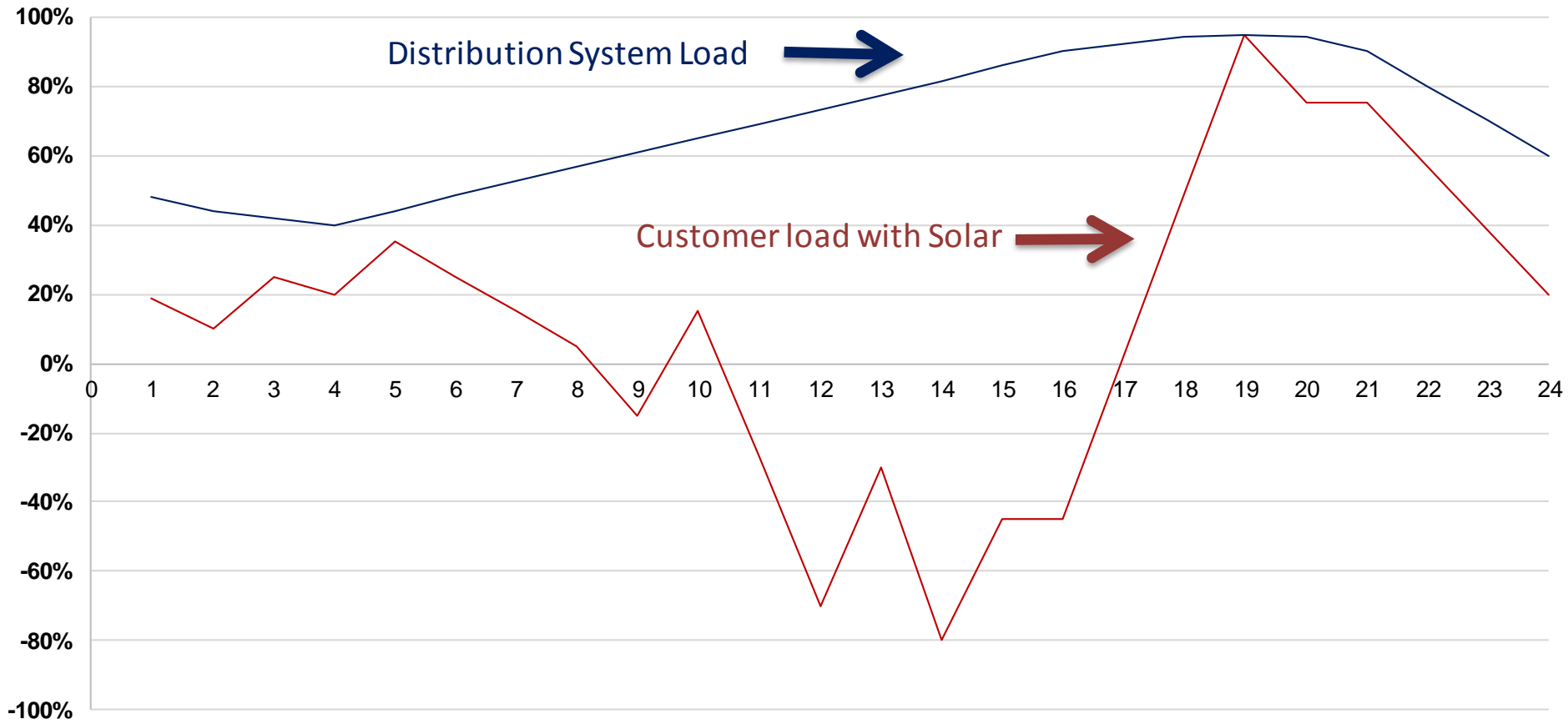


CAISO now has 13,000-15,000 MW of renewables on its system with a peak load of 50,000 MW



CHASING THE LOAD CURVE

\$100 billion in 2014 on distribution system alone

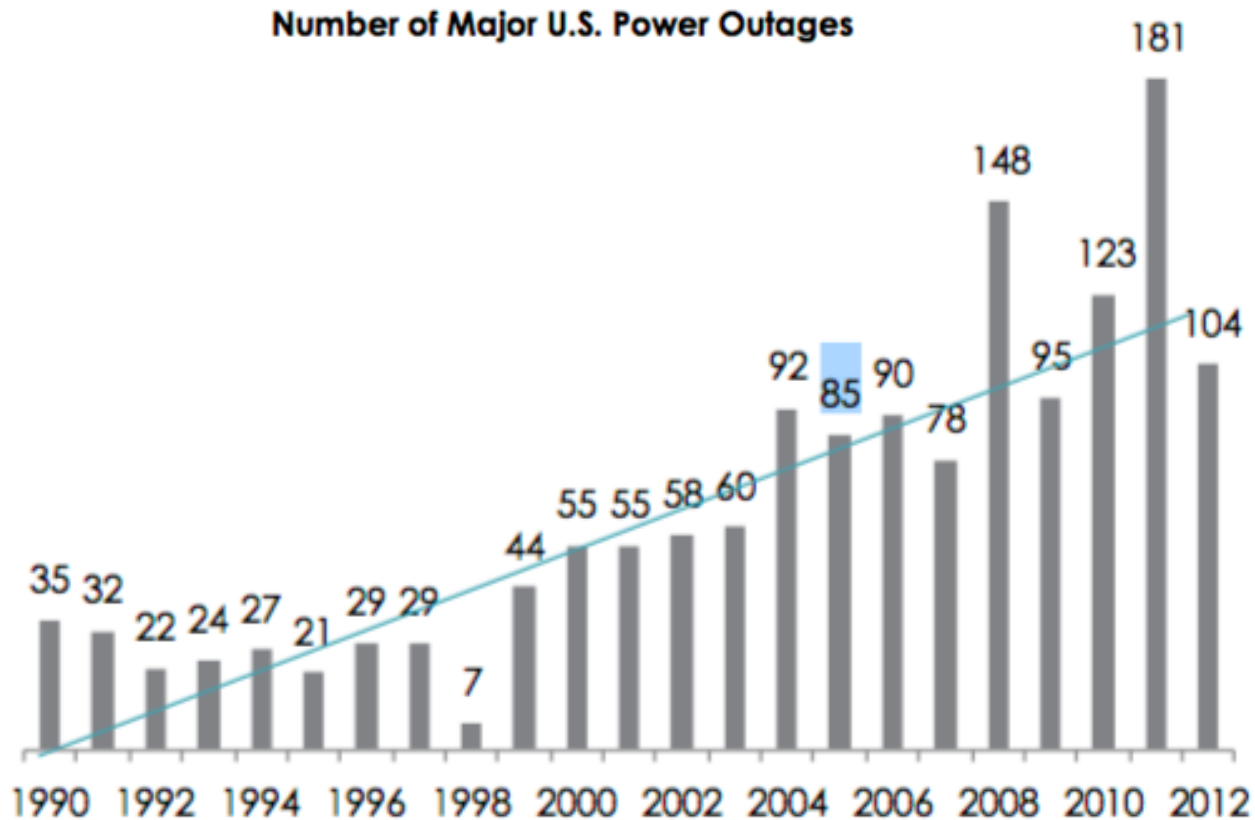


\$1 trillion over the next decade



AGING & CONGESTED INFRASTRUCTURE

Grid congestion becomes an increasing concern.
Aging T&D infrastructure has made the grid more susceptible to weather events

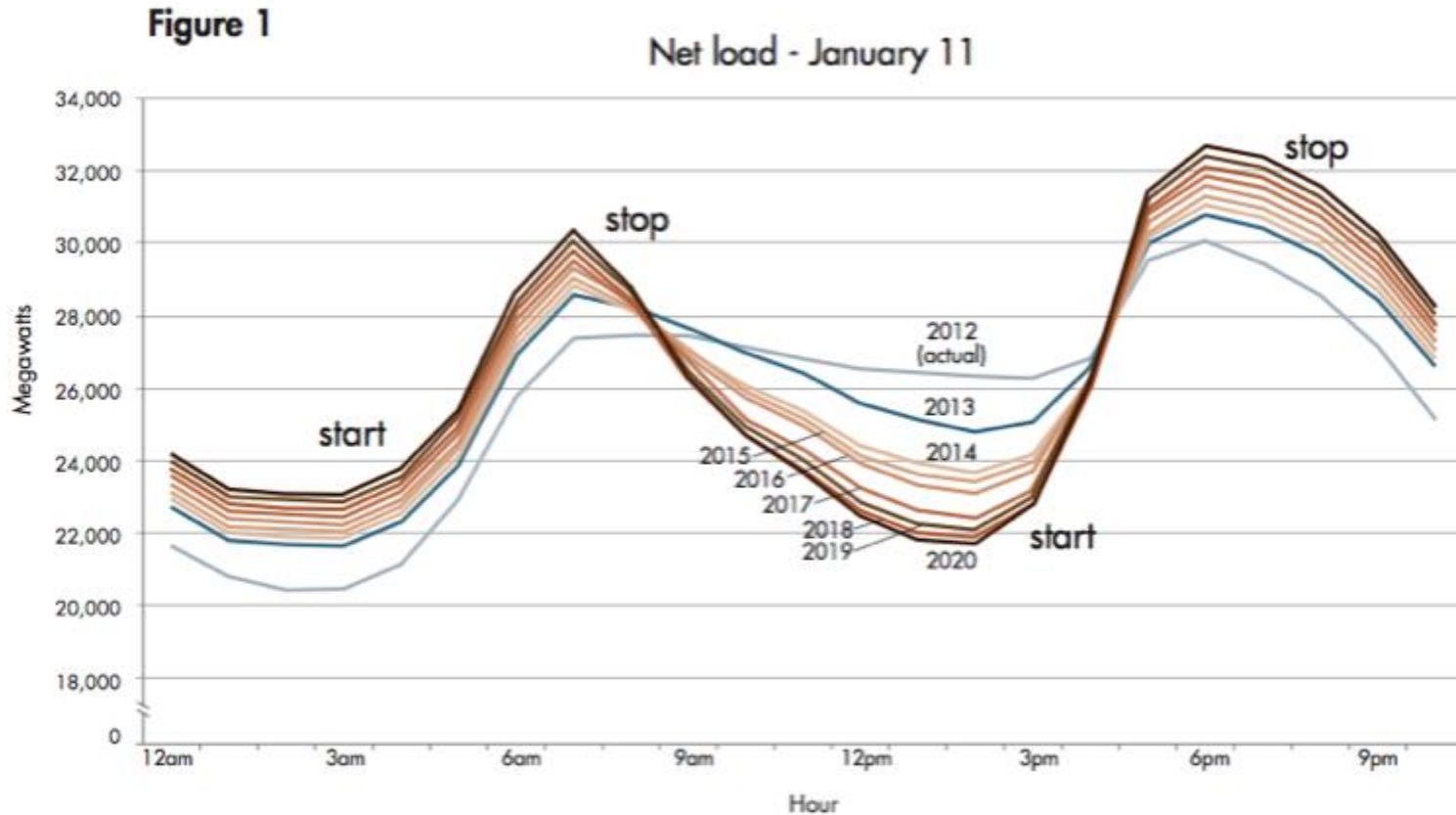


Source: DOE.



NEW OPERATION CONDITIONS FOR GRID

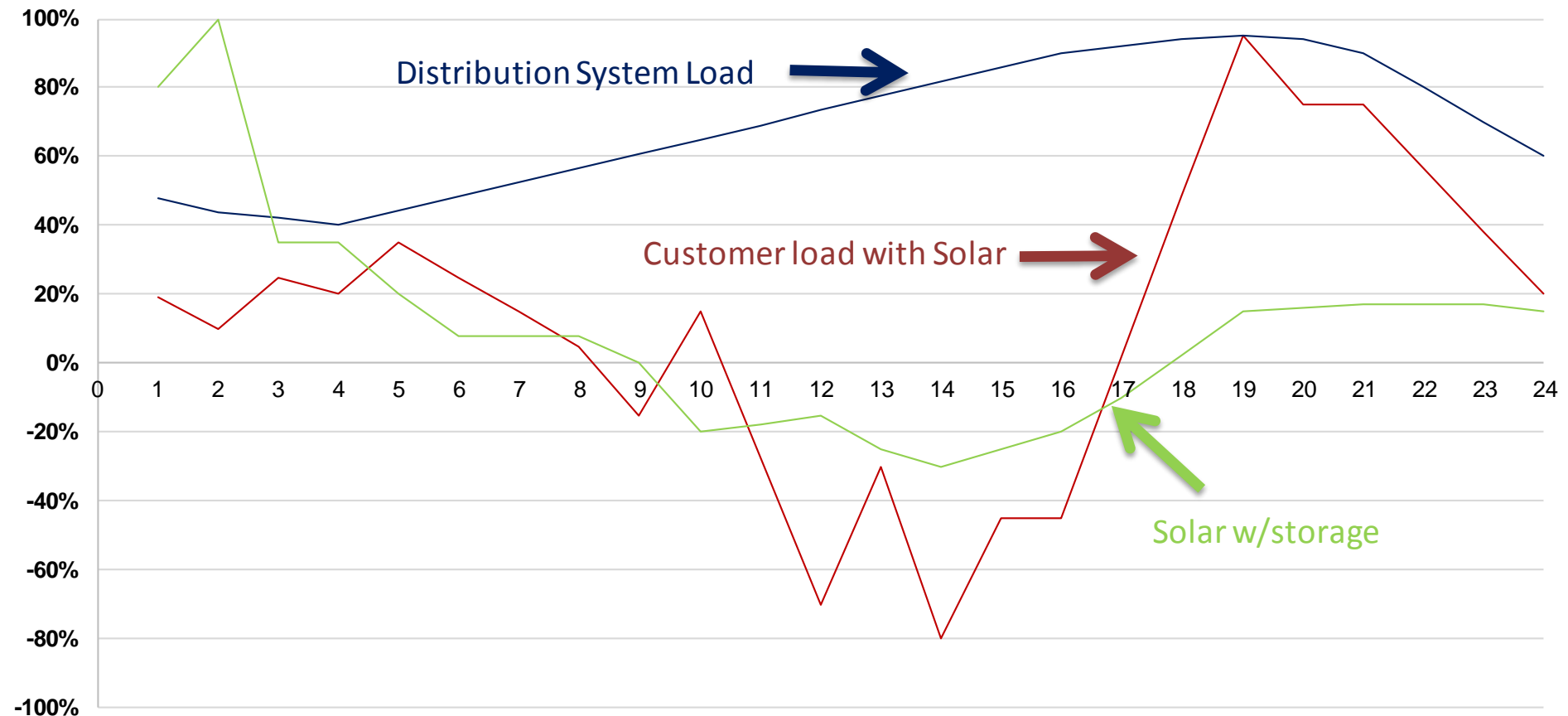
higher levels of non-controllable, variable generation resources



Short, steep ramps
Overgeneration risk
Decreased frequency response



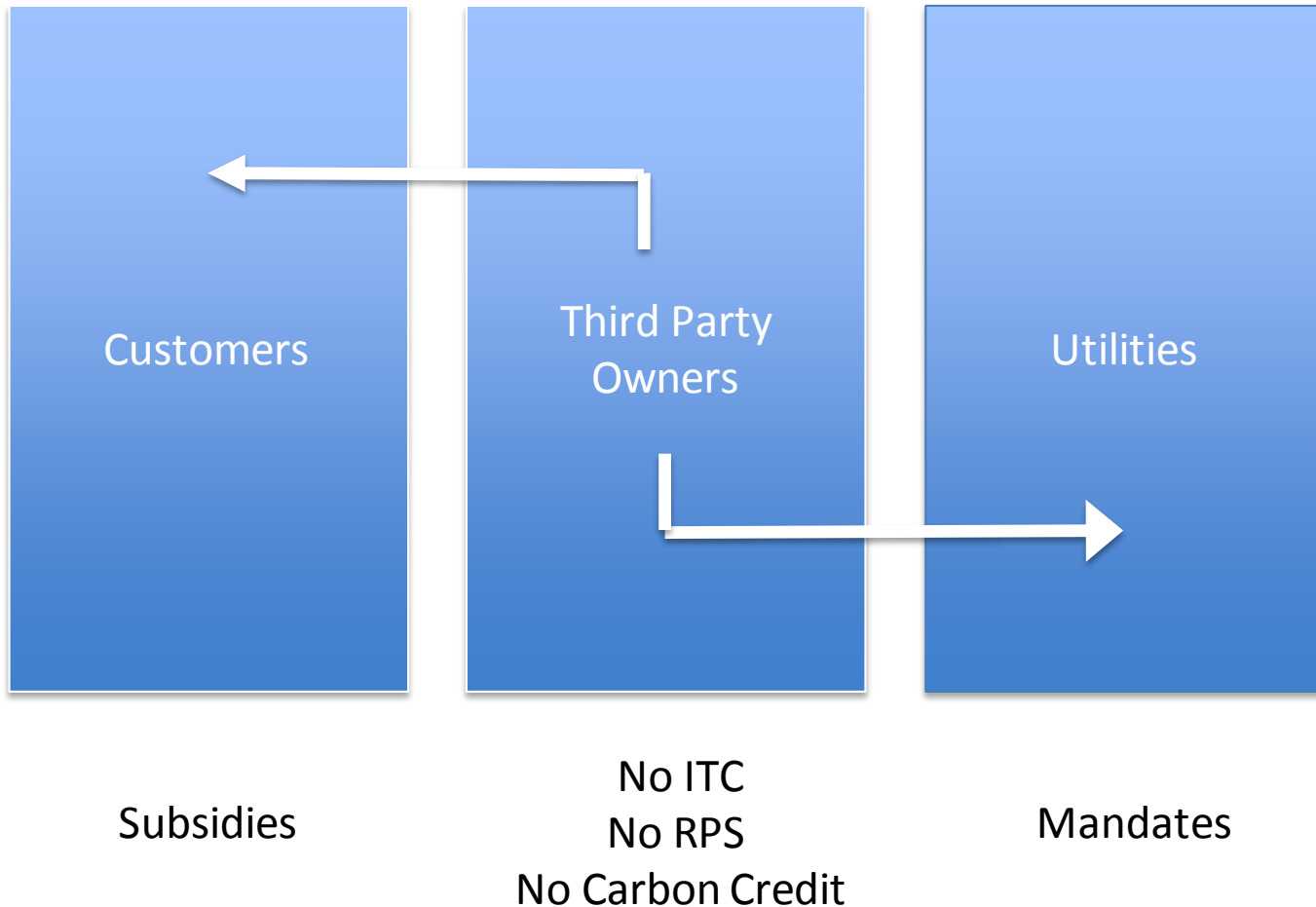
ENERGY STORAGE *CHANGES* THE LOAD CURVE



FIRMS AND SHAPES BOTH SUPPLY AND DEMAND



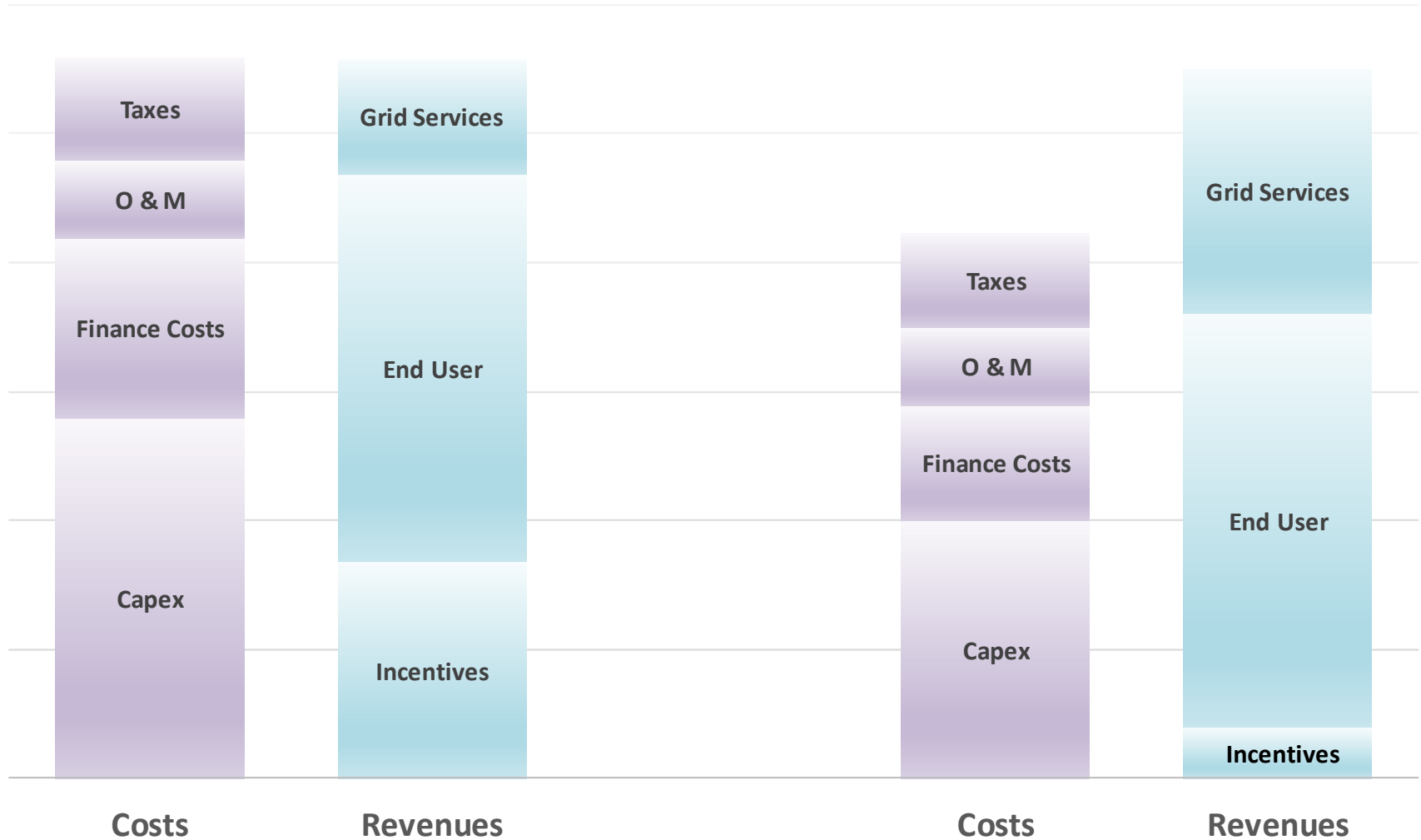
WHO WILL PAY FOR ENERGY STORAGE?



STORAGE ECONOMICS

2015

2020





HYBRID ELECTRIC BUILDING™

- 26 commercial office buildings
- **25% peak demand reduction**
- 10 MW of firm, dispatchable capacity to the utility
- **8% reduction in energy costs to the building owner (~\$900,000 annually)**
- Zero emissions
- **No distribution upgrades**



IRVINE COMPANY

Since 1864

Custom-fitted with Energy Storage

HYBRID ELECTRIC BUILDING

This building is being equipped with advanced energy storage systems by Hybrid Electric Building® Technologies, LLC as part of a grid modernization project for Southern California Edison. The 250kW/1,500 kWh Powerpacks from Tesla Powerpack will enable Irvine Company to seamlessly shift energy usage from grid power to battery power, providing real-time support to the electric grid, reducing peak energy usage and saving money on their energy bills.

IRVINE COMPANY
Since 1864



BLACK & VEATCH

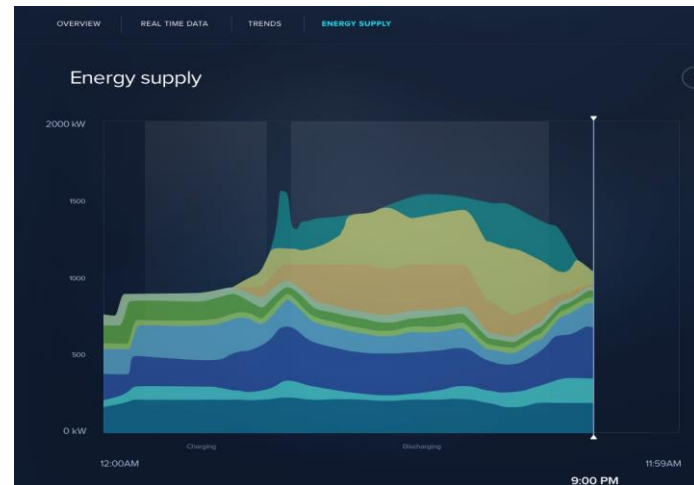


SOUTHERN CALIFORNIA
EDISON
A PG&E COMPANY

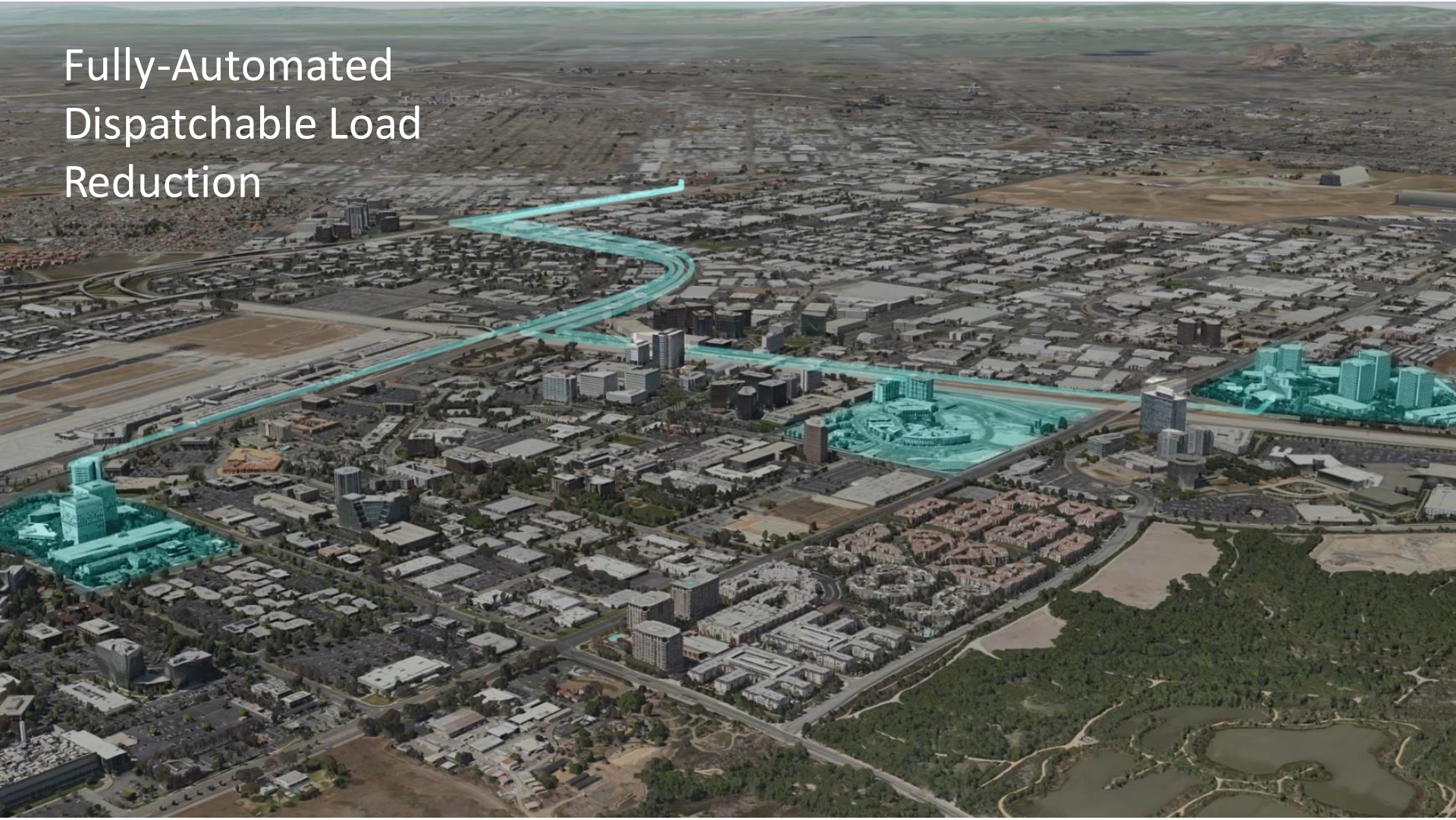


Advanced Analytics Software

Energy usage & Market price ▾



Fully-Automated Dispatchable Load Reduction



SCALE & AGGREGATION ARE KEY

UTILITY/GRID
OPERATORS



END USE
CUSTOMER

DISTRIBUTION LEVEL SERVICES

Firm Dispatchable
Capacity

Dynamic Load Mgmt.

Volt/VAR Optimization
Conservation Voltage
Reduction

Wholesale Energy
Market Products
-Day Ahead
-Real-time
-Frequency

DISTRIBUTED RESOURCE AGGREGATOR

Asset Management, O&M, NOC,



GRID EDGE SERVICES

Demand Management
(GHG Reduction)

Energy Cost Reduction

Energy Islanding/
Critical Loads

Demand Response
Revenue Generation

Solar Integration

EV Charging Integration





Welcome to tomorrow's energy grid.

