Resilient, reliable, and renewable: A new approach to designing the electric grid

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Clean Coalition
www.clean-coalition.org
Mission:
To accelerate the transition to renewable energy and a modern grid through technical, policy, and project development expertise.

Goals:
- From 2020 onward, all new electricity generated in the U.S. will come from at least:
  - 80% renewable sources
  - 25% local renewable sources
- By 2020, policies and programs around the U.S. will:
  - Reflect the full value of local renewable energy and a modern grid
  - Include economic, environmental, and resilience benefits
Anatomy of the power grid
Distribution grids are centers of innovation
Our vision: A distributed and integrated grid
Working with utilities and municipalities

Analysis & Planning
- Full cost and value accounting for distributed energy resources (DER); siting analysis
  - PG&E
  - PSEG
  - SCE

Grid Modeling & Optimization
- Powerflow modeling; DER optimization
  - PG&E
  - PSEG
  - SCE

Program Design
- Procurement and interconnection
  - LADWP, Fort Collins, PSEG
  - Palo Alto
  - RAM, ReMAT
  - Rule 21 & FERC

Community Microgrid Projects
- Design and implementation
  - San Francisco, CA
  - Long Island, NY
  - U.S. Virgin Islands
Current electricity mix in the U.S.

- Coal: 39%
- Renewable: 13%
- Natural Gas: 27%
- Nuclear: 19%
- Petroleum: 1%

- Hydro: 48%
- Wind: 34%
- Biomass wood: 8%
- Biomass waste: 4%
- Geothermal: 3%
- Solar: 3%
Clean energy capacity

U.S. POWER PLANT CAPACITY ADDITIONS
(annual)

Sources: EIA and SEIA

December 14, 2015

Making Clean Local Energy Accessible Now
California’s innovative DRP proceeding, which requires the state’s largest utilities to proactively plan for – and deploy – distributed energy resources, such as local renewables and energy storage, has set a new national standard.

Our continued involvement will ensure that the distribution grid planning process continues at a steady pace.
Driving Distribution Resources Planning in CA

California’s largest utilities — Pacific Gas & Electric Company, San Diego Gas & Electric, and Southern California Edison — recently filed their proposed distribution resources plans as required by California State Assembly Bill 327 (AB 327). These proposals, a direct result of the Clean Coalition’s ongoing policy efforts, are accelerating the deployment of clean local energy in California.

2009-2010
The Clean Coalition is founded and begins advocating for local renewables, in front of the California Public Utilities Commission (CPUC) and the Federal Energy Regulatory Commission, as an alternative to centralized, fossil fuel generation.

2011-2012

2013-2014
AB 327 becomes law in California requiring the largest utilities to proactively plan for the rise of distributed renewable energy. The CPUC adopts numerous Clean Coalition recommendations as they implement the law, including the Community Microgrid Initiative methodology.

2015
On July 1, utilities submitted their distribution resources plans, signaling a major step forward in establishing a cleaner, more reliable, and more efficient grid, while setting a model for the rest of the United States.
Our Solar Siting Survey for Southern California Edison’s Preferred Resources Pilot identified prospective solar sites ≥500 kW in ~120 square miles in Orange County, CA.
## Distributed Energy Resource Interconnection Maps (DERiM)

![Interconnection maps](image)

**Legend**

- **Substations**
  - Distribution
  - Subtransmission

**12 kV Segments**

<table>
<thead>
<tr>
<th>Substation Type</th>
<th>Range</th>
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<tbody>
<tr>
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<tr>
<td>2.9 - 3.2</td>
<td>MW</td>
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</tr>
<tr>
<td>2.3 - 2.8</td>
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<tr>
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<td>MW</td>
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</table>

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**SCE DERiM**

- [on.sce.com/derim](on.sce.com/derim)
Rule 21: Interconnection

- The Clean Coalition has been driving improvements to the California Public Utilities Commission’s Rule 21, which regulates interconnection, operation, and metering requirements for distributed generation in California.
- Building upon success streamlining interconnection studies, the Clean Coalition is now focused on improving **cost certainty** for interconnection applicants.
What is Wholesale Distributed Generation (WDG)?

- **Retail DG**: Serves Onsite Loads
- **Wholesale DG**: Serves Local Loads
- **Central Generation**: Serves Remote Loads

**Project Size**
- 50+ MW
- 500 kW
- 5 kW

**Behind the Meter**

**Distribution Grid**

**Transmission Grid**
Net Energy Metering (NEM)

Customer solar

All energy exported to the grid is purchased by the utility at the **retail rate**

Utility distribution grid

Electricity from the grid used by the customer is purchased by the customer at the **retail rate**

Energy consumed on site offsets at the **retail rate** (on an annual basis)
What is Wholesale Distributed Generation (WDG)?

- **Central Generation**
  - Serves Remote Loads
  - 50+ MW

- **Wholesale DG**
  - Serves Local Loads
  - 500 kW

- **Retail DG**
  - Serves Onsite Loads
  - 5 kW

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*Making Clean Local Energy Accessible Now*
Feed-in Tariff (FIT)

Customer solar

All generation purchased by the utility at FIT rate

Utility distribution grid

Customer purchases all electricity they consume at the retail rate
Benefits of a FIT

- **Maintains relationship with customers:** A FIT is a wholesale arrangement between an energy generator and utility; utility customers continue to pay for all energy they consume, so load is not reduced by DG.

- **Creates visible, manageable assets:** A FIT uses wholesale interconnection, so the local utility has visibility and control of power produced by DG systems.

- **Maximizes applicable properties:** A FIT simplifies the process for all commercial properties to participate in energy generation, including non-owner occupied and split-metered properties.

- **Enables guiding deployment to optimal grid locations:** FIT design can direct the market to build DG capacity where it is most valuable (maximum benefits to the grid at minimum cost).
FITs deliver cost-effective scale

Solar PV Deployment: Germany vs. California

The German ‘Energiewende’ (energy transition)
Germany added nearly 15 times more solar than California in 2011, even though California’s solar resource is 70% better.
Carbon-Free Palo Alto has called for emissions reductions since 2011.

Carbon-Free Palo Alto calls for an 80% reduction in all greenhouse gas emissions in the next 10 years.

Providing customers with 100% carbon-free electricity. One of the first places on the planet to do so.
Adopted in March 2012, the Palo Alto CLEAN Program, a FIT designed by the Clean Coalition, makes the City of Palo Alto one of the greenest in the country.

Palo Alto CLEAN accepts all eligible renewable energy projects, with a 3 MW cap on potential solar developments. All projects must be developed within Palo Alto city limits.
In 2014, the Clean Coalition partnered with Palo Alto City staff to design and assist with administering RFP process to lease the solar siting rights to install solar parking canopies on Palo Alto’s City-owned parking structures.

The City created a new model for deploying local renewables on municipal properties, totaling 1.3 MW.
The Community Microgrid Initiative established... to demonstrate the technical and economic feasibility of high penetrations of local renewables.
Community Microgrid methodology

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

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

3. Renewable siting survey
Comprehensive survey of the renewable energy potential in the target grid area specific to local resources and site characteristics.

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

5. Economic analyses
Full analysis of the cost-benefits and net value including reductions in transmission and distribution investments, ratepayer benefits, and local job creation.

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

Result: Distributed energy resources can be deployed more quickly and cost-effectively
Community Microgrids: the benefits

**Resilience**
Renewables-driven back-up power to critical community facilities during outages.

**Environmental**
Billions of pounds in reduced toxic emissions that are harmful to our land, water, and climate.

**Health**
Improved air quality, fewer respiratory diseases, and lower mortality rates.

**Economic**
Thousands of jobs added, plus hundreds of millions in local wages and regional revenue.
The Long Island Community Microgrid Project will achieve nearly 50% of its grid-area electric power requirements from local solar and sets the stage to avoid hundreds of millions of dollars in transmission investments. It will significantly increase the penetration of local renewable energy, significantly enhance grid resilience, and greatly decrease fossil-fuel consumption.
The Hunters Point Community Microgrid Project is expected to bring $100 million in local wages to San Francisco’s Bayview-Hunters Point community, while reducing greenhouse gas emissions by 1.5 billion pounds over the next 20 years.

In partnership with Pacific Gas & Electric and the San Francisco Public Utilities Commission, the Clean Coalition is finalizing a deployment plan and gaining support from local residents and community leaders in moving the project forward.
The utility’s role in the future...

SolarCity unveils new software services for utilities, grid operators

By Gavin Bade, Herman Trabish | May 5, 2016

CA companies Verengo, Swell companies team up for residential solar-plus-storage
Massachusetts lawmakers mull 2,000 MW offshore wind mandate
Texas regulators delay decision on Hunt's bid for Oncor
ERCOT: Summer reserves shrink, but forecasts indicate enough supply
Report: Dynegy’s retirement of coal units marks 100 GW of US coal shuttered
The utility’s role in the future...

What is the greatest obstacle to the evolution of your utility’s business model?

- Existing regulatory model: 35%
- Integration of emerging technologies: 21%
- Internal resistance to change: 20%
- Cost of stranded assets: 11%
- Stakeholder consensus: 10%
- Nothing – my utility’s business does not need to evolve: 3%
The utility’s role in the future...

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Challenge</th>
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</thead>
<tbody>
<tr>
<td>43%</td>
<td>Aging workforce</td>
</tr>
<tr>
<td>41%</td>
<td>Existing Regulatory model</td>
</tr>
<tr>
<td>38%</td>
<td>Aging infrastructure</td>
</tr>
<tr>
<td>37%</td>
<td>Renewables integration</td>
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<tr>
<td>35%</td>
<td>Stagnant load growth</td>
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<tr>
<td>26%</td>
<td>Physical and/or cyber grid security</td>
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<tr>
<td>20%</td>
<td>Clean Power Plan compliance</td>
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<tr>
<td>16%</td>
<td>Grid reliability</td>
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<tr>
<td>16%</td>
<td>Load defection</td>
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<tr>
<td>15%</td>
<td>Compliance with state renewables and/or efficiency mandates</td>
</tr>
<tr>
<td>13%</td>
<td>Plant retirements</td>
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</tbody>
</table>
Thank you!

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