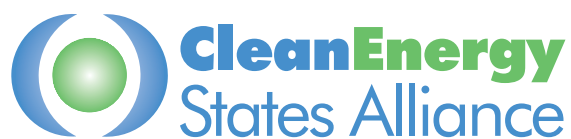




2020 AWARDS

State Leadership in Clean Energy

Case Studies of Award-Winning Programs that
Are Accelerating the Clean Energy Transition





About this Report

This report was prepared by Maria Blais Costello of CESA. It is based on the information that organizations submitted as part of their nominations for the *State Leadership in Clean Energy Awards*. Several CESA staff members were also involved with and contributed their expertise to the awards process: Warren Leon, Samantha Donalds, Nicole Hernandez Hammer, Nate Hausman, Todd Olinsky-Paul, and Val Stori. Their assistance has been invaluable to both the case studies contained in this report and for the implementation of the webinar series that will be held throughout the summer and fall of 2020 to highlight the winning programs. Finally, we would like to thank all the CESA members who participated in the 2020 Leadership awards; all the nominations that were received described excellent programs being undertaken by states to advance clean energy.

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Introduction

Welcome to CESA's biennial *State Leadership in Clean Energy Awards'* case studies report. This report and an accompanying webinar series highlight the impact that CESA member organizations are making across the U.S. as they advance effective and innovative clean energy programs. The 2020 *State Leadership for Clean Energy Awards* process began in January, just as the world was beginning to take notice of the new coronavirus. Since then, the world has turned upside down in many ways, and we've all had to adjust to a new, ever-changing reality. Through all the challenges, the award process continued, even as participants assumed their work responsibilities from home. Nomination materials were drafted and submitted, five distinguished judges evaluated the applications and selected six winners, award plaques were shipped to winners, and an award ceremony was held online. It's been an unusual process, and we deeply appreciate the efforts of all who participated.

This year's *State Leadership* winners have continued the long line of distinctive programs that exemplify successful state actions. They reflect the transformative change that is occurring in the energy sphere. The 2020 *State Leadership* programs are tackling major energy challenges, including bringing the benefits of clean energy to disadvantaged communities, paving the way for large-scale offshore wind development, reducing emissions in the agricultural sector, and developing new business models for emerging technologies like energy storage. All states that participated in the awards share a common vision of creating a clean energy economy that benefits the public, addresses environmental and climate challenges, expands economic opportunities, and increases the health and wellbeing of residents.

Although equity was not an explicit criterion that the judges were asked to use when evaluating the nominated programs, five of the six winning programs aim to increase access to clean energy technologies in low-income and under-resourced communities. Three of the winners specifically address expanding solar to low- to moderate-income customers. As clean energy markets have become more firmly established and the costs have steadily declined, many states are seeking to bring clean energy to those who have been overlooked in years past, when states were focused more single-mindedly on increasing the number of clean energy megawatts installed.

Much has changed since these awards started in 2009, and we can be certain rapid change will continue as clean energy expands its reach. We at CESA are working steadily with our members to meet new challenges, to find opportunities to increase clean energy, and to make sure its benefits are widely distributed across states and communities. It will be very interesting and exciting to see what state leadership in clean energy will achieve in the next two years, and we are very much looking forward to finding out!

We invite you to learn more about each of this year's winning programs by viewing CESA's webinar series; more information can be found at www.cesa.org/projects/state-leadership-in-clean-energy/2020-awards.

Maria Blais Costello

Manager of Program Administration, CESA
July 2020

The 2020 Award Judges

The *State Leadership in Clean Energy Awards* are made possible by the generous donation of time and expertise by our panel of judges. These individuals have an impressive wealth of knowledge and years of experience related to clean energy. We would like to express our sincere appreciation for their enthusiasm and participation in this process. It should be noted that the participation of the judges and the granting of these awards are not intended to represent the views of the judges' organizations or any of the organizations' respective members.



Ellen Anderson
Climate Director
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Ellen Anderson is Climate Program Director with the Minnesota Center for Environmental Advocacy, utilizing legal, scientific, and policy expertise to reduce greenhouse gas emissions across all sectors of the economy.

Prior to that, Anderson was a senior energy researcher and Executive Director of the Energy Transition Lab (ETL), Institute on the Environment, University of Minnesota, since 2014. The Lab focused on energy storage thought leadership, cities and energy/climate planning, energy equity, grid modernization, and renewable energy, and founded the Minnesota Energy Storage Alliance (MESA). Ellen holds a B.A. from Carleton College and J.D. *cum laude* from University of Minnesota Law School. She is an Adjunct Associate Professor at the University of Minnesota, teaching courses in law, energy, and sustainability.



Lori Bird
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Lori Bird is Director of WRI's U.S. Energy Program and the Polsky Chair for Renewable Energy. In this role, she focuses on decarbonization by the utility sector and large buyers, increasing grid flexibility through market

design, and transportation electrification. Prior to joining WRI, she served as a principal analyst in the Markets and Policy Group of the National Renewable Energy Laboratory, where she specialized in renewable energy policy, solar and wind energy markets, and integrating variable generation into electric grids. She holds a master's degree in environmental studies from Yale University's School of Forestry and Environmental Studies and a B.A. in economics and environmental studies from Indiana University.



Mark Bolinger
Energy/Environmental Policy
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Mark Bolinger is a Research Scientist in the Electricity Markets and Policy Department at Lawrence Berkeley National Laboratory. Mark conducts research and analysis on renewable energy, with a focus on cost, benefit, and market analysis as well as renewable energy

policy analysis and assistance. Since joining LBNL, Mark has authored or co-authored more than 150 reports and articles, including 16 articles published in seven different archival journals. Mark regularly presents the findings of his work to national audiences, and in 2010 was invited to testify before the Committee on Ways and Means of the U.S. House of Representatives as part of a hearing on energy tax incentives. Mark holds a master's degree in Energy and Resources from the University of California at Berkeley, and a bachelor's degree from Dartmouth College.



Cameron Brooks
President, E9 Insight

Cameron Brooks is the President of E9 Insight, a research firm focused on the US utility industry and the policy landscape surrounding it. E9's clients include a wide range of technology companies, advocacy coalitions and government agencies, including Department of Energy and Lawrence Berkeley National Labs. Cameron also founded Tolerable Planet Enterprises, an advisory firm that provides

regulatory engagement and business development services, including a strong focus of developing coalitions for distributed energy technologies and open markets. Cameron has served in executive and director roles with clean energy companies and nonprofits, including Opus One Solutions, Tendril, Renewable Choice Energy and the Clean Energy States Alliance. He studied Ecologic Design at Yale University and holds an MBA from Cornell. E9 and Cameron are based in Boulder, Colorado.



Meredith Hatfield
Executive Director
New England Conference of Public
Utilities Commissioners

Meredith Hatfield is the Executive Director of the New England Conference of Public Utilities Commissioners (NECPUC). She has over two decades of experience working on energy and regulatory issues in public, private, and nonprofit settings, including serving as New Hampshire's Utility Consumer Advocate and

as the Director of the New Hampshire Office of Energy and Planning. She is an alumna of the University of New Hampshire, Wellesley College, and Vermont Law School. In addition to her state service, Meredith has worked in philanthropy and practiced law in nonprofit and law firm settings. She lives in Concord, New Hampshire and serves on the Concord City Council and the Concord Energy and Environment Advisory Committee.

Program Highlights

- ▶ REAP awards were given to projects located in 18 counties throughout California, including multiple educational institutions, plus low-income, woman- and minority-owned agriculture operations.
- ▶ 23 of the 45 grants went to projects within a disadvantaged or low-income community. The cumulative grant awards to these communities account for \$5,893,110, or over 60 percent of available program funds.
- ▶ The 45 funded projects have an expected combined system output of over 11 megawatt-hours per year. Over the life-span of the installed equipment, the estimated GHG emission reduction is over 128,300 metric tons of CO₂ or CO₂ equivalent.
- ▶ Over a 30-year lifespan of the equipment, REAP projects are estimated to save over \$50 million in energy costs for program participants. These cost savings are important to maintain a thriving agricultural industry in California.
- ▶ \$1 in program cost converts to over \$5 in value to the grant recipient.



California Energy Commission

RENEWABLE ENERGY FOR AGRICULTURE PROGRAM (REAP)

The California Energy Commission's Renewable Energy for Agriculture Program (REAP) awards grants to agricultural operations in California to fund the installation of renewable energy systems, providing the agricultural sector with the opportunity to lower greenhouse gas (GHG) emissions, lessen its grid electricity dependence, and to save on energy bills. California's agricultural sector is a vital part of the state's economy and it is critical to global food security. However, agricultural operations emit large quantities of GHGs, and agricultural productivity is vulnerable to the effects of climate change. Along with reducing GHG emissions, REAP projects provide improved air quality, and they also promote energy and environmental equity, with an emphasis on serving disadvantaged communities and low-income areas. REAP demonstrates clean energy leadership through a customer-focused approach that features a streamlined grant application process and establishes grant requirements that maximize the efficiency of funding.

Investing in Greener Agriculture to Reduce GHG

In January 2019, the California Energy Commission (CEC) released a competitive grant solicitation to support renewable energy technologies in agricultural operations and to reduce GHG emissions. The competitive solicitation made \$9.5 million in REAP funds available for owners or operators of an agricultural operation, with the highest-scoring applications receiving grants. Points were earned based on criteria supporting the primary objectives of the program, with bonus points given in various categories, including projects located in priority counties, projects obtaining equipment from California-based vendors, and projects directly benefitting residents of disadvantaged or low-income communities. The REAP program seeks to leverage applicant match funding, so projects with optional matching funds were awarded additional points.



California Energy Commission staff stand in front of a REAP-funded solar installation alongside a grant recipient in Yuba City, CA. Source: California Energy Commission

The grant solicitation was oversubscribed, receiving 98 applications totaling nearly \$20 million in requests and offering over \$11 million in match funding. The \$9.5 million available was awarded to 45 project proposals, with grant awards ranging from \$25,000-\$350,000. The total cost for all the REAP projects is approximately \$14.9 million, which includes approximately \$5.4 million in optional match funding from the grant recipients.

REAP awards were made in 18 counties throughout the state and went to multiple educational institutions as well as to low-income, woman-owned, and minority-owned agriculture operations, reflecting a wide spectrum of grant recipients. The awarded projects are currently undergoing construction and installation. Of the 45 grant awardees, 23 awards are for projects within a disadvantaged or low-income community, as defined by California Senate Bill 535.

Increasing Access to Clean Technologies Where They are Needed

California's major agricultural regions are some of the most polluted in the state, making a shift towards clean energy imperative. However, a common barrier to adopting solar photovoltaic (PV) is the financial investment required. REAP is aimed directly at this challenge. To reach agriculture operations of all sizes, REAP designed a streamlined grant application and funding program tailored to the agricultural community. With the help of the California Public Advisor's Office, the California Air Resource Board, and the California Farm Bureau, outreach efforts and workshops were held in agricultural centers to gather feedback and to develop a program that would serve both the needs of the agricultural communities and the goals of the state. REAP collaborated with the Energy Commission's Contracts, Grants, and Loans' Legal office, and the Accounting office to design a simpler, more efficient grant process necessary to encourage the busy farmers to apply.

CEC staff created a new budgeting and the invoicing method that allowed recipients to submit invoices prior to a payment due date through a binding incurred cost, which offered cash-strapped recipients the ability to receive grant funds necessary to pay a vendor. Prior to this invoicing change, Energy Commission programs required vendor payment first, which posed a significant barrier to grant recipients unable to provide an up-front payment to a vendor. This feature enabled agricultural operators from all financial backgrounds the opportunity to participate in the program.

Program eligibility is limited to owners and operators of commercial agricultural operations in California, and projects must



New CEC-funded solar PV installation on a vineyard in Lodi, CA.
Source: Cherry Road Vineyards

include a renewable energy component. All awarded project proposals included solar PV systems. Funding can also be used for complementary equipment, including electric vehicle (EV) chargers, battery storage, or a new electric agricultural pump if it replaces a diesel pump. Replacing diesel pumps with new electric pumps plays a vital role in reducing local criteria air pollutants, a major concern in the Central Valley region of the state. Twenty projects include EV chargers, while four include battery storage and three projects replaced diesel agricultural pumps with electrical pumps.

Program Impacts for Clean Air and a Growing Economy

The primary objective of the REAP grant funds is to reduce GHG emissions, and the legislative mandate of the program supports the installation of renewable energy projects in the agricultural sector. The 45 REAP-funded projects have an expected combined system output of over 11 megawatt-hours per year. As stipulated by program requirements, funding is limited to direct equipment costs, installation labor, and limited

site preparation costs. REAP funds cannot be used for soft costs such as permit fees, design costs, and other overhead charges.

The impact of REAP is measured in part by the reduction of GHG emissions, jobs created, and quantity of new renewable system capacity installed. REAP projects are estimated to reduce GHG emissions by over 128,300 metric tons of CO₂ or CO₂ equivalent, which is comparable to burning 141 million pounds of coal or taking over 27,000 cars off the road for a year. The amount of GHG emission reductions is calculated using a [Benefits Calculator Tool for REAP](#), which was created specifically for this program by the California Air Resources Board. The Tool also includes a Job Co-Benefit tab that identifies job creation stimulated by REAP projects, with 31 full-time equivalent jobs estimated to be directly supported by all projects.

Many REAP-supported projects feature tangible co-benefits to nearby residents. Five of the REAP projects in disadvantaged or low-income communities provide direct benefits to community residents. For example, one REAP grant recipient is a vocational training facility operating a farmer-training and education program for low-income residents. The solar PV system provides renewable energy to each tenant student-farmer's operation, thus enabling them to save on energy costs. Another grant was awarded to a high school incorporating its newly installed solar PV system into their agricultural curriculum, providing electricity for their operations and classrooms at the school. When complete, an updated curriculum will incorporate the benefits of renewable energy in the school's agricultural operations.

Additionally, multiple REAP projects located in disadvantaged communities benefit local air quality by replacing a diesel-powered agricultural pump with a new electric-powered pump. Another REAP-funded project that could influence other agricultural operations with its innovative clean energy equipment is an almond farm that will utilize solar PV, an EV charger, and battery storage installed on an all-electric Mobile Power Station (MPS). The MPS equipment can deliver energy with versatile attachments to multiple needs over all terrains. The MPS replaces the need for diesel fuels and single-purpose alternatives. The project will be replacing 18 diesel tractors with two of the all-electric Mobile Power Stations.

Economic Benefits and Replicability

The renewable energy systems also directly benefit grant recipients in the form of energy cost savings. In some cases, the new renewable energy systems allow the recipients the freedom to irrigate when needed instead of waiting for a lower billing cost period, which may not be optimum for maximizing agriculture harvest yields.

Based on average retail electricity rates, the grants are expected to produce over \$1.6 million in cost savings in the first year among all grant recipients. Over a 30-year lifespan of the equipment, REAP projects are estimated to save over \$50 million in energy costs for program participants; and \$1 in program cost converts to over \$5 in value to the grant recipient. These cost savings are important to maintain a thriving agricultural industry in California.



New CEC-funded solar PV installation on an almond and walnut farm in Fresno, CA. Source: James Efrid

The REAP program is easily replicable by other states or jurisdictions. All program materials are publicly available, and while program applicants were limited to California residents, program guidelines and requirements may easily be expanded or adapted to other clean energy markets. The REAP Guidelines give an overall background of the program, explain program administration, and outline terms and definitions. Within the boundaries of the guidelines, the grant funding opportunity (GFO) specifies exact eligibility requirements, rules, and the process for applying. In their current form, the REAP Guidelines and GFO may serve as a blueprint when other states implement similar programs. As part of the effort to streamline program administration, REAP staff created a one-page invoice template that can easily be used or incorporated in other capacities. Similarly, the Benefits Calculator Tool for REAP and the Job Co-benefit Modeling Tool can be readily adopted by other programs, as it is a simple GHG reduction calculation based on an existing framework not specific to California.

For California, agriculture provides food security and billions of export dollars, making it an important yet vulnerable sector facing the challenges of a changing climate. Agriculture is also responsible for a large quantity of CO₂ emissions. These factors offer an opportunity to innovate the agricultural industry

and reduce its dependence on the grid while at the same time reducing its CO₂ emissions significantly. REAP is part of California's concerted efforts on climate change mitigation and adaptation strategies. In the process, REAP helps to spread renewable technology and energy updates within the sector, and contributes to cleaner and more profitable agricultural operations. The oversubscribed demand for the program, coupled with positive feedback received from REAP's grant recipients, indicate the promise and need for additional programs of this nature.

REAP is a new grant program in its first funding cycle. As the programmatic data compiles, the efficacy and demonstrable benefits of REAP will become more apparent and easily adaptable to other state or local programs interested in replicating the CEC's effort. The CEC staff stand ready to share their experiences and program outcomes.

Judges' Comments: *"Tackling greenhouse gas emissions in sectors beyond electricity and transportation is critical, and California's focus on its agricultural sector offers major opportunities for environmental and economic benefits by transitioning to clean energy systems."*



About the California Energy Commission

The California Energy Commission is the state's primary energy policy and planning agency, leading the state to a 100 percent clean energy future that is clean, modern, and ensures the fifth largest economy in the world continues to thrive. Established in 1974, the California Energy Commission and its employees are committed to reducing energy costs, curtailing greenhouse gas emissions, and ensuring a safe, resilient, and reliable supply of energy through fostering cutting-edge research, development, and demonstration in diverse areas such as climate change, energy and building efficiency, transportation, and renewable energy. In concert with these missions on the scientific-frontiers to inform sound public policy, the Energy Commission implements incentives, grants, and loans programs to incentivize individual behavioral changes and increase market-penetration of new and clean energy technologies. The Energy Commission is paving the trail for a clean and sustainable energy future.

For more information:

<https://www.energy.ca.gov/programs-and-topics/programs/renewable-energy-agriculture-program>

Contact

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Program Highlights

► The Inclusive Innovation Project created three new incentives for solar:

- *Innovation Grants* for communities to develop locally relevant solar projects and programs that benefit under-resourced residents
- *Solar Within Reach*, an income-qualified incentive for residential rooftop installations
- *Community Solar Development Assistance*, an incentive to assist public and nonprofit-led community solar projects with early development

► Solar program staff have developed collaborative relationships with 32 community-based organizations.

► The project has led to 54 new low-income projects in the pipeline at residential, commercial, and multifamily sites.

► Energy Trust now has a 40 percent increase in the funding directed to under-resourced Oregonians for solar.



Energy Trust of Oregon INCLUSIVE INNOVATION PROJECT

Energy Trust of Oregon's Inclusive Innovation Project sought to adapt innovative business development models to create effective solar programs that reach under-resourced customers throughout Oregon. Energy Trust has a long history of offering solar incentives to commercial and residential customers, but over the past four years, staff have explored ways to make solar affordable and accessible for lower-income customers, rural customers, and communities of color. Enterprising new businesses are successful because they can innovate and make big changes quickly in order to reach new customers, test products in the field, and use customer feedback to redesign and improve their products. By building relationships with community organizations across the state, Energy Trust adapted this model to create a system for learning, teaching, and experimenting. The Inclusive Innovation Project has inspired new offerings, transformed methods for creating new solutions, and has resulted in new solar PV systems generating power in under-resourced communities. This replicable and adaptable approach can be used in other areas of the country to expand the benefits of solar in more communities.

Building on the Past to Support New Innovations

Energy Trust's solar program has a successful history of installing residential, commercial, and utility-scale projects across the state. Since 2002, it has supported the installation of more than 15,000 PV systems in Oregon, totaling 159 megawatts in capacity. Recognizing the need to ensure equitable deployment of solar, Energy Trust examined other state programs across the country but found that those that were most successful had larger budgets than Energy Trust had available. The challenge



A Oregon homeowner with her new rooftop solar panels that resulted from an Innovation Grant to Seeds of Sol, in support of its partnership with Habitat for Humanity. Source: Seeds of Sol

for Energy Trust became how to develop its own programs that could meet the needs of under-resourced customer groups and communities within the limitations of its budget. Development and implementation of its strategy were funded in part by an award from the US Department of Energy Solar Energy Technologies Office.

Energy Trust adapted a business development model that starts with identifying a need or gap in the market, followed by design and experimentation, testing products/solutions with consumers, and making adjustments based on their feedback. The resulting model provided opportunities for capacity building, community engagement, and partnership development in local communities; it is a replicable and scalable method for effectively reaching under-resourced communities of all types. The Inclusive Innovation Project has also made traditional rooftop residential solar more affordable in Oregon by offering an incentive for low- and moderate-income customers who may be unable to make use of federal tax credits, and it has adjusted its non-residential funding for solar to allow for more nonprofit- and diversity-focused incentives.

Engaging in Ideation with Local Communities

To better understand the customers they had been underserving, Energy Trust turned to the experts: the communities and community-members themselves. Energy Trust met with multiple community-based organizations in person, recognizing that outreach, engagement, and fostering relationships were paramount to the success of this model.

Energy Trust began this process by hosting four public meetings across the state in early 2017. The meetings featured presentations, small group discussions, and a locally catered meal. The 140+ attendees provided critical insight into community values, priorities for clean energy deployment, and contact information for those who wanted to stay involved. From there, Energy Trust formed a working group with representatives from community-based organizations and agencies that work with frontline, under-resourced communities. This working group met regularly over seven months to build relationships with each other, to learn about solar, and to develop and consider solutions. One of the early pieces of feedback was that the predominately nonprofit working group members' time must be valued, so Energy Trust provided a stipend to enable their participation.

To test the new ideas that emerged from the working group with potential customers, staff from Energy Trust went back on the road in early 2018. Staff met with 30 organizations in nine communities throughout the state to solicit input on the

proposed solutions. These meetings were held with community action agencies, tribal governments, social service providers, housing authorities, county and local agencies, solar installers, energy groups, and interested residents. Input at this level was fundamental to refining Energy Trust's strategies and to developing trial programs.

Information Sharing, Mutual Education, and Effective Collaborations

Despite a great deal of interest from under-resourced communities in solar, Energy Trust found gaps in their understanding of solar that made it challenging for them to initiate projects or engage with solar policymaking. To close these gaps, staff launched a second iteration of the working group in the second half of 2018, reaching more deeply into communities of color and rural areas for members. Over the course of eight months, Energy Trust staff learned even more from participants about their challenges with adopting solar, and helped participants build their solar knowledge with lessons on technology, system costs, financing, and related housing issues. Once again, stipends were provided to enable community participation in this group.

Iteration is another essential element of the model, but experimenting with solar deployment programs is challenging. Energy Trust awarded \$10,000 *Innovation Grants* in early 2019 to eight community groups to develop their own program ideas for overcoming barriers to solar for people in their communities. This was meant to build greater capacity among community partners and empower them to create solutions tailored to their needs. The grants were awarded through a competitive process using selection criteria developed with the working group. As grantees progressed in their work, they received feedback from the working group, allowing for incremental and iterative adjustments.

The grantees included small community organizations, a housing authority, Habitat for Humanity, an African American homeownership organization, and a coalition of rural cities. The program model's grantees developed a variety of approaches and represented sectors as diverse as their organizations: rooftop and community solar; single-family, manufactured and multifamily housing; loan and savings approaches; specific projects; and community education.

Alongside the solutions developed by community groups, Energy Trust took two recommendations that emerged from the working group and rapidly developed them into new incentive offerings with a first-year budget of \$850,000: *Solar Within Reach* and *Community Solar Development Assistance*.



The Inclusive Innovation program provided stipends to support community participation at its events.
Source: Energy Trust of Oregon

Instead of the six months it can commonly take to design and launch a new program offering, Energy Trust launched these two offerings in two months by rapidly prototyping. Staff developed a proposal, got feedback from the working group network, then quickly reworked the proposal, repeating that cycle several times until they arrived at a ready-to-launch program.

Solar Within Reach, a solar installation offering that provides higher incentives and other services for income-qualified homeowners, was launched in late October 2019. As an added layer of consumer protection for customers who may be more vulnerable and subject to predatory sales practices, *Solar Within Reach* projects must be installed by approved contractors. These contractors must maintain a top-level performance rating with the program, participate in special training, provide longer warranties, and agree to stronger customer service standards.

Community Solar Development Assistance, launched in early November 2019, supports early development work on small public or nonprofit-led community solar projects with specific goals to benefit low-income customers, communities of color, tribes, renters, or rural customers. The objective of this offering is to increase the feasibility and success of these community-driven projects so that they have an equitable opportunity to participate in Oregon's new Community Solar Program.

Many public and nonprofit organizations lack experience developing renewable energy projects and need additional support to bring these projects to their communities. This is especially true for risky, early development work, such as

siting, financial modeling, land use permitting, and preliminary interconnection—all of which must be resolved prior to apply for Oregon's Community Solar Program. *Community Solar Development Assistance* incentives can be used to help pay for a variety of project development activities that occur prior to installation, including grant writing, feasibility studies, interconnection support, and other technical assistance. It can also be used to offset some of a nonprofit organization's time spent managing the project during this early stage.

Two other new offers that expand on these programs are also in the works, with an anticipated first-year budget of \$2 million and a planned launch in mid- to late-2020. One will expand on *Solar Within Reach*, with a focus on greater funding and support for installing rooftop solar on affordable multifamily properties and at other businesses serving and located in under-resourced communities. The other will extend support for public and nonprofit-led community solar projects and will cover a portion of construction costs for those projects. Staff are applying the experiment-and-test method to all new incentives and adjusting elements as they learn from customers what is and is not working.

Innovations and Investments

Energy Trust's extensive portfolio of solar incentives tailored to support under-resourced customers is a significant change from three years ago when it had just two offerings—one for residential customers and one for commercial customers—and no additional funding available for customers who couldn't take advantage of tax credits and other enabling clean energy policies.

The Inclusive Innovations Project had two components that were crucial to its success. The first was the use of stipends to support community and nonprofit participation in both working groups, something Energy Trust had not previously offered. Community-based organizations made clear that they could not absorb the staff costs for hours needed for working group participation. Many operate on tight budgets and cannot be expected to take on additional work for free, and solar energy did not factor into the core mission of most participating organizations. Energy Trust invested \$42,000 in stipends over three years for two working groups, which also covered travel costs for participants in rural parts of the state, several of whom had to travel six hours to attend meetings. The stipends were critical to having a variety of voices at the table. Energy Trust has since revisited its policies regarding its advisory councils and begun offering stipends to members of its newly formed Diversity Advisory Council.

The other critical component was the provision of the innovation grants (mentioned above), which totaled \$80,000. The goal of the grants was to empower and support communities to develop their own program and project ideas. This method recognizes community-based organizations know the people they serve best, and with support, they may be able to come up with even better program ideas.

Through the Inclusive Innovation Project's iterative and open process, Energy Trust as a standalone confirmed that the need

to solicit input from all stakeholders is not just necessary but fundamental to creating programs tailored to the communities they are intended to serve. It sought input from partners directly and empowered the community to help in decision making by providing honest, deliberate feedback that Energy Trust could act on. By listening and learning, Energy Trust was able to build trust, value the expertise of others, and take an informed approach to constructing new, responsive, and effective programs and offerings. Going one step further to build knowledge and empower individuals to provide meaningful, efficacious feedback resulted in strong relationships and a system for developing and modifying future programs.

Energy Trust is promoting this model for others to adopt and replicate and is happy to share with other organizations the tools developed for this project, including the following: listening sessions outlines; worksheets used to teach concepts of solar output, capacity and cost; meeting agendas; stipend applications; innovation grant applications; and background on program models developed by innovation grantees and lessons learned.

Judges' Quote: *"Energy Trust has developed a model for genuinely engaging frontline, low-income communities, and diverse customers. It is successfully helping to enhance public engagement and empower local decision making. It is a best practice for how to increase low-income access to solar."*



About Energy Trust of Oregon

Energy Trust of Oregon is an independent nonprofit serving 1.5 million utility customers. Under the direction of the Oregon Public Utility Commission, Energy Trust invests in cost-effective energy efficiency, lowers the above-market costs of renewable energy resources and transforms markets to high-efficiency products and services. Since 2002, Energy Trust has provided cash incentives, technical assistance, services and information to help households, businesses, industries and public buildings save energy and generate renewable power at more than half a million locations. Energy Trust is working to fulfill Oregon's vision to meet future energy needs through affordable, clean energy sources.

For more information:

<https://www.energytrust.org/2019/04/19/energy-trust-awards-solar-innovation-grants-to-community-based-organizations-2>

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Program Highlights

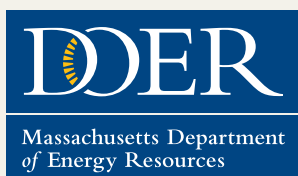
- ▶ Mass Solar Loan has facilitated the installation of 46 MW of solar PV across 97 percent of the state's municipalities. The greenhouse gas emissions reduced equates to taking approximately 4,000 cars off the road annually.
- ▶ Of the \$45 million in total program funding, roughly 95 percent was allocated for loan support.
- ▶ To date, roughly \$30 million (or 77 percent of the funding awarded) has gone to low- and moderate-income residents, supporting over 2,800 projects.
- ▶ Partnering with local banks and credit unions that bring loan underwriting and origination expertise, as well as private capital, allows the program to better leverage program funding and target income-based incentives.

Massachusetts Clean Energy Center (MassCEC) and Massachusetts Department of Energy Resources (DOER) Mass Solar Loan Program

The Mass Solar Loan program combines strategic incentives and partnerships with local banks and credit unions to increase access to solar PV financing, while creating a robust solar lending market. From the start of the program, incentives emphasized expanding access to low- and moderate-income customers, but the program is now focused exclusively on low-income homeowners, addressing challenges such as their limited ability to utilize the federal tax incentive and lower credit scores. To date, 77 percent of funding awarded has been to income-qualified residents. Since December 2015, over 5,400 loans totaling approximately \$173 million have been closed, activating 46 megawatts of residential solar PV in 342 of 351 Massachusetts municipalities. Loan requirements, such as fixed-rate terms, capped closing fees, and capped interest rates, ensure customers have a consumer-friendly option while lenders gain greater experience with solar. This approach has fostered a durable and competitive market for residential solar lending even as program incentives phase out over time.



Nine-kilowatt PV system installed through the Mass Solar Loan program in Cambridge, MA .
Photo courtesy of Invaleon Technologies Corporation



Mass Solar Loan Program Background

Since launching in 2015, the Mass Solar Loan program has enhanced the competitive marketplace for financing residential solar while ensuring a broad range of customers have access to this market, despite income or credit score limitations. This has been done through a combination of increased financing options and thoughtfully targeted incentives. Increasing the number of capital providers for solar has helped create and maintain a competitive marketplace. Incentives were designed to be more generous to start—jump-starting the market and reducing risk for lenders—then have stepped down over time to continue support exclusively for income-qualified customers.

MassCEC and DOER developed the Mass Solar Loan program following a 2013 study commissioned by DOER to evaluate solar financing models. The study found that the financial benefits to PV system owners and the local economy are greater when a solar project is owned by the customer instead of by a third party. Backed by the study's findings, the Mass Solar Loan program was designed to encourage direct ownership of residential solar through the creation of a low upfront-cost financing option that would be competitive with leases and provide more economic benefits than Power Purchase Agreements (PPAs).

In 2014 and 2015, MassCEC and DOER developed the detailed program design and structure through significant stakeholder outreach to the solar industry, local banks and credit unions, and local industry associations. The program enables customers who previously may have had no options to install solar PV to take advantage of the full benefits of owning a PV system (such as production incentives, energy savings, tax credits). As the market strengthened and matured, the program focused its incentives exclusively on income-qualified customers.

Current Program Incentives

The Mass Solar Loan program was originally a \$30 million program, but an additional \$15 million was allotted over time to support continued incentives for income-qualified customers. Mass Solar Loan now offers three incentive types to help expand access and reduce the costs of financing for low-income customers. These incentives have tiered down over time to focus funding most effectively on customers most in need:

- **Interest Rate Buy Down**, which currently reduces the lender's market rate by 1.5 percent for income-eligible customers.
- **Income-Based Principal Reduction**, which currently is a 30 percent buy down of the loan principal (capped at \$10,500) for income-eligible customers.


- **Loan Loss Reserve**, which acts as an added security to lenders for lending to income-qualified customers with lower credit scores. A Loan Loss Reserve account is created for each lender, reserving funds for recovery of a portion of a qualified customer's loan balance in the event the loan defaults. Any unused funds are returned to the program.

The program incentives are paid directly to the lender and then applied to the customer account, vastly reducing administrative payment efforts. In addition, the program offers ancillary benefits to participating lenders that ease the burden of launching a new loan product in a market that may be unfamiliar to them. These benefits include a built-in program loan structure (disbursements, required timelines), technical requirements, installer vetting and oversight, quality assurance efforts, technical review and approval of each application, and final review of each application to confirm installed details.

Program Goals to Expand Financing

Since the start of the program, the Mass Solar Loan program has achieved important program goals:

1. **Supporting growth of a competitive marketplace and financing options.** Mass Solar Loan has partnered with 17 local banks and credit unions that offered solar loan products through the program. Some of these lenders have since launched their own solar loan products, signaling that lenders intend to continue solar loan offerings beyond program timelines. MassCEC has also leveraged lessons learned, program materials, and data to educate many additional lenders considering independent solar financing products.
2. **Expanding financing access to broader ranges of customer incomes and credit scores.** Fifty-two percent of loans closed have been to income-qualified customers (2,814 loans), and 16 percent have been to customers with lower-than-preferred credit scores (866 loans). Participating installers have consistently indicated that the reduced costs for income-qualified customers has enabled them to reach new markets and provide attractive solar ownership options to customers who they were previously unable to serve with a worthwhile product. Similarly, participating lenders have indicated that the incentive support enables lending to customers who might have been otherwise denied.
3. **Creating a financial benefit to the customer while supporting the Massachusetts economy.** Through the lender partnerships, Mass Solar Loan has provided a low up-front cost ownership option. The majority of participating installers and lenders are local companies, indicating the \$173 million



Part of a 12-kilowatt PV system installed through the Mass Solar Loan program in Mashpee, MA.
Source: Mass Solar Loan Program

in total loan amount is being largely invested in the state's local economy.

Growing the Solar Lending Market

The Mass Solar Loan program was one of the first state-supported loan programs in the country to focus specifically on developing partnerships with local banks and credit unions, as opposed to a partnership with a single capital provider. The program educates the local Massachusetts lending industry and gives lenders an opportunity to engage with the rapidly growing clean energy industry. The program also leverages local lenders' networks and experience in underwriting and origination. This approach has reduced program operating costs and allows funding to focus on project awards. The innovative program design also allows lenders to build a product with longevity beyond the program timeline. Some participating lenders have embraced this engagement with clean energy and gone on to offer commercial solar loans or expand offerings to other clean energy technologies. Experience with the solar loan program has demonstrated to lenders the viability of a solar loan product, and the high-quality nature of borrowers choosing to pursue a solar project designed to be financially beneficial. Another key benefit involves encouraging inclusivity and equitability within the Massachusetts solar market, by expanding access to a wider range of borrowers, specifically those with lower incomes.

Finally, the program has demonstrated the ability of a solar loan product to facilitate new and positive customer relationships with lenders. In a post-installation survey of the solar loan borrowers, 89 percent of respondents indicated that they did not have a prior relationship with the lending bank or credit union, and 93 percent indicated they were likely to recommend their lender to a friend or colleague. These new relationships have brought additional business opportunities to Massachusetts lending institutions and have helped some participating banks and credit unions achieve community goals.

As of January 2020, \$39 million of the award funding had been reserved for projects, leveraging \$176 million in total private spending.

Adjusting to Market Conditions

The Mass Solar Loan program has adjusted to market conditions. The Interest Rate Buy Down was originally offered at 3 percent to all customers, but it was gradually adjusted and is now offered at 1.5 percent to income-qualified customers only. The Income Based Principal Reduction stepped down over time from 20 percent, to 10 percent, to 0 percent for moderate-income-qualified customers, but it has remained at 30 percent for low-income customers, as this level has proven successful in enabling that market segment to access financially beneficial solar PV ownership. Eligibility for the Loan Loss Reserve incentive is only for loans made to customers with qualifying credit scores, and it has been adjusted from including all income levels to low-income only. This incentive acts as a security for lenders to recover part of an eligible defaulted balance. This loan loss reserve also provides an additional opportunity to leverage funding. If default rates remain low (current default rate under the program is 0.3 percent), much of this funding will not be expended and could become available for reinvestment in state clean energy programs.

Non-income-qualified customers can still participate in the program with a non-incentivized, market rate loan. Mass Solar Loan leverages the application portal and program structure in support of lenders, encouraging a sustainable market without additional incentives. A steady application rate for non-incentivized applications confirms the tiered changes to incentive eligibility were appropriately tied to market conditions.

Partnerships Lead to a Successful, Innovative Program

MassCEC engaged extensively with stakeholders and partners long before the program launched. Without this early collaboration, the program would have had many fewer loans,

lending institutions, and installer partners, and would have been less successful in targeting support for the low- and moderate-income markets.

The Massachusetts Bankers Association, many local banks and credit unions, solar industry trade organizations, and others contributed significantly by providing feedback on program structure and operation. This strategic planning helped inform loan parameters, disbursement schedules, and other key components of the loan product that were critical to the unique design of the program. Innovative program features include:

- **Multiple targeted incentive types:** Three incentive types are available to comprehensively address the key barriers in residential solar lending: Interest Rate Buy Down targets lowering interest rates; Income-Based Principal Reduction offers a principal buy down to income-qualified customers; and a Loan Loss Reserve enables lenders to widen the range of borrowers' credit scores they accept.
- **Loan disbursement schedule:** At loan closing, 35 percent of the loan is disbursed to cover the deposit and starting construction costs. Once installed, the remaining 65 percent is disbursed.

- **Interest-only period:** Once the loan has closed, the customer pays interest-only monthly payments until the system has been completed. This reduces the financial burden prior to receiving energy savings and system revenues.
- **Loan re-amortization option:** Lenders offer one free re-amortization within 18 months of loan closing. This allows customers to reduce their monthly payment following receipt of the principal buydown or tax credits.

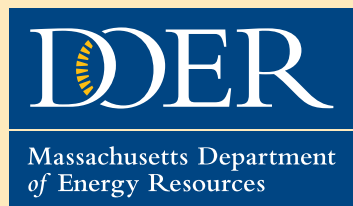
The Mass Solar Loan program offers a replicable program structure for state agencies or other organizations across the country. The program design could be modified to best solve a state or locality's unique hurdles to developing a residential solar financing market.

Judges' Quote: *"This innovative program has been highly effective in driving direct ownership of solar with its financing and capacity-building approaches. The program has been a significant driver for low-income solar ownership and can be a model for other states."*



Massachusetts Clean Energy Center (MassCEC)

MassCEC is a state economic development agency dedicated to accelerating the growth of the clean energy sector across the Commonwealth to spur job creation, deliver statewide environmental benefits, and secure long-term economic growth for the people of Massachusetts. MassCEC works to increase the adoption of clean energy while driving down costs and delivering financial, environmental, and economic development benefits to energy users and utility customers across the state. MassCEC manages the Renewable Energy Trust fund for the state. www.masscec.com



Massachusetts Department of Energy Resources (DOER)

DOER develops and implements policies and programs aimed at ensuring the adequacy, security, diversity, and cost-effectiveness of the Commonwealth's energy supply to create a clean, affordable and resilient energy future. As part of DOER, the Emerging Technology Division works with other DOER Divisions and related state and federal agencies to develop programs and initiatives which promote energy resilience, energy storage, and electric vehicle technologies. www.mass.gov/doer

For more information:

<https://www.masssolarloan.com>

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Program Highlights

- ▶ Low-income households have signed up to participate in two Michigan community solar projects.
- ▶ Participants also receive free weatherization services in order to maximize energy savings and environmental benefits.
- ▶ Participating households save an average of \$20-\$30 per month on their electric bills.
- ▶ Through the program's activities, Michigan EGLE can better understand and address low-income energy challenges and demonstrate a wide range of locally designed energy efficiency and distributed renewable energy solutions.

Michigan Department of Environment, Great Lakes, and Energy

MICHIGAN SOLAR COMMUNITIES— LOW- TO MODERATE-INCOME ACCESS PROGRAM

The Michigan Department of Environment, Great Lakes, and Energy's (EGLE) *Low- to Moderate-Income Access Program* uses a community solar model to enable customers to access solar, obtain weatherization services, and save on their electric bills. The program represents a close partnership between two local electric utilities (Cherryland Electric Cooperative and the Village of L'Anse Electric Utility), state government, and weatherization and community action entities. Since the start of the program in 2018, 75 Michigan households have signed up to participate in two community solar projects, with the Cherryland's 50 subscribers each receiving bill credits averaging about \$350 per year, and the L'Anse project subscribers earning about \$275 in solar bill credits each year. Through these pilot projects, Michigan is gaining valuable data on program participants' energy use while program managers are learning how to better address low-income energy challenges.

Helping Households in Need

Low-income households often have a high energy burden, paying a significant percentage of their income towards energy bills. Reducing energy expenses can have a big impact on a low-income household's budget, freeing up limited funds that can be spent on other necessary expenses such as food, rent, medicine, and transportation. The *Michigan Low- to Moderate-Income Access Program* aims



Village of L'Anse Community Solar ribbon cutting ceremony in September 2019. Source: Julie Staveland, EGLE

to address the roadblocks that low-income communities face in accessing renewable energy and efficiency.

In order to be eligible to participate, households must be at or below the federal poverty line, live in single-family housing units, and be willing to share energy usage data. Participants sign up for a share in a local community solar array in the Cherryland or Village L'Anse electric service territories, for which they receive a monthly solar bill credit for their subscription. This "community solar" model allows people to participate in solar energy and access solar energy savings, without the upfront expense of putting solar on their property. This model makes solar accessible to both renters and homeowners who do not have adequate roof space. And, it can be more economical and efficient to build one large, shared, solar project as opposed to smaller individual residential installations.

Participating households must pass a home energy audit that determines that the home is adequately weatherized, or they are required to access free weatherization services. Pairing weatherization with community solar ensures maximum cost savings for participants and increases the environmental benefits from the project. Weatherization improvements were funded through the Weatherization Assistance Program (WAP), a federal energy efficiency funding program for low-income people. Michigan's WAP is run by the State of Michigan Department of Health and Human Services. This agency played an important role in this project, by assisting the local Community Action Agencies to find low-income households to enroll in the program.

Program participants are saving an average of \$20-\$30 per month on their electric bills, through the combination of weatherization and community solar participation. The electric utilities have reported that the number of late payments among participants has decreased, indicating that it has gotten easier for program participants to pay their bills. In program surveys, participants report that they can keep their homes warmer in the winter, which is crucial in Michigan's harsh winters, and that they are now able to allocate their limited funds to other necessities, which in turn has reduced their stress levels. Other program benefits include improving participants' understanding of renewable energy and energy efficiency and reducing greenhouse gas emissions.

The *Low- to Moderate- Income Access Program* is ongoing and will conclude at the end of the community solar project's lifespan.

Program Evolution: From Cherryland to Village L'Anse, and Beyond

The *Michigan Low-to-Moderate-Income Access Program* began as a pilot project through the U.S. Department of Energy's Clean Energy for Low Income Communities Accelerator (CELICA), a voluntary federal partnership with state and local governments to provide low-income communities with access to renewable energy. It has now grown to become its own self-sufficient program.

In phase one of this project, the federal government granted \$80,000 in CELICA funds towards the Cherryland pilot in 2017. State of Michigan EGLE Energy Services paid for the solar subscriptions for the 50 participating low-income households, meaning that there were no out-of-pocket costs for program participants. Subscribers first saw credits on their electric bills in 2018 and will continue to receive credit through the lifetime of the solar array. Subscribers receive a monthly bill credit of 10 cents per kilowatt hour for the output of their solar share, or about \$350 in solar bill credits each year. After year one of the solar program, there was a total annual energy usage decrease of 0.7 percent and decrease of 9.7 percent in late payments from the enrolled households.

In phase two of this project, the program expanded to the Village of L'Anse in 2019. Subscribers were given the option to lease between one and 10 solar PV panels for a specified number of years. For instance, a subscriber leasing 10 solar panels will receive a monthly bill credit of 0.095 cents per kilowatt-hour for the output of their PV share, or about \$276 in solar bill credits each year. Priority was given to households with income at 200 percent or below the federal poverty line. Secondary priority was given to households between 200 percent and 300 percent of the federal poverty line.

This project utilizes an on-bill financing option for subscribers. On-bill financing is a popular option for low-income clean energy projects because it does not require up-front costs or credit approval, making it potentially more accessible to a wider range of customers. In the Village of L'Anse project, payments of \$0.90/month/panel for a term of 25 years are assessed on the subscriber's monthly electric bill. This cost is offset by the solar credit earned from the panels. So far, there have been no out-of-pocket costs for participants, as the solar credit has exceeded the lease payment for the panels.

There are numerous differences between the two projects, in terms of eligibility requirements, number of subscribers, financing, and other program details. These differences



Village of L'Anse Community Solar panels. Source: Julie Staveland, EGLE

occurred because each program was specifically tailored to the community it serves and developed in collaboration with the local community action agency. One of the main differences between the two projects is the addition of on-bill financing in the Village of L'Anse project, which will provide a valuable point of comparison and help inform future projects.

The installation cost for both of the community solar projects was about \$317,000. The Cherryland Electric Cooperative community solar installation (450 solar panels, two-megawatt system) cost approximately \$220,000, and the Village of L'Anse community solar installation (200 solar panels, 110-kilowatt system) cost approximately \$97,000. EGLE Energy Services contributed \$142,000 collectively to these projects. In addition

to providing funding, EGLE also plays an important convening role, and provides critical project support by helping to lead discussions, answer questions, and fill gaps where needed.

Going forward, the next phases of the program will involve a partnership with an investor-owned utility. A project was on track to take place in the summer of 2020 but was stalled due to COVID-19. EGLE is hopeful that phase three can take place in the fall of 2020. They are in conversation with the community action agency, and the Department of Health and Human Services, and are now working to identify which community they want to settle in, how many households to include, and what kind of data to collect. In round three, EGLE will have the opportunity to make changes based on lessons learned from phases one and two.

Harnessing Energy Data to Inform Future Programs

Through this program, Michigan EGLE is able to better understand and address low-income energy challenges and demonstrate a wide range of locally designed energy efficiency and distributed renewable energy solutions. A key element of program evaluation is data collection.

The following metrics are collected annually in collaboration with the local electric utility and local community action agency:

Cherryland Electric Cooperative Project

- Average electricity cost (\$/month) prior to weatherization services
- Average electricity cost (\$/month) with weatherization services in place
- Average electricity usage (kWh/month) prior enrollment into program
- Average electricity usage (kWh/month) after enrollment into program
- Energy Waste Reduction services provided
- Late payments

Village of L'Anse Project

- Average electricity usage (kWh/month) prior to weatherization services
- Average electricity cost (\$/month) prior to weatherization services
- Average electricity usage (kWh/month) with weatherization services in place
- Average electricity cost (\$/month) with weatherization services in place
- Average electricity usage (kWh/month) after enrollment into on-bill community solar financing program

- Average electricity cost (\$/month) after enrollment into on-bill community solar financing program
- Energy weatherization services provided
- Late payments

Both projects provide information on whether a subscriber receives Low-Income Home Energy Assistance Program (LIHEAP) or Energy Assistance funding. Due to the limited energy weatherization services data from the local community action agency and DHHS, an extensive weatherization survey was created and provided by the EGLE Energy Services at the beginning and end of year 1 of the solar projects. This detailed preliminary and post survey provides consistency for the *Low- to Moderate- Income Access Program*.

EGLE also collects data from subscribers via surveys to measure their satisfaction with the program. So far, program satisfaction has been very high, as subscribers are saving money and are able to keep their homes at more comfortable temperatures.

This program can be replicable by or readily modified to make it applicable to other states or jurisdictions. There are continued discussions within the State of Michigan to implement more community solar programs.

Additional Efforts to Support Solar Development in Michigan

With any renewable energy project, zoning needs to be in place before a project can move forward. In an effort to help communities plan for the zoning requirements related to renewable energy, EGLE has partnered with the University of Michigan to create a zoning database of all 1,856 local jurisdictions within the State and indicate if the zoning references renewable energy, wind and/or solar, on both a residential and commercial scale. This zoning database is free and available online. EGLE, through its grant with the University of Michigan, is also providing technical assistance related to renewable energy zoning to local governments to assist them in making informed decisions for planning/zoning/policymaking related to clean energy. The zoning database and technical assistance allows local governments to ensure that they have the zoning requirements in place in order to create renewable energy programs in their communities, such as implementing a Michigan Solar Communities program.

Judges' Quote: *"This program exemplifies how partnerships between state government and local electric utilities can use community solar to increase low-income access to solar. It would be easily replicable by states even with limited resources."*



About the Michigan Department of Environment, Great Lakes, and Energy (EGLE)

EGLE's mission is to protect Michigan's environment and public health by managing air, water, land, and energy resources. EGLE Energy Services is committed to promoting healthy communities, economic growth, and environmental sustainability through energy efficiency and renewable energy. We support individuals, businesses, and communities by providing educational awareness as well as technical, financial, and referral assistance. Energy Services offers a variety of programs each year to catalyze growth and jumpstart Michigan entities in reaching their own energy goals. The programs range from aiding communities, K-12 public schools, manufacturing, agriculture and rural business sectors, and other public entities. Some of the projects for these programs may include, but are not limited to, benchmarking, Energy Star certification of public facilities, training, sponsorships, guidance documents, and energy project implementation.

For more information:

https://www.michigan.gov/climateandenergy/0,4580,7-364-85453_98214_98271-521093--,00.html

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Program Highlights

- ▶ From its first two off-shore wind projects, New York will realize over 1,600 direct new jobs, as well as more than \$3.2 billion in new economic activity.
- ▶ By developing 9 GW of offshore wind by 2035, New York has the potential to bring billions of dollars in private investment, including major upgrades to infrastructure, 10,000 jobs, and contribute approximately 30 percent of the state's electricity load.
- ▶ NYSERDA's Offshore Wind Program offers an opportunity to meaningfully pursue retirements of New York's dirtiest fleet of fossil-fuel generators, while delivering approximately \$700 million of avoided health impact benefits.
- ▶ This program has the potential to bring significant economic benefits to New York's disadvantaged communities, including environmental justice and low-income communities, with a significant share of the state's expected 10,000 jobs associated with 9 GW of offshore wind by 2035.



NYSERDA

New York State Energy Research and Development Authority (NYSERDA) OFFSHORE WIND PROGRAM

Since 2016, the New York State Energy Research and Development Authority (NYSERDA) has been working to develop offshore wind on behalf of New York in the most responsible and cost-effective way possible. Its first procurement of offshore wind power has demonstrated the resounding success of its years of careful study, stakeholder engagement and planning. NYSERDA's Offshore Wind Program and New York's goal of 9,000 megawatts (MW) of power by 2035—is the cornerstone of New York's aggressive clean energy ambitions, reflecting unparalleled resource potential and co-benefits that will yield important dividends for the New York and the north-eastern Atlantic region's economies and decarbonization efforts. With its heavy emphasis on proactive and detailed planning, and especially stakeholder engagement, the program has given New York confidence to support the nation's largest offshore wind mandate and buttresses the region's aggregated goals of 26,000 MW.

State Leadership with a Vision

Under Governor Andrew M. Cuomo's leadership, New York is combatting the urgent threat of climate change with ambitious climate and energy goals and a concrete plan for achieving them. The state's *Climate Leadership and Community Protection Act* (CLCPA) provides a comprehensive approach to decarbonizing New York's electricity sector by achieving 70 percent renewable energy by 2030 and 100 percent clean energy by 2040.



NYSERDA celebrates the signing of the nation's most aggressive climate legislation, the *Climate Leadership and Community Protection Act*, and the announcement of the nation's largest procurement of offshore wind totaling nearly 1,700 MW. (July 2019) Source: NYSEDA

NYSERDA: Offshore Wind Program



NYSERDA presents its offshore wind programs and first awarded projects, Sunrise Wind and Empire Wind, to the community of Sunset Park, Brooklyn, as part of its September 2019 Open House series. Source: NYSERDA

Confidence in the state's ability to achieve these aggressive targets has been built on strong recognition of the potential of offshore wind to be a cost-effective resource with unparalleled public health benefits and economic growth potential. NYSERDA is coordinating offshore wind opportunities in New York State to bring clean, locally produced renewable energy to the state.

In the fall of 2018, NYSERDA issued its first solicitation for 800 MW, or more, of offshore wind to stimulate the development of the domestic offshore wind industry, reduce the cost of later offshore wind procurements, and allow New York State to realize the economic benefits associated with the construction, operation, and maintenance of offshore wind resources.

Through NYSERDA's Phase I solicitation, Sunrise Wind (880 MW, a joint venture of Ørsted A/S and Eversource Energy) and Empire Wind (816 MW, Equinor Wind US) were selected for contract negotiation pursuant to a rigorous evaluation process that considered proposal price, New York State economic benefits, and project viability. Once these facilities reach commercial operation in 2024, NYSERDA will procure Offshore Wind Renewable Energy Certificates (ORECs) from the awarded facilities as they deliver clean, resilient offshore wind energy to New Yorkers for 25 years or more.

The contracts that NYSERDA executed with the two projects in October 2019 represent an average all-in development cost of \$83.36 per megawatt-hour (2018 dollars) and an expected average Index OREC cost of \$25.14 per megawatt-hour. A significant indicator of the success of NYSERDA's programmatic approach to the market, this first large-scale offshore wind

solicitation resulted in OREC prices approximately 40 percent less than projected by analysis NYSERDA conducted in 2018, signaling that offshore wind is an increasingly competitively priced renewable energy resource.

New York's OREC contracting structure for these initial projects is based on an index of wholesale market prices, and the indexed REC price will go up or down, depending on prices in the energy and capacity markets. This will mitigate wholesale market volatility and price swings, lowering capital costs, decreasing risk, and increasing savings for ratepayers. Totalling 1,696 MW of nameplate capacity, the projects will deliver enough renewable energy to power more than one million New York homes and represent the single largest renewable energy procurement by any state in U.S. history. For less than \$1 dollar per month for an average residential customer, they will bring:

- \$3.2 billion in combined economic impact to New York State
- More than \$85 million in investments in long-term port facilities and cutting-edge technologies
- More than 1,600 jobs in project development, component manufacturing, installation, and operations and maintenance, directly offering careers with salaries of approximately \$100,000 per year
- Approximately \$700 million of avoided health impact benefits in the form of avoided hospitalization and premature death associated with asthma and respiratory and cardiovascular diseases
- Carbon emission savings of approximately four million metric tons of CO₂ avoided, equivalent to removing 830,000 cars from the road annually.

Developing and Implementing a Comprehensive Master Plan

Between 2016 and 2018, NYSERDA developed the New York State Offshore Wind Master Plan, which provides a comprehensive roadmap based on more than 20 studies. The Plan was informed by extensive stakeholder engagement that encouraged the development of offshore wind in a manner that is sensitive to environmental, maritime, economic, and social issues while addressing market barriers and aiming to lower costs. Since the Master Plan's publication in January 2018, New York has expanded its offshore wind goals fourfold to 9 gigawatts by 2035, as codified under the CLCPA. NYSERDA has continued to evolve its approach to cost-effective and responsible offshore wind development into a responsive offshore wind program, with on-going focus on:

- **Supply Chain, Workforce and Economic Development.** NYSERDA is hosting critical business-to-business matchmaking events to support education about this new industry and to bring together local businesses, training providers, labor organizations, and educators to coordinate with offshore wind developers, component manufacturers, and service suppliers to identify the technology and training needs of New York's first projects, and future offshore wind projects in the region. In addition, NYSERDA is working in collaboration with the New York State agencies to advance a competitive process to award \$200 million in public investment in port infrastructure improvements to attract manufacturing, assembly, and maintenance of offshore wind equipment to New York. NYSERDA is also helping steward the launch of a \$20 million Offshore Wind Training Institute, which will generate the institutional infrastructure to educate and train over 2,500 New Yorkers.
- **Pre-Development, Open Data, Environmental Science and Fisheries Research.** NYSERDA has executed multiple, multi-year contracts to study and actively publish significant meteorological and oceanographic ("metocean") conditions in the waters off the Atlantic coast of New York, including commitments of \$5.5 million for predevelopment data collection, and \$2 million in five multi-year projects to further study important environmental considerations and commercial fishing.
- **Transmission and Grid Development.** New York is conducting analysis to better understand ways to facilitate the development of an offshore transmission grid and to learn about opportunities for transmission and energy storage to support the achievement of New York's goals to get 70 percent renewable energy by 2030 and 100 percent carbon-free grid by 2040. These analyses will inform renewable energy-related proceedings at the Department of Public Service, as well as the state's ongoing renewable energy procurement efforts.
- **Stakeholder Engagement.** During the development of the Master Plan, NYSERDA's Offshore Wind Team held 13 public

meetings and open houses, six public webinars, and two technical conferences. In conjunction with the first solicitation, the Offshore Wind Team conducted more than 100 briefings with key stakeholders such as community fishing, and with the public, and elected officials that specifically focused on communities that might serve as hosts to various offshore wind project components (cable landfall, interconnection substations, port infrastructure), prior to and following NYSERDA's receipt of proposals, to ensure their familiarity with NYSERDA's offshore wind program, procurement process, and the state's ambitious energy agenda. The Offshore Wind Team continues to host quarterly public webinars, and together with state agency partners, hosts regular meetings of four Technical Working Groups.

Investments and Innovation

NYSERDA's Offshore Wind Program including the Master Plan and other early program work has been funded since 2016 with \$15 million under the state's 10-year, \$5.3 billion Clean Energy Fund (CEF). More recently, in effectuating its initial procurement, NYSERDA's Offshore Wind Program has been supported through the future rate-base stream offered by OREC revenues, with approximately \$9.7 million in funding authorized by New York's Public Service Commission via its July 2018 Order Establishing Offshore Wind Standard and Framework for Phase 1 Procurement. With the nominal total contract value of approximately \$5.92 billion for its first two projects, NYSERDA's Offshore Wind Program constitutes less than 0.1 percent of the resultant contract values. With a combined spend to-date of less than \$25 million, NYSERDA is delivering the first of what is anticipated to be billions of dollars of direct investments and 10,000 jobs in New York State.

NYSERDA's Offshore Wind Program and the success of its initial contracts have ushered in a seismic shift in the state's approach to large-scale renewable energy generation. NYSERDA's first offshore wind contracts utilize an innovative Index OREC contracting structure where payments rise and fall inversely to a composite average of New York's energy and capacity market prices, which provides protection for ratepayers and projects against volatility in utility bills and project revenue, respectively. Private developers' positive response to the first procurement and an analysis of the benefits of the Index REC model for land-based renewable procurements encouraged the Public Service Commission in January 2020 to adopt the Index REC model for future procurements under the state's large-scale renewable generation program.

NYSERDA: Offshore Wind Program

NYSERDA's Offshore Wind Program works closely with Climate Jobs NY, a growing coalition of labor unions united to combat climate change and reverse inequality and whose goal of educating fellow workers, building alliances, and advocating for policy solutions seeks to demonstrate that there is not a conflict between a healthy planet and good jobs. NYSERDA's Offshore Wind Program also works closely with academic and training institutes including the State University of New York's Farmingdale and Stony Brook locations that will serve as the anchor for the \$20 million Offshore Wind Training Institute, so that training can begin as early as 2021, when the industry is expected to need a significant number of new skilled employees. Through the concentrated work of its Technical Working Groups, of novel composition, structure, and active responsibility, New York has fostered constructive dialogue with critical local and regional stakeholders such as the commercial fishing industry, navigation representatives, environmental activists, workforce development and supply chain experts to cultivate a regional dialogue between proponents, opponents, and undecided stakeholders in grappling with the development of an offshore wind industry in the mid-Atlantic. NYSERDA was also the first to conceive of using Environmental and Fishing Mitigation Plans in its procurements as a means for projects to demonstrate a strong commitment to implementing environmental, fishing, and ocean use priorities as voluntary

measures—over and above regulatory requirements — through the inclusion of mitigation plans that actively address the interests of ocean users such as commercial and recreational fishing and environmental stakeholders and ensure that coastal communities will be fully engaged and informed during the development and construction process.

After NYSERDA unveiled its Mitigation Plan approach, the State of Connecticut's Department of Energy and Environmental Protection implemented a similar approach in its 2019 offshore wind procurement to widespread stakeholder approval. More broadly, the Program is emerging as a global offshore wind center-of-excellence alongside such mature markets as the United Kingdom, Norway, and Denmark. Through regular engagements with the Consulate Generals and respective national energy agencies, NYSERDA's Offshore Wind Program is beginning to serve as the basis for best practices along such topic lines of economic incentives to supply chain localization and stakeholder engagement, even within such mature markets.

Judges' Quote: "NYSERDA's comprehensive offshore wind development efforts are helping to build regional momentum with other states and to create a robust new industry that will drive investments, create jobs, improve partnerships with marine and fisheries groups, and result in cleaner air and public health benefits."



About New York Offshore Wind Program (NYSERDA)

The New York State Energy Research and Development Authority (NYSERDA) offers objective information and analysis, innovative programs, technical expertise, and support to help New Yorkers increase energy efficiency, save money, use renewable energy, and reduce reliance on fossil fuels. A public benefit corporation, NYSERDA has been advancing energy solutions and working to protect the environment since 1975. NYSERDA is leading the coordination of offshore wind opportunities in New York State and is supporting the development of 9,000 megawatts of offshore wind energy by 2035 in a responsible and cost-effective manner. Offshore wind will be a crucial step on the pathway to a carbon-neutral economy and a critical component in achieving the expanded Clean Energy Standard, whereby 70 percent of New York's electricity will come from renewable sources by 2030 under the Climate Leadership and Community Protection Act (CLCPA), New York's ambitious and comprehensive climate and clean energy legislation.

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Program Highlights

- ▶ The Energy Storage-Shares program allows commercial customers to make an up-front investment in a utility-owned battery storage instead of installing a battery at their business. The program provides guaranteed savings to the participating customers without impacting their business operations, imposing maintenance obligations, or requiring physical space at their business for a battery system.
- ▶ SMUD bundles customer investments to install a large battery at an optimal location on the grid, where its value is far greater than the collective benefit from individual customer battery installations.
- ▶ When SMUD maximizes utilization of the battery, it reduces risk of stranded assets through utility ownership. SMUD uses the battery to defer infrastructure costs, which benefits all customers.
- ▶ Energy StorageShares aligns retail benefits with grid benefits, because battery dispatch is based on the needs of the entire electrical system rather than an individual load.



Sacramento Municipal Utility District (SMUD) ENERGY STORAGE SHARES

SMUD's innovative Energy StorageShares program is the first virtual storage program in the US. StorageShares allows SMUD's commercial customers to invest in energy storage and enjoy energy cost savings without siting batteries at their facilities. Eligible commercial customers make an up-front payment to SMUD for program participation, and in exchange they receive a monthly on-bill credit for a 10-year term, reflecting the savings an on-site battery would have provided through demand charge reduction. SMUD bundles the investments from program participants with its own capital and procures a battery in a location that optimizes grid benefits. The program provides guaranteed savings to the customer without impacting their business operations, imposing maintenance obligations, or requiring physical space at their business for a battery system. All SMUD customers benefit from the Energy StorageShares program because SMUD's costs are reduced through peak demand reduction and deferral of distribution system investments.

Shared Costs and Benefits

Launched in January of 2019, SMUD's Energy StorageShares program allows commercial customers to maximize the benefits from an investment in energy storage without having to host a system, while also increasing the overall benefits that energy storage can provide to the electrical grid. Eligible commercial customers are given the option to make an up-front investment into the StorageShares program instead of installing a battery behind the meter at their business. In exchange for the investment into the program, participants receive "storage shares." Each share provides 1 kilowatt (kW) of demand charge reduction savings that is credited monthly on the customer's bill over a 10-year term. The demand savings from a share represents the savings an on-site battery would have provided to the customer for demand charge reduction.



SMUD Energy StorageSharesSM

Virtual behind-the-meter battery storage
program for commercial customers

Sacramento Municipal Utility District (SMUD)

SMUD bundles the investments from the program participants with its own capital, procures a utility-scale battery, and installs it at a location that increases overall grid benefits. The program provides guaranteed savings to the customer without impacting their business operations, imposing maintenance obligations, requiring prediction of load peaks, or taking physical space at their business. Because SMUD can install a single large battery in place of many small ones, the program also enjoys economies of scale. Share prices in 2020 range from \$475 to \$520 per share, depending on the customer's electric rate class.

Assessing the Storage Benefit

The Energy StorageShares program is designed to mirror the economic benefits and value that an on-site battery system would provide to the customer. Estimating those benefits begins by analyzing the electric load to determine the battery size to meet the customer's need. SMUD has developed a battery sizing tool to perform this calculation. The tool looks at the customer's most recent 12 months of operating data and estimates the optimal battery size that would meet demand charge reduction needs. This estimate sets the upper limit on the number of shares the customer would be offered through the program. Using actual load data to calculate the optimal battery size ensures that the program is aligned with the benefits a behind-the-meter battery would be able to provide, while preventing customers from over-subscribing in the program to reduce their demand beyond what an on-site battery system could achieve.

Additionally, commercial customers interested in Energy StorageShares are bound by the following eligibility requirements:

1. Customers must have actively been considering the adoption of energy storage for demand charge reduction.
2. Customer share acquisition is limited to no more than 50 percent of the customer's peak demand within the most recent 12 months (for example: a customer with a maximum demand in the last 12 months of 500 kW is eligible for no more than 250 shares).
3. After joining Energy StorageShares, the customer is not allowed to install on-site energy storage for further demand charge reduction, or they will be expelled from the program. This provision is required to ensure that the customer does not "double-dip" on demand charge reduction savings.

Once enrolled in the program, participating customers receive a monthly on-bill credit. The value of the credit is not static over the 10-year term of the participation contract; instead, the value will change over time based on SMUD rate changes. That way, just as the value of a behind-the-meter battery

increases when demand charge rates rise, the benefits that a share provides will also increase when demand charges increase.

Since launching this program, SMUD has begun work to procure a new, 4-megawatt (MW), utility-scale battery—interconnected at the distribution level—that will provide the initial 4,000 shares for the Energy StorageShares program. This is SMUD's first utility-scale battery that will help implement the utility's long-term plans to meet the energy storage needs, which are forecasted to be approximately 246 MW by 2030. The 4-MW/8-MWh battery will be installed in an area forecasted to have increased load growth due to planned new residential subdivisions that will have roof-top solar, as well as the potential load increase due to planned indoor agricultural facilities. With the new battery, this area will no longer need a planned reconductor upgrade to handle the load growth. In addition, when the battery is not being used to support local infrastructure needs, SMUD may also rely on it to provide local grid services, participation in the Energy Imbalance Market, capacity/resource adequacy, energy arbitrage, ancillary services and PV smoothing. The StorageShares program is being implemented based on the initial 4-MW battery, but additional sites are being evaluated. Current considerations include a potential locational need for 9 MW/18 MWh of battery storage in 2022 to defer the construction of a new substation and add an additional 9,000 StorageShares to the program.

Using Energy Storage to Maximize Benefits and Meet Net-Zero Goals

The Energy StorageShares program is one of the tools developed by SMUD to maximize customer and utility investment into battery storage to ensure optimal benefits in its push for greenhouse gas (GHG) emission reductions. SMUD's Integrated Resource Plan calls for net-zero GHG emissions by 2040; achieving net-zero GHG emissions requires significant investment in renewable generation, Distributed Energy Resources (DERs) and electrification of buildings and transportation. To ensure that SMUD can meet its 2040 goals, they are developing innovative ways to engage with DERs and enable different types of technology to support the electrical grid.

Balancing customer and utility benefits can be a challenge because the value of each party does not always align. Traditional demand charge reduction, for example, does not always result in reduced emissions. When a battery is managing the load peaks of an individual customer, which may not be coincident with regional load peaks, the actions of that battery may be counter to the needs of the local grid: load can be added when the grid is constrained, and load may be shed when there is no local need. Additionally, because many commercial batteries



SMUD office in Sacramento, California. Source: SMUD

are not paired with renewable energy, efficiency losses of a battery system could result in a net increase in GHG emissions when a battery is used just for demand charge reduction. The SMUD Energy StorageShares program avoids the misalignment between customer operation of a battery and the grid by virtualizing the customer savings and dispatching the battery based on grid needs, rather than the needs of individual customers.

Because individual customer benefits are separated from battery operating decisions, SMUD can ensure that the dispatch of the battery is providing the most valuable service at any given time. This can result in increased penetration of distributed generation by absorbing excess generation, limiting the amount of new grid infrastructure that needs to be built due to electrification, and reducing reliance on natural gas power plants. Individual behind-the-meter systems can also support these objectives if coordinated, but this is not generally the case in traditional demand charge management scenarios.

In addition to improving the operating effectiveness of the electrical grid, the StorageShares program can also enhance customer business models. For example, Electrify America, an electric vehicle charging company, recently joined the program by investing \$1.3 million. In return, it will receive demand charge reduction credits for 12 electric vehicle (EV) charging sites in SMUD's service territory. Through the Energy StorageShares program, Electrify America was able to invest in battery storage, benefit from demand charge reduction, and avoid the risk of stranded assets in the future when direct-current fast chargers (DCFC) become more common at EV charging stations. As EV adoption proliferates the load factor at DC charging stations improves, the load will become less peaky and the benefits of behind-the-meter batteries will decline—but the value of StorageShares will remain high. Participation in StorageShares reduces the monthly operating cost of the DCFC stations through demand charge reduction savings, avoids the installation of energy storage systems at areas of the grid with limited need for batteries, and supports providing access to high speed charging for electric vehicles.

Improving Economics and Expanding Battery Storage

Battery energy storage is approaching cost effectiveness in SMUD's service territory, but in most cases, economics alone do not justify installing a battery storage system. Based on planned rate changes and anticipated cost reductions in battery storage, SMUD estimates general cost effectiveness will occur around 2023 or shortly thereafter. While the economics are not enough for most customers to adopt batteries, there is a growing number of customers willing to be early adopters and accept longer payback periods when they consider battery energy storage. The StorageShares program is working with those early adopters to improve the economics of energy storage for both the customer and SMUD. When SMUD maximizes the utilization of the battery, it reduces risk of stranded assets through utility ownership, and it defers infrastructure costs, which benefits all customers. When retail benefits align with grid benefits, battery dispatch is based on the needs of the entire electrical system rather than an individual load and on improved economies of scale.

Economies of scale significantly reduce the cost of battery energy storage. It is far more expensive to install many small battery systems than to install a few large battery systems. The Energy StorageShares solution results in the same total installed capacity of batteries as the installation of behind-the-meter systems, however the resulting grid benefit from that capacity is significantly increased when the battery is strategically located and utility controlled.

No outside funding will be used to support or implement this program. SMUD anticipates customer investment will cover about 40 percent to 50 percent of the initial battery procurement for this program. The balance of the battery cost is funded from SMUD's investment in battery storage. Without this program, SMUD's investment in distribution energy storage would not be cost effective and may have been delayed while waiting for battery prices to decrease further. However, by enabling customer investment to leverage SMUD's costs for the battery, the economics of the investment are improved and investment in energy storage is possible today.

Sacramento Municipal Utility District (SMUD)

SMUD's long-term goal for energy storage is for the technology to become a standard tool used by grid planners and operators in their day-to-day work. Successful integration with energy storage means that the technology is evaluated side-by-side with other options during the grid and resource planning processes. When a battery is the right choice to address a grid need, utilities should be confident in selecting that option to solve the problem. Grid infrastructure costs can range from thousands of dollars well into the millions. Batteries may not be the most effective solution to meet all grid needs, but by implementing innovative programs such as StorageShares to improve the economics of battery energy storage, the range of opportunities to use batteries to meet grid needs can be expanded.

Beyond ensuring effective deployment of battery energy storage and maximizing operational benefits, StorageShares also addresses many barriers that could prevent access to storage for some customers. Grid interconnected batteries remain a nascent technology. Business models for implementing battery storage are continuing to evolve as are discussions around safety, insurance, and liability. Though commercial businesses may be able to benefit from battery energy storage and have strong incentives for investing, many of these customers may not own their facilities. Installation of a behind-the-meter battery—although economically possible and beneficial for those customers—may not be feasible based on requirements or restrictions from the building owner. Installation of behind-

the-meter batteries can impact lease agreements, insurance costs, and stranded asset risk if a customer invests in a battery and then needs to move to a different location. StorageShares enables SMUD's commercial customers to access the benefits of batteries to without impacting their lease agreements or insurance considerations, and these benefits can "follow them" if the customer moves to a different facility within SMUD's service territory.

The StorageShares program also has the potential to expand to provide a more comprehensive storage value stack in the future. For example, the current design does not provide back-up power benefits, but in the future there may be an opportunity for a SMUD-owned battery to be located at customer locations. This could provide back-up power to local customers while also providing local grid services. Customer siting of the battery could increase battery revenue by providing back-up power as a service, enable installation of utility-controlled batteries in densely developed areas, and enable in-fill land use opportunities instead of impacting undisturbed land.

Judges Comments

"SMUD has developed a new business model to drive economies of scale for energy storage with a shared-storage program that aligns commercial customer and grid benefits. It locates energy storage systems where they are most needed while saving customers money."



Sacramento Municipal Utility District (SMUD)

SMUD is a community owned, not-for-profit electric utility in Northern California. SMUD began serving Sacramento in 1946 and is now the nation's sixth-largest community-owned electric utility. SMUD provides reliable, affordable electricity to most of Sacramento County and a portion of Placer County. SMUD is recognized nationally and internationally for its innovative energy efficiency programs, renewable power technologies and research & development. We have 2293 employees and serve over 628,952 customers. SMUD was the first large California utility to receive more than 20 percent of its energy from renewable resources and we now have over 50 percent of our power from non-carbon emitting resources. In October 2018, the SMUD Board of Directors approved the Integrated Resource Plan, which included a goal to achieve net zero greenhouse gas emissions by 2040.

For more information:

<https://www.smud.org/en/Going-Green/Battery-storage/Business>

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The Clean Energy States Alliance (CESA) is a national, nonprofit coalition of public agencies and organizations working together to advance clean energy. CESA members—mostly state agencies—include many of the most innovative, successful, and influential public funders of clean energy initiatives in the country.

CESA works with state leaders, federal agencies, industry representatives, and other stakeholders to develop and promote clean energy technologies and markets. It supports effective state and local policies, programs, and innovation in the clean energy sector, with an emphasis on renewable energy, power generation, financing strategies, and economic development. CESA facilitates information sharing, provides technical assistance, coordinates multi-state collaborative projects, and communicates the views and achievements of its members.



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