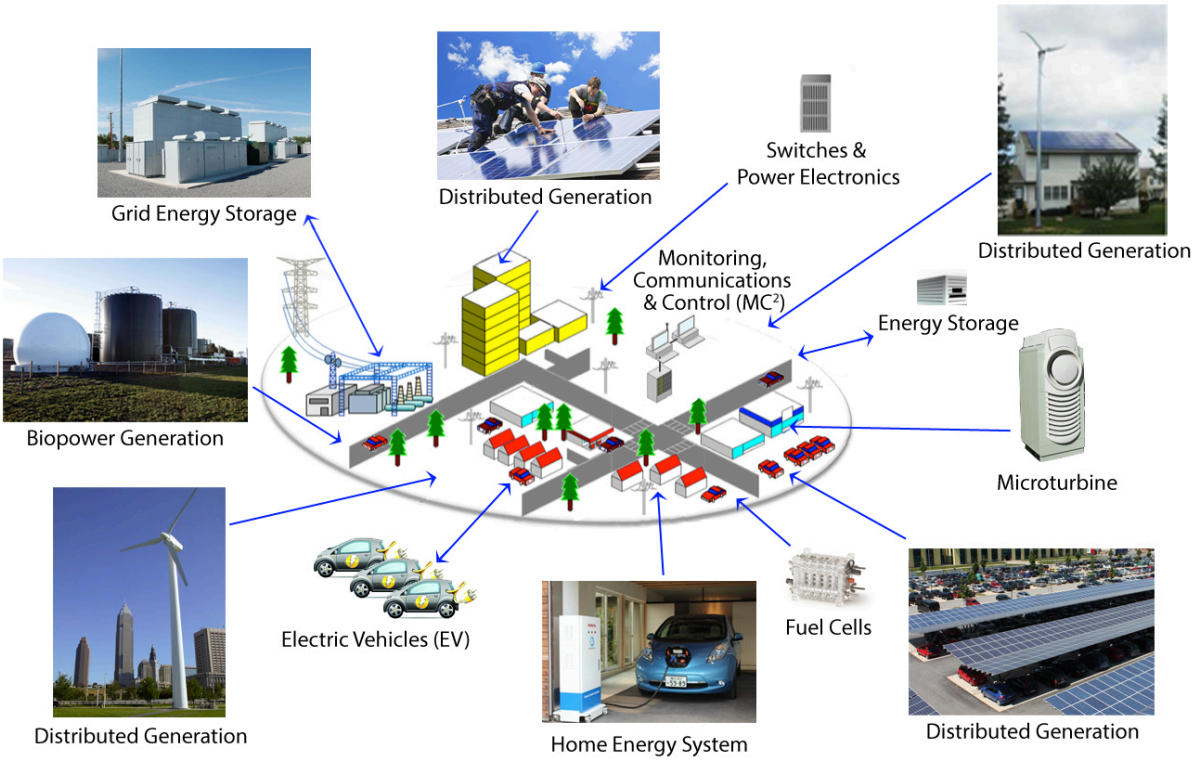
Clean Coalition
Making Clean Local Energy Accessible Now

# Community Microgrid Initiative

## Innovation for a Clean Energy Future

### *Executive Summary*



## Introduction

The Clean Coalition is a nonprofit organization whose mission is to accelerate the transition to renewable energy and a modern grid through technical, policy, and project development expertise. We work closely with community and utility leaders across the country to establish local renewable energy systems that provide cleaner, more reliable, and more affordable power.

Our Community Microgrid Initiative is transforming our electricity system. Our power system was originally designed to deliver electricity from centralized fossil-fueled power plants across significant distances to the cities and towns where it is used. However, the dropping cost of new technologies like solar and storage – coupled with the need to reduce greenhouse gas emissions while improving grid reliability and efficiency – requires modernizing our power system.

The Clean Coalition established the Community Microgrid Initiative to propel our electricity system into the 21st century by demonstrating the technical and economic feasibility of deploying high penetrations of renewable energy connected to the distribution grid. Working in partnership with electric utilities and communities, the Community Microgrid Initiative proves that local renewables can provide 25%-50% of our total electric energy needs – in sharp contrast to the only 2% of energy provided by all solar in the U.S. today. At the same time, local renewables and other distributed energy resources (DER) – such as energy storage, advanced inverters, and demand response – can improve grid reliability, resilience, power quality, and security. In addition, the Community Microgrid Initiative provides a scalable and replicable model that any utility and community can use to implement integrated, cost-effective local renewable energy systems.

Local renewable energy supported by storage and other DER is the critical missing piece in our outdated, centralized electrical system. Although renewable energy targets exist in certain states, like California's 33% renewables by 2020, these goals primarily focus on spurring the development of large, centralized solar and wind farms. This leaves highly valuable and cost-effective local energy resources largely underutilized. This is problematic as local renewables offer many unique benefits, such as: avoiding inefficient and expensive long-distance transmission infrastructure; diversifying our power system for enhanced security and reliability; reducing greenhouse gas (GHG) emissions; and strengthening local economies by keeping energy investments close to home. Our Community Microgrids offer a pathway for modernizing America's power grid in a manner that secures the most benefits for communities and utilities alike.

## An Overview of Community Microgrids

A Community Microgrid is 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) such as energy storage and demand response. Community Microgrids represent a new approach for designing and operating the electric grid, relying heavily on DER to achieve a more sustainable, secure, and cost-effective energy system while generally providing renewables-driven power backup for prioritized loads over indefinite durations. The

substation-level foundation of a Community Microgrid ensures that the approach can be readily extended throughout a utility's service territory and replicated across utilities.

*Community Microgrid features*:

- High penetrations of local renewables and other DER that achieve desired levels of grid reliability, resilience, and power quality
- Local balancing and load flattening that reduces costly transmission investments and load peaks
- Ongoing, renewables-based backup power to prioritized loads
- A scalable and replicable solution based on the substation-level building block of the electric grid

*Community Microgrid benefits:*

- A more sustainable, reliable, resilient, and secure grid
- A cost-effective and replicable solution that delivers optimal levels of local renewable energy
- A foundation for more precise and efficient grid operations
- A pathway for utilities to thrive in the distributed energy future
- A system-wide approach that reduces dependence on vulnerable, inefficient, and expensive remote generation and associated transmission infrastructure

Unlike a traditional microgrid, which usually benefits just a single customer or location, a Community Microgrid secures benefits for customers across a large grid area, while also creating new business opportunities for utilities. The table below highlights how a Community Microgrid is different than a traditional microgrid.

| Feature | Community Microgrid | Traditional Microgrid |
|---|---|---|
| ***Scale*** | Spans an entire substation grid area, securing benefits for thousands of customers. | Covers only a single customer location or a small number of adjacent locations. |
| ***Cost*** | Offers a more cost-effective solution by: 1) achieving much broader scale of DER deployment and 2) utilizing a systems approach that identifies optimal locations for DER in context of existing local distribution grid assets and loads. | Maximizes benefits for a single customer but does little for the local grid. Replicating this approach across an entire community area would be: 1) extraordinarily expensive and 2) fail to leverage and optimize the existing distribution grid assets. |
| ***Grid resilience and security*** | Provides backup power to prioritized loads that are critical to the entire community, such as police and fire stations, water treatment centers, emergency shelters, etc. | Provides backup power to only a single location or customer. |
| ***Scalability*** | Enables easy replication and | Requires tedious work to |

| | | |
|---|---|---|
| | scaling across any distribution grid area. | implement at each individual locations; starting from scratch in terms of both analysis and physical assets. |

A Community Microgrid leverages existing technologies while integrating innovations in design and operations. Community Microgrids feature targeted siting and sizing of local renewables and energy storage solutions, as well as utilization of advanced inverters and demand response in context of the specific local renewable generation profile. All of the elements are optimized based on the local grid characteristics, including customer loads, feeder capacity using connected feeders, peak shifting and reduction, and relevant transmission and distribution grid deferral opportunities. The Community Microgrid Initiative delivers a holistic, integrated, and easily replicable solution that becomes the platform – or "engine" – enabling a utility or community to accelerate deployment of local renewable energy and other DER in bulk and cost-effective amounts across any target grid area. We have achieved important validation of this systems approach from utility partners and industry media, including a recent Utility Dive article.

**A Proven Solution**

Just as Henry Ford's assembly line approach revolutionized the automobile industry, the Community Microgrid Initiative is transforming our electricity system. Internal combustion engines, other car components, and cars existed prior to Ford's assembly line – just as solar panels, inverters, and energy storage components exist today. Rather than producing individual car components or cars one at a time, Ford shifted the perspective to a higher-level, system-wide view. This changed the world of manufacturing and logistics. Similarly, the electrical system can adopt an "assembly line" approach. Rather than today's extremely slow – and operationally disruptive – "one rooftop at a time" model, we can deploy local renewable energy and other DER in bulk amounts based on optimized local energy system designs. The Clean Coalition's Community Microgrid Initiative brings this system solution – and the resulting scale, innovation, and cost-effectiveness – to our electricity grid.

Already, investment in local renewables and other DER has proven financially beneficial for communities and utilities. Forward-thinking utilities are now utilizing these resources to defer, and potentially eliminate, substantial transmission and distribution grid investments. For example, two leading U.K utilities – Scottish and Southern Energy and U.K. Power Networks – forecast savings of more than €300 million [$387 million] in avoidable capital expenditures through DER (Greentech Media, September 2014). Also, the state of New York's *Reforming the Energy Vision* proceeding identified $30 billion in reduced transmission and distribution system costs over the next ten years by utilizing local renewables and other DER (Greentech Media, September 2014). And Consolidated Edison is seeking approval to shed 52 megawatts (MW) of electricity demand using DER rather than building a new $1 billion substation. This move is projected to save customers around $500 million.

The Clean Coalition has worked closely with multiple utilities, utility commissions, solar developers, storage providers, and other DER technology providers in the United States to develop viable and cost-effective solutions. Our successes to date include: designing wholesale distributed generation procurement (e.g. feed-in-tariff) and interconnection solutions (e.g. Rule 21 in California) that achieve faster and less expensive deployment of distributed solar, incorporated in multiple utility operations around the country; spearheading the Community Microgrid Initiative, which features an innovative systems approach and methodology that was incorporated into the California Public Utility Commission's (CPUC) ruling requiring state utilities to provide distribution resources plans that support much larger deployments of DER; leading technical efforts to utilize advanced inverters that provision reactive power to avoid more expensive voltage balancing solutions; and closely collaborating with energy storage developers to identify optimal and cost-effective approaches for achieving high penetrations of local renewables supported by storage.

**Methodology**

In terms of planning and deploying successful Community Microgrids, the Clean Coalition utilizes the following six proven steps:

1. **Set Goals**: Identify the Target Grid Area, such as a region served by a substation or substations, and define the Community Microgrid goals based on desired levels of local renewables, grid performance, and cost-effectiveness.

2. **Perform Baseline Grid Analysis**: Assess the existing grid performance based on the local grid infrastructure, loads, and generating resources. Include identifying critical facilities that should be considered for backup power during outages. Critical facilities generally include hospitals, fire and police stations, and critical service facilities like those providing water and communications services.

3. **Conduct Renewables Siting Survey**: Conduct a comprehensive survey of the renewable energy potential in the target grid area specific to local resources and siting opportunities. For example, in order to assess the amount of local solar that can be achieved, it is necessary to assess solar resource quality and the availability of rooftops, parking lots, and brownfields for siting solar projects.

4. **Perform DER Optimization**: Establish an optimized combination of local renewables, energy storage, demand response, and other DER with respect to cost and grid performance metrics. As part of this optimization process, test various DER combinations that achieve the Goals, building on the results of the Baseline Grid Analysis and the Renewables Siting Survey.

5. **Analyze the Economic Benefits**: Conduct a comprehensive analysis of the costs and benefits associated with the Community Microgrid – spanning energy, economic, and environmental benefits. This economic analysis includes assessing the energy costs under a streamlined and bulk approach to deploying local renewables and other DER,

reductions in transmission and distribution (T&D) investments, and anticipated local job creation.

6. **Establish Deployment Plan**: Design bulk procurement and interconnection processes that facilitate streamlined and scalable deployment of the local renewables and other DER, fulfilling the Goals of the Community Microgrid project. The Deployment Plan will often include designing a Request For Proposal (RFP), or similar requirements documentation, that allows for a straightforward assessment of proposed solutions.

As a broader additional benefit, the Community Microgrid Initiative will facilitate development and standardized interoperability of the planning and operational tools required to implement these optimized local energy systems. This "DER Platform" will enable deploying Community Microgrid projects in months rather than years. The Community Microgrid Initiative provides the real world deployment and market demand that accelerates these tools into an operational platform that can be replicated easily across the country.

## Current Projects

The Clean Coalition's current Community Microgrid projects include:

Hunters Point Community Microgrid Project

The Hunters Point Community Microgrid Project has helped develop a replicable model that any utility or community can use to design cost-effective Community Microgrids. This project showcases the technical and economic viability of high levels of local renewables supported by DER. For this project, the Clean Coalition delivered: 1) a Renewable Siting Survey identifying 50 MW of new solar potential; 2) assessment of the local energy, economic, and environmental benefits of bringing 50 MW of new solar to the community; and 3) development of DER Optimization using powerflow modeling based on an innovative methodology validated by Pacific Gas & Electric and incorporated in the CPUC's final ruling on distribution resources planning requirements for California utilities. As an example to the industry, this methodology will expedite the creation of Community Microgrids by efficiently designing local renewable energy systems that balance vital grid services (power, voltage, and frequency) in the most scalable and cost-effective manner by fully leveraging existing distribution grid assets.

When deployed, the Hunters Point Community Microgrid Project is projected to eliminate 78 million pounds of toxic GHG emissions, save 15 million gallons of water, and preserve 375 acres of land over twenty years. During the same time period, the project is estimated to generate $200 million in regional economic stimulation[1], including:

- $100 million in local wages – $42 million coming in the first two years, adding 1,270 near term job-years in construction and installation and 520 job-years in ongoing operations and maintenance
- $5.8 million in construction-related state sales tax revenue
- $10 million in site leasing income to property owners in Bayview-Hunters Point

Long Island Community Microgrid Project

The Long Island Community Microgrid Project (LICMP) was one of the initial five projects to receive a NY Prize grant – announced by Gov. Cuomo on April 30, 2015 – as part of the first phase of New York State's Community Microgrid Competition to increase grid resilience and to support high penetration of local renewables. The LICMP features the Clean Coalition's Community Microgrid approach implemented in partnership with PSEG Long Island (the contracted grid operator), the Long Island Power Authority (the grid owner), the New York State Energy Research and Development Authority (NYSERDA), and multiple community stakeholders. PSEG Long Island's Utility 2.0 Long Range Plan, released in October 2014, introduces the basic elements of the LICMP, which will strengthen the most vulnerable portion of the Long Island power grid by adding significant amounts of local renewables supported by energy storage. Initially, the Long Island Community Microgrid Project will combine roughly 15 MW of local renewables with a 5 MW/25 MWh battery system. In the longer term, the Project will showcase the possibilities for DER avoiding the construction of a planned 100 MW oil-based, 'peaker' plant that is slated to be built in 2018 on the East End of Long Island.

Southern California Edison

The Clean Coalition was engaged by Southern California Edison to evaluate siting opportunities for local solar within the Preferred Resources Pilot (PRP) grid area and to determine the economics associated with procuring significant tranches of solar in the grid area. This effort is fundamental to understanding how local renewables can replace grid services that were previously provided by the San Onofre Nuclear Generating Station. The PRP Solar Siting Survey identified over 160 MW of solar potential on the larger commercial sites in the area and sets the stage for streamlined interconnection and procurement of this local solar potential. For more information and to review the results of this project including the solar siting map the Clean Coalition developed, see http://www.clean-coalition.org/resource/solar-siting-surveys.

For more information regarding the Community Microgrid Initiative, please see www.clean-coalition.org/our-work/community-microgrids.