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Identifying and deploying cost-effective distributed energy resources

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Anatomy of the power grid

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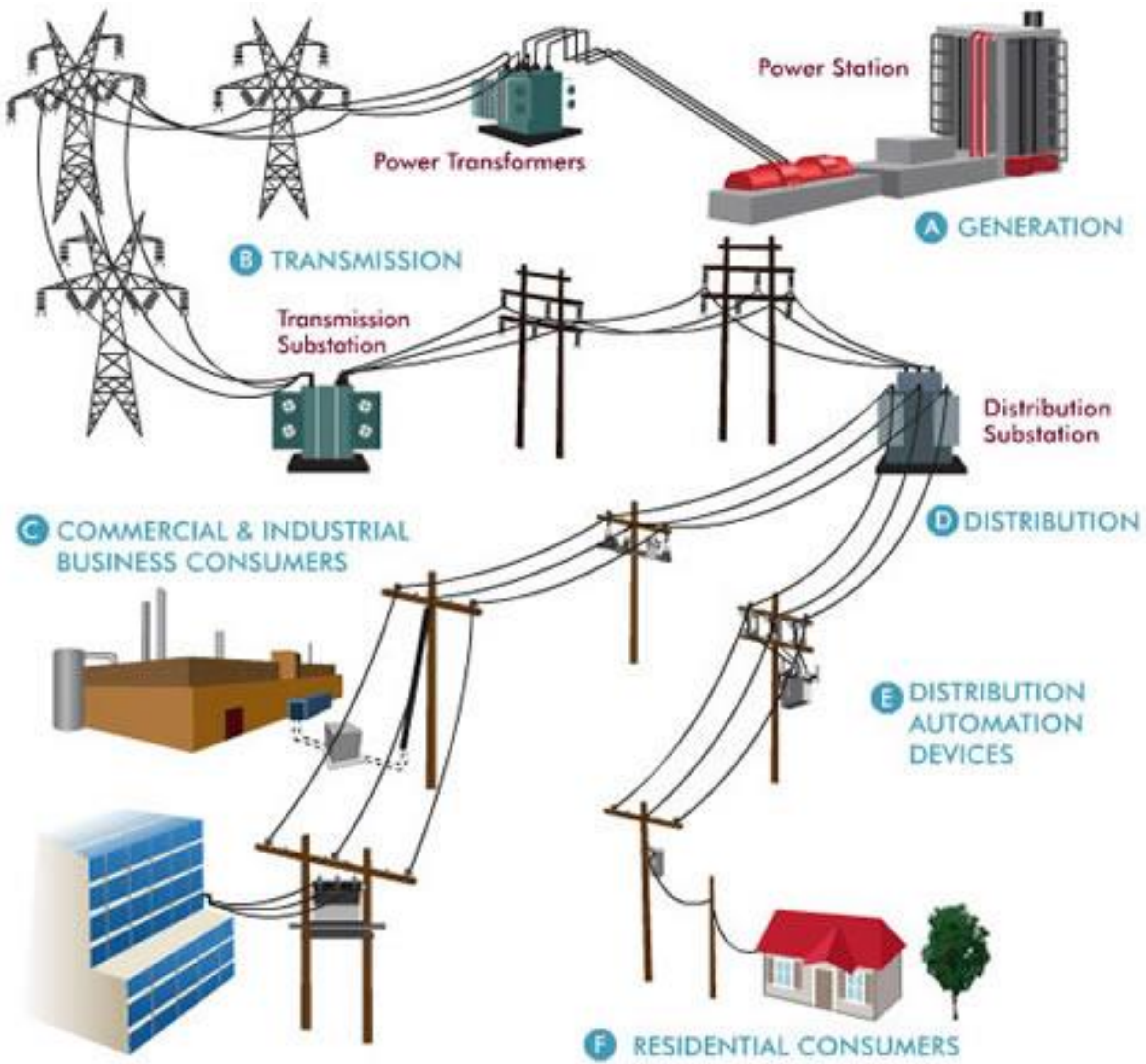

Source: Oncor Electric Delivery Company

Distribution grids are centers of innovation

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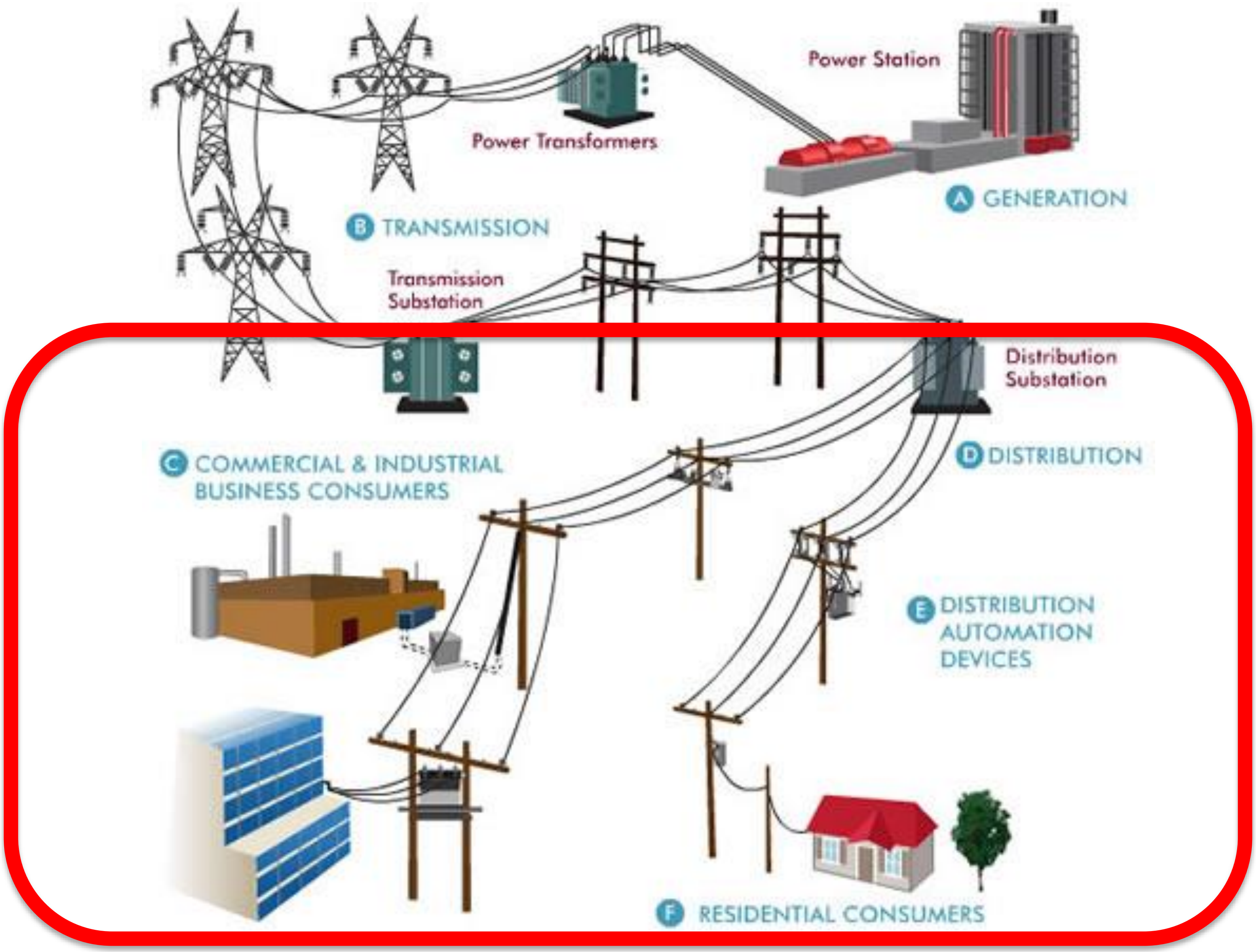

Source: Oncor Electric Delivery Company

Technology: distributed energy resources (DER)

And strong future growth is projected

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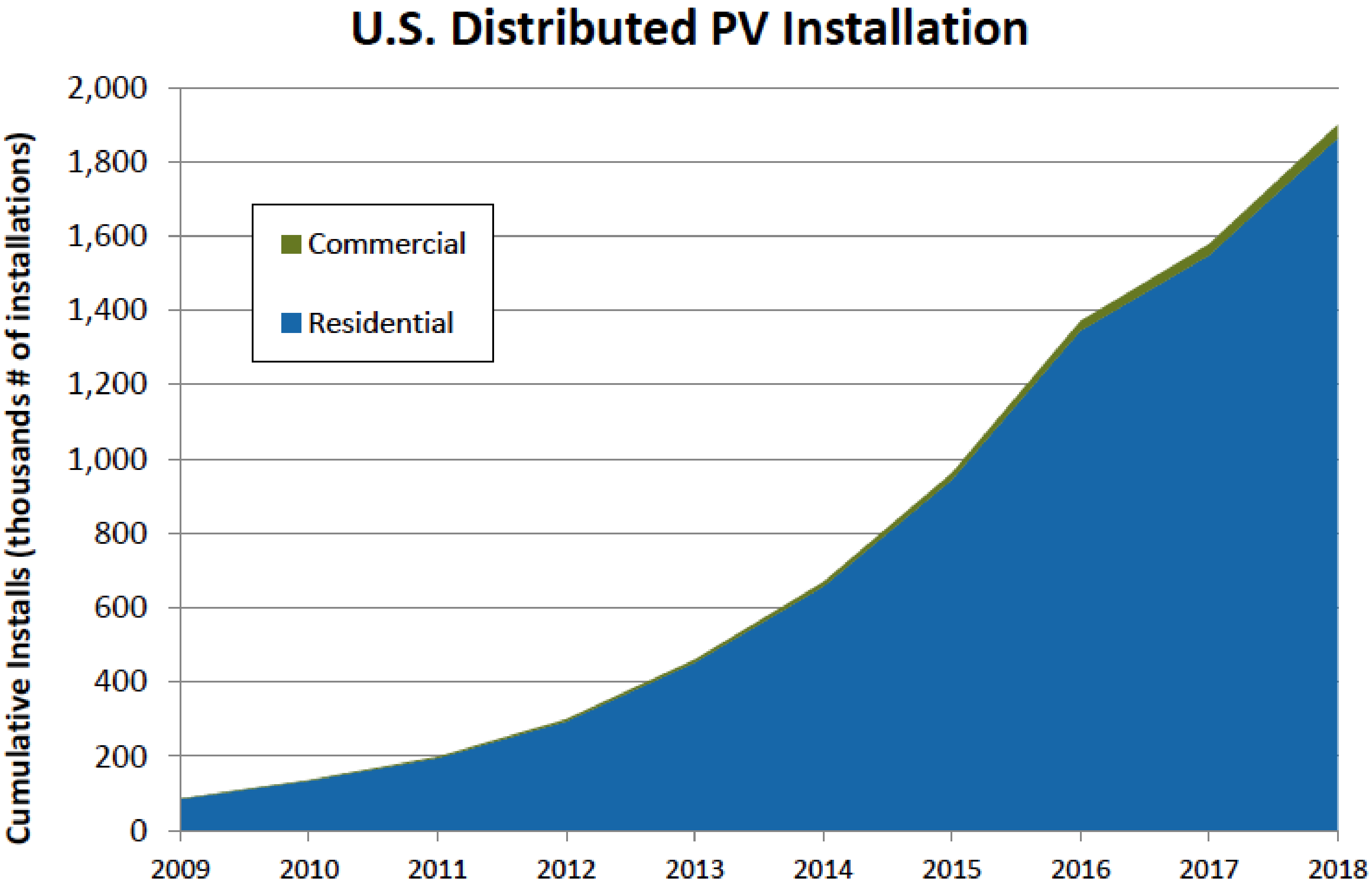

Source: Historical: SEIA | Projections: ICF

Policy: REV, CA distribution resource plans, etc.

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The Opinion Pages | EDITORIAL

Smarter Electricity in New York

By THE EDITORIAL BOARD MAY 12, 2014

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In one of the most promising moves in the energy sector in years, New York State is proposing a way to get a head start on, and perhaps help lead, a revolution in the world of electricity generation. Starting this week, the main players in the state's complex electricity business will be asked to comment on a new report from the state's Public Service Commission that envisions more efficient and climate-friendly ways to produce electricity.

How Rooftop Solar Can Stabilize the Grid

Following Germany's lead, California gives advanced inverters a bigger role in the grid

By Peter Fairley
Posted 21 Jan 2015 | 16:00 GMT

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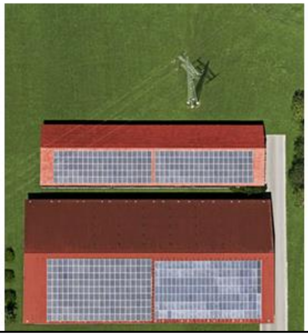

Rooftop solar power systems are picking up a second job on the distribution grids that deliver electricity to California homes and businesses. Right now, their photovoltaic panels just generate electricity (meeting about 1 percent of the state's consumption), but within a few months some systems will also start moonlighting as junior grid regulators—a role that could keep them busy even after the sun goes down.

It's Time for Grid Planners to Put Distributed Resources On Par With Transmission

Craig Lewis of the Clean Coalition explains the significance of new planning requirements in California.

Craig Lewis
November 13, 2013

Markets: New business opportunities & models

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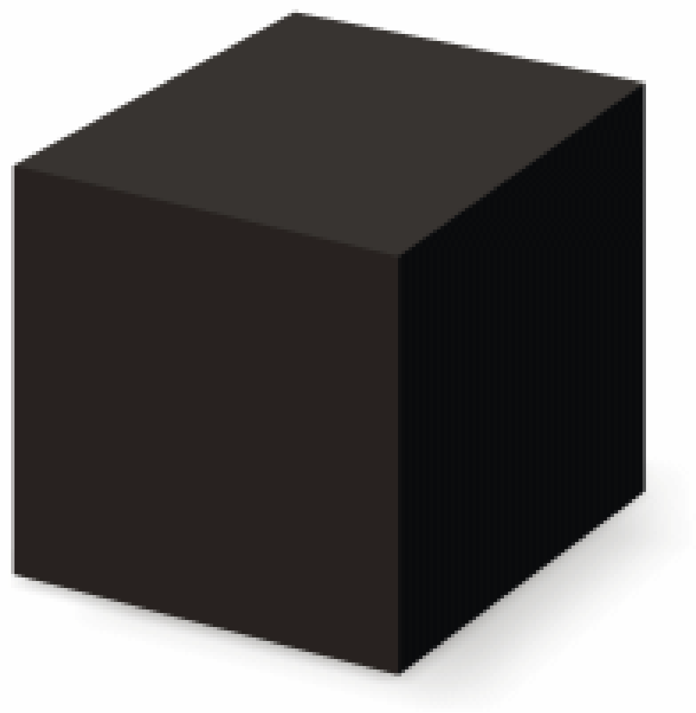
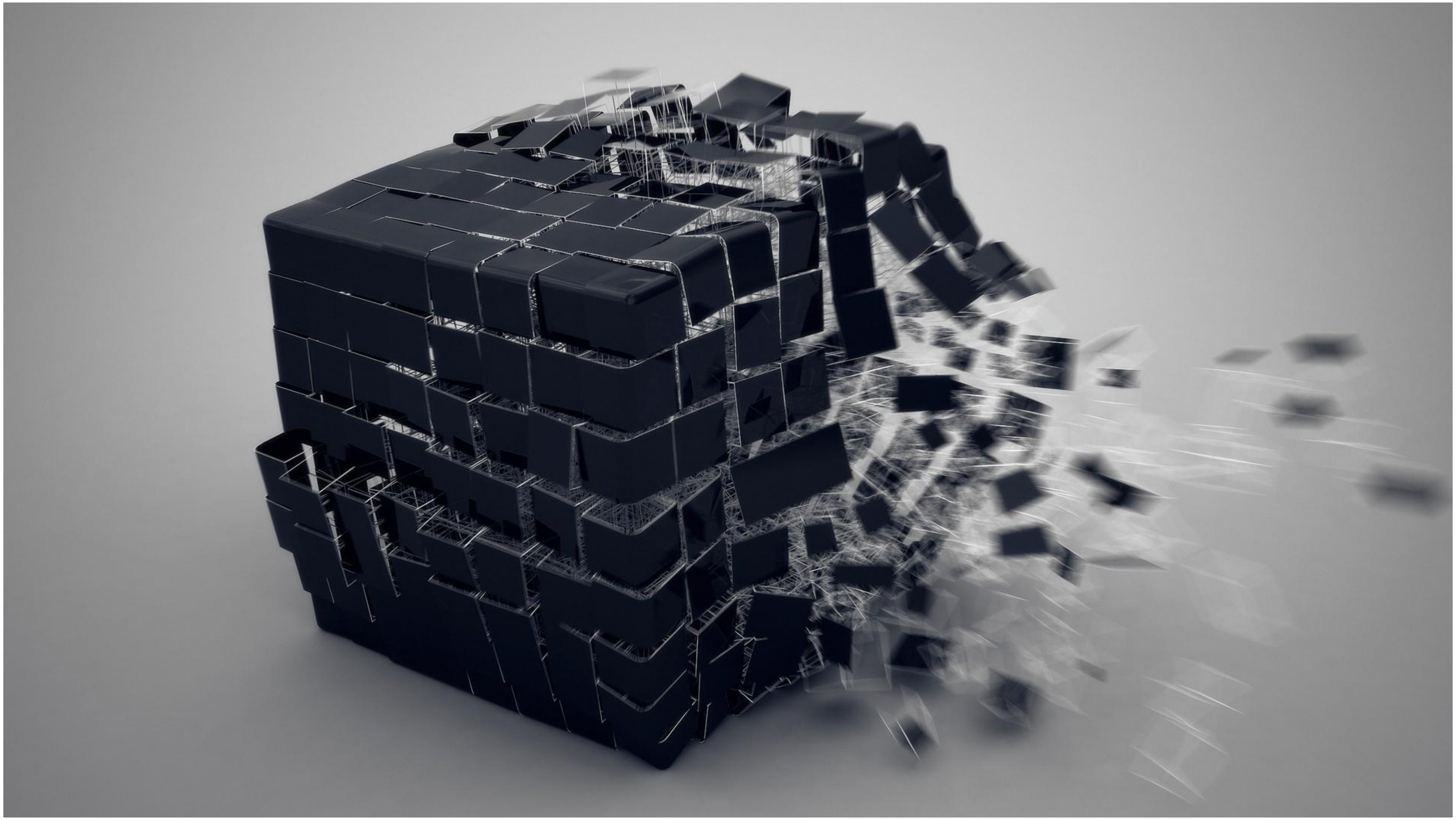
- New 'value-add' services
  - Efficiency, demand response, enhanced reliability/power quality
- New asset ownership and capital investment opportunities
  - Utility-owned DER
  - Rate-basing: "utility pays" for distribution grid upgrades
- New business models
  - Utility as an integrator – distribution system operator/platform provider/etc.

Insufficient insight is a problem



Enhanced visibility and knowledge is key



Shedding light: powerflow modeling

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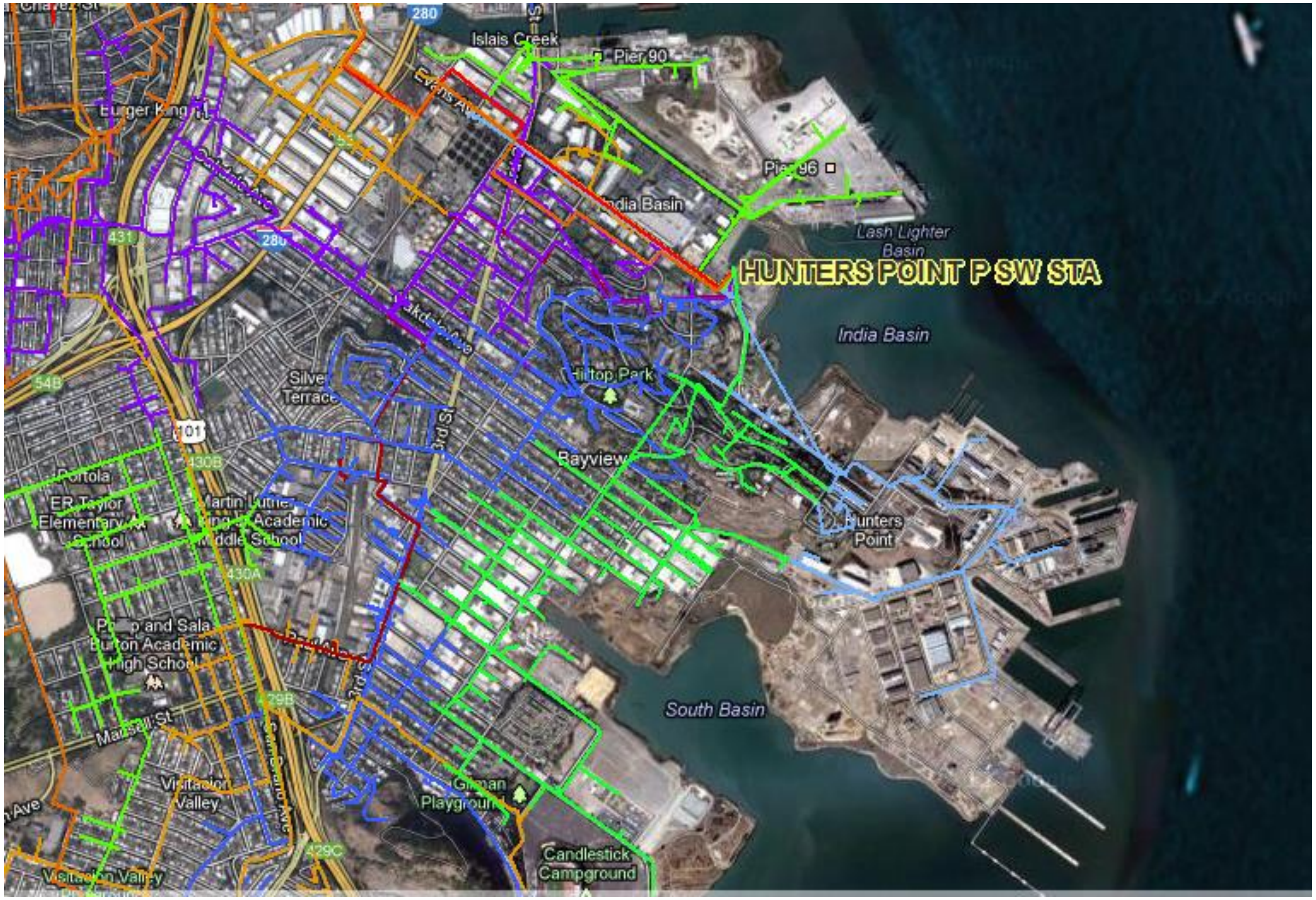
- Powerflow modeling, using Cyme, of the entire Hunters Point substation in San Francisco, CA



Shedding light: Solar Siting Surveys

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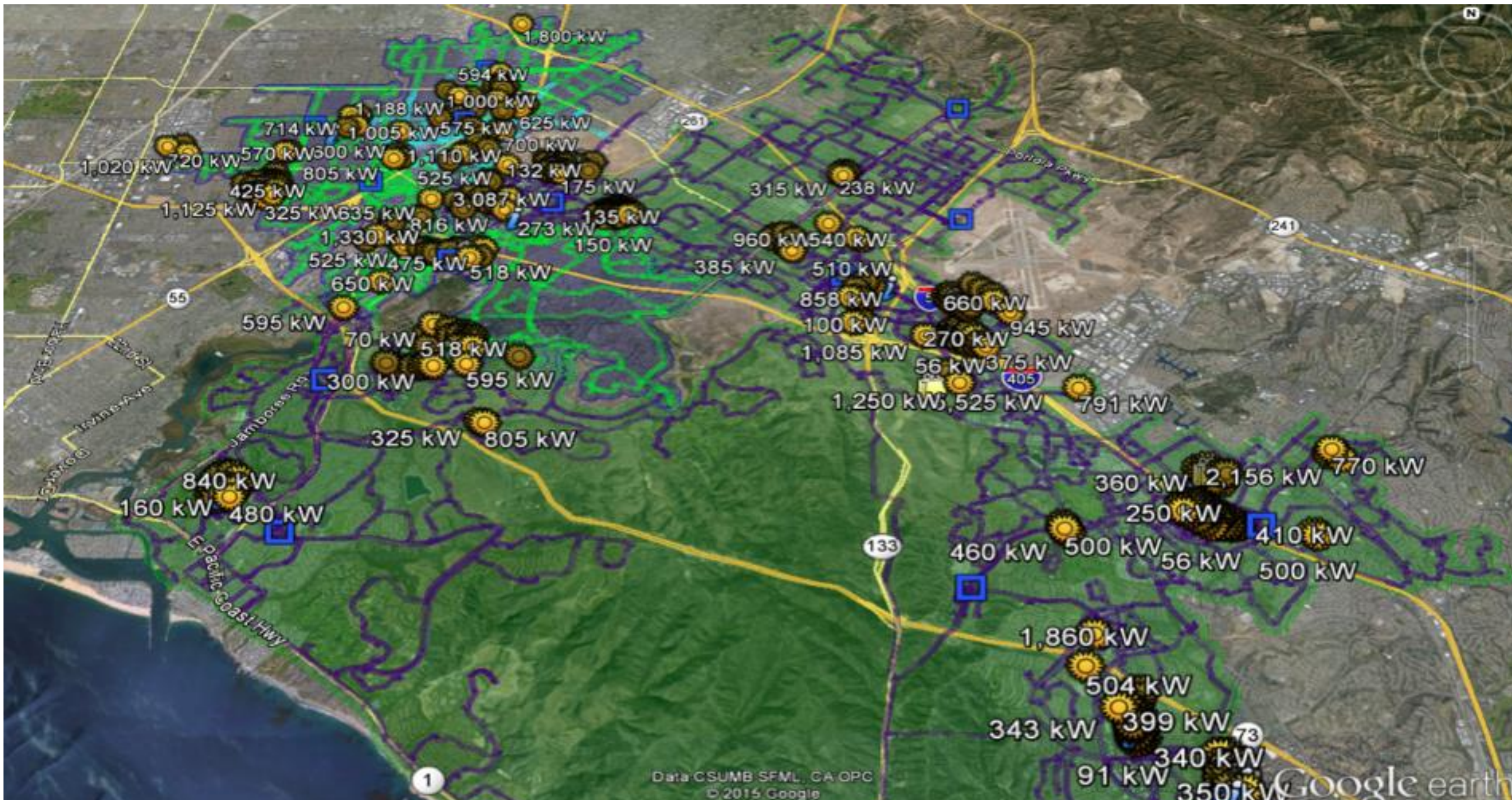
- Southern California Edison Preferred Resources Pilot Solar Siting Survey
  - Identified prospective solar sites ≥500 kW in ~120 square miles in Orange County, CA



Shedding light: interconnection maps

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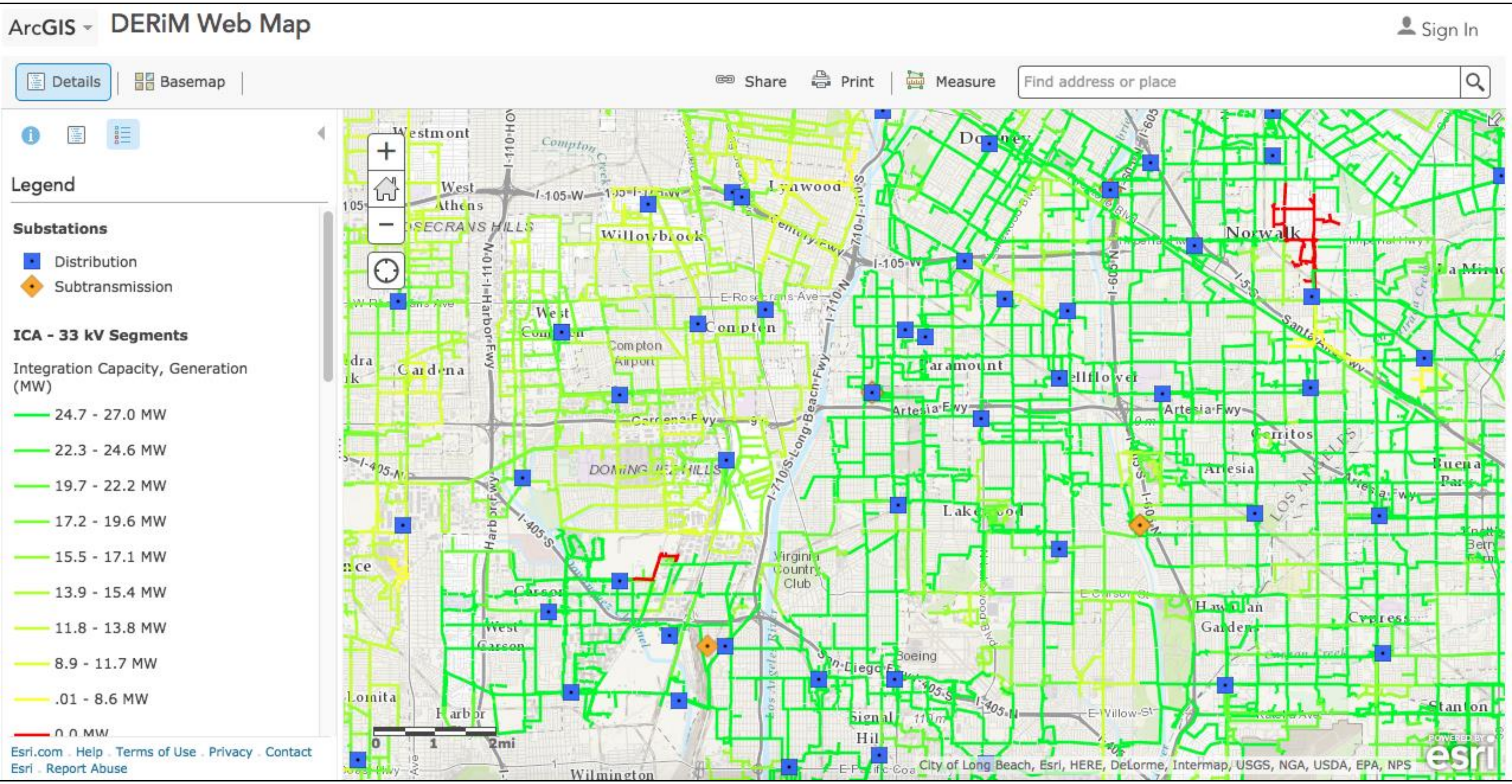
- A snapshot from Southern California Edison's new interconnection map



Taking a system level approach

- "Substation-as-a-system"
  - Understand the capacity of the existing grid to accommodate new DER
  - Drive DER investments that benefits thousands of customers rather than just one

Community Microgrid Initiative

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- Community Microgrid definition:
  - A coordinated local grid area served by one or more distribution substations and supported by high penetrations of local renewables and other distributed energy resources (DER).
  - Community Microgrids reflect a new approach for grid operations that achieve a more sustainable, secure, and cost-effective energy system while generally providing long-term power backup for prioritized loads.
  - The substation-level foundation of a Community Microgrid facilitates cost-effective replication for optimizing grid operations and customer satisfaction across utility service territories.

Community Microgrid methodology

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1. Goals:

Desired goals and performance metrics of the target grid area based on local resources and known or anticipated grid issues.

Includes renewables penetration goals, grid reliability & power quality performance targets, and power backup requirements.

2. Baseline Grid Analysis:

Inventory of the existing grid assets including load profiles, voltage regulation, feeder and transformer capacities, and existing generation.

Includes identifying prioritized services that require backup power during outages.

3. Renewable Siting Survey:

Comprehensive survey of the renewable energy potential in the target grid area specific to local resources & site characteristics.

Informs other requirements such as energy storage capacity needs and control system functionality.

4. DER Optimization:

Design of optimal DER portfolios combining renewables, energy storage, and demand response.

Incorporates Baseline Grid Analysis and Renewables Survey to achieve optimal outcomes based on local resources and grid assets.

5. Economic Analyses:

Full analysis of the cost-benefits and net value including reductions in T&D investments, ratepayer benefits, and local job creation.

Includes bulk procurement & interconnection that achieve a "plug-and-play" model, further reducing costs.

6. Deployment Plan:

Final system design, financial model and operational plan for the Community Microgrid.

Includes vendor analysis (e.g. RFIs, RFPs) appropriate to the final design criteria, financial model, and operational requirements.

Result: Distributed energy resources can be deployed more quickly and cost-effectively

Hunters Point Community Microgrid Project

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Overview

- Innovative project in the Bayview-Hunters Point area of San Francisco, in collaboration with Pacific Gas & Electric

- Model for achieving 25% of the total energy consumed in the area from local renewables, while maintaining or improving grid reliability and power quality using dynamic grid solutions

- The Hunters Point substation serves ~20,000 customers (about 90% residential, 10% commercial/industrial)

High penetrations of local renewables at low cost

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In the Hunters Point substation area:

- 30 MW of new PV added to the substation feeders at optimal locations, equaling 25% of total annual energy
  - 20 MW added to select Commercial & Industrial sites matching low resistance locations with higher daytime loads
  - 10 MW added to select Residential sites (multiple dwelling units) matching more robust feeder locations
- No adverse impacts to distribution grid operations
  - No out-of-range voltages
  - No backfeeding to the transmission grid

Peek at the future of Bayview-Hunters Point

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Ecoplexus project at the Valencia Gardens Apartments in SF. ~800 kW serving ~80% of the total annual load.

Long Island Community Microgrid Project

Overview

- Collaboration with PSEG Long Island, Long Island Power Authority (LIPA), and NYSERDA covering a substation in East Hampton, NY that serves thousands of customers
- 15 MW of local solar (via Feed-In Tariff) combined with a 5 MW / 25 MWh battery system
- 50% of total annual energy from local renewables while minimizing use of existing fossil generators, including local diesel peakers and backup facilities
- Indefinite and ongoing power backup to multiple critical facilities, including a fire station and two water pumping/filtration facilities
- Sets the stage to preempt hundreds of millions of dollars in transmission and fossil generation investments