Many communities that have received SolSmart designations are not only expanding solar energy development, but are also pursuing electrification for activities such as transportation that traditionally have required fossil fuels. It turns out that policies to encourage solar development and policies to encourage electrification can be complementary: low-cost solar power can help make electrification more cost-effective, and electrifying more services can help make solar installations more valuable. Electrification policies also open the door to discussions with the local electric utility regarding how utilities can better support communities’ solar power aspirations. This guide explains how communities can collaborate with their utilities on programs that produce complementary benefits for solar and electrification policies.

One path to electrification — perhaps the most popular one in America today — is electrifying transportation. Many communities are interested in promoting electric vehicles (EVs) for cleaner air and greater energy independence. These are great benefits, and it is no wonder that many communities consider EVs part of the pathway to achieving their broader sustainability goals. What communities may not realize is that their EV efforts can support deeper solar adoption if they effectively engage their utility.
HOW ELECTRIFICATION HELPS UTILITIES

Electrification can be beneficial for utility shareholders and for all utility customers alike, because an increase in utility sales supports opportunities to invest in modernizing the grid while offering customers stable or reduced rates. Many utilities today are struggling to keep prices low while modernizing the grid at a time when electricity sales are flat or declining. The emergence of cost-effective distributed energy resources (DERs) like rooftop solar further complicates the struggle to keep rates low, since substantial investment in the grid is often required to effectively accommodate and use DERs. This incremental expense can place upward pressure on electricity rates. Electrification helps to pay for grid investments and can even contribute to lower prices, because increased electricity sales allows the fixed costs of the system to be spread across more kilowatt hours (kWh) of sales. Discussing electrification possibilities together with a community’s DER aspirations is a constructive way to start a conversation with a utility.

Some electrification policies have the added benefit of supporting increased solar adoption. For example, solar energy provides a cost-effective way to charge electric vehicles during the day. This is good for EV owners, and it is good for a utility that may be struggling to manage increasing amounts of local solar DER power production. Charging EVs when solar is abundant and time of use or wholesale electricity prices are low is often called “smart charging.” Smart charging helps ensure distribution system reliability as solar adoption grows and helps EV owners to keep their cost of charging low.

An EV policy implemented in this way is one example of “Beneficial Electrification.” Electrification is beneficial if it meets one or more of the following conditions without adversely affecting the other two:

1. Saves consumers money over the long run;
2. Enables better grid management; and
3. Reduces negative environmental impacts.

TYPES OF BENEFICIAL ELECTRIFICATION

Smart charging of EVs qualifies as beneficial electrification because consumers pay lower costs for electricity and avoid paying for other fuels (condition #1); grid managers will almost certainly face a simpler task when EVs are soaking up solar (condition #2); and using solar instead of fossil fuels to power cars will improve local air quality (condition #3).

Other examples of beneficial electrification include powering water heaters and space heaters with electricity. The technology exists today to automate when these appliances draw power without affecting the quality of service they provide. Just like EVs, water heaters and to some degree space heaters can soak up excess solar energy, if the right policy is in place. Putting this technology in place could benefit more than solar, too. Smart charging these appliances might cost less than customers are currently paying. By lowering household bills, electrification could make housing more affordable — another common public policy goal!

Some communities and utilities are already recognizing the value of solar-powered beneficial electrification. In the following pages, we discuss several case studies:

- A municipal utility in Sacramento, California sets electricity prices that encourage EV charging at workplaces during the solar day.
- A rural co-op headquartered in Owatonna, Minnesota offers discounted community solar subscriptions to consumers who electrify their water heaters.
- A vertically integrated utility headquartered in Colchester, Vermont, offers both solar installations and electrification options such as cold-climate heat pumps as part of a comprehensive “energy makeover” program.

These programs exemplify a few approaches to beneficial electrification, and each highlights the complementarity of solar and electrification policies. The case studies below demonstrate various ways in which communities and utilities can partner to ensure that solar power and electrification work together:

- Setting electricity prices to encourage adoption of EVs and incentivize charging during times when solar is abundant;
- Making solar ownership possible to customers through affordable subscriptions and pairing it with an end use such as water heating; and
- Working with homeowners to transform old homes into energy-efficient dwellings powered by solar.
Electrification is beneficial if it meets the test developed by RAP, and each of the case studies passes the test. As we’ve explained, beneficial electrification can lower costs for consumers (not only those who participate directly in these programs, but all consumers who benefit from their utilities’ lower cost of service in the long run), reduce environmental impacts, and offer flexibility benefits to the power grid. These case studies demonstrate that as communities work toward ambitious clean energy goals, the partnership between solar and electrified end uses can be a powerful tool to drive innovation and achieve sustainability. If you think beneficial electrification could advance your solar goals, please refer to the resources listed below and reach out to SolSmart for assistance. The national SolSmart program offers no-cost technical assistance to help communities implement beneficial electrification programs and advance solar energy development. Learn more by visiting SolSmart.org.

To learn more on beneficial electrification, we recommend:


BENEFICIAL ELECTRIFICATION IN ACTION:
Sacramento Municipal Utility District’s Favorable Electricity Prices

The presence of distributed solar and electric vehicles on the grid is not a future possibility but a present reality for the Sacramento Municipal Utility District (SMUD), California’s fifth-largest utility. SMUD estimates that customers and third parties now spend more on distributed energy resources than SMUD spends on centralized clean energy resources. Rather than looking at this growth in distributed resources as a challenge, SMUD is leading the nation in planning to leverage these new resources to benefit all customers. This sort of integrated planning can enable utilities to encourage future growth in solar installations and EV charging in the best places on the grid to minimize costly infrastructure upgrades.

One way SMUD is responding to the rise of solar and EVs is through setting electricity prices to encourage charging during the solar day. For example, SMUD’s commercial rates are cheapest during the morning, before noon. These rates support businesses that offer workplace charging for their employees or customers. Employees who drive EVs can plug in as soon as they get to work. Plus, buying electricity during the morning period is considerably cheaper than buying gasoline would be.

SMUD’s smart electricity pricing encourages workplace charging and supports transportation electrification in Sacramento. This electrification qualifies as beneficial, because it meets one or more of the three conditions without adversely affecting the other two. Consumers — both participating and non-participating — save money over the long run from the utility’s sales of solar energy to workplace EV chargers. SMUD is better able to manage the grid by encouraging actions that discourage the need for costly grid upgrades. Finally, the program benefits the environment by replacing fossil fuels with clean, local electricity.

2 In 2017, the Smart Electric Power Alliance (SEPA) released a report documenting the collaborative work between SMUD and Black & Veatch. SEPA had previously proposed a methodology for utilities to use in planning that incorporates distributed energy resources (DERs), but SMUD was the first utility to engage with SEPA’s methodology and pursue a holistic planning process. See Smart Electric Power Alliance & Black & Veatch. (2017, May). Beyond the Meter. Planning the Distributed Energy Future. Volume II: A Case Study of Integrated DER Planning by Sacramento Municipal Utility District. Retrieved from https://store.seapower.org/CPBase__item?id=a121J00000j1aIwQAI


5 The off-peak price for a large commercial user is $0.1084 per kilowatt-hour with a demand charge of $4.06 per kilowatt; assuming a 6.6 kW charger (6.6 x $4.06 = $26.80) and 200 kWh consumption (200 x $0.1084 = $21.68), the average price per kWh would be $0.242. This is equivalent to a gasoline price of $2.42 / gallon, which is considerably below Sacramento’s current gas price of about $4.10 per gallon. E.g., Colburn, K. & Shipley, J. (2017, Oct. 18). Rate Design for DERs and Beneficial Electrification. Retrieved from https://www.raponline.org/wp-content/uploads/2017/11/rap_colburn_shipley_rate_design_ef_re_advocates_2017_oct_18.pdf (calculating SMUD’s 2017 commercial rate as providing electricity at $2.10 per gallon equivalent); McGough, M. (2019, May 6). Gas prices rise yet again, in Sacramento and across California. Is the end in sight? The Sacramento Bee. Retrieved from https://www.sacbee.com/news/local/transportation/article633009860.html (citing gas prices of $4.19 / gallon).
For more on this and SMUD’s other activities—such as electrifying buildings and encouraging more consumption of solar by shifting the utility’s time-of-use peak rate to later in the evening—check out the following resources:


Responding to customer interest in local solar, Steele-Waseca Cooperative Electric (S-W Cooperative Electric) — a small rural electricity provider — sought an option that the utility and its roughly 10,000 customers could afford. In 2015, it decided to build a community solar garden known as the Sunna Project at its headquarters in Owatonna, Minnesota, and offer customers the opportunity to lease one or more of the 250 solar panels in exchange for receiving a bill credit for all the electricity generated. Each panel costs $1,225 for a 20-year lease; the one-time fee covers all maintenance costs. (For more on community solar programs, please see the companion SolSmart issue guide, Expanding Solar Participation Through Community Solar.)

To make the solar leases even more affordable, S-W Cooperative Electric offered a discounted subscription price of $170 for a customer’s first panel if the customer agreed to participate in its grid-integrated water heater (GIWH) program. An official at S-W Cooperative Electric estimates that each solar panel brings enough savings on the electricity bill to pay for the customer’s $170 outlay in about three years. The GIWH program allows S-W Cooperative Electric to control when the water heaters draw power from the grid, enabling the utility to turn off the water heaters during system peak hours — a management tool that allows the utility to save peak energy costs and demand charges from its power supplier. If a customer does not have an electric water heater, mixing valve,6 and grid-integration module, then the utility provides the necessary components to the customer for free.

This program encourages consumers to electrify their water heating load while investing in solar energy. This electrification qualifies as beneficial because it meets one or more of the three conditions without adversely affecting achievement of the other two. Consumers — both participating and non-participating — save money over the long run from the community solar garden and grid-integrated water heater program. S-W Cooperative Electric is better able to manage the grid by gaining control over a substantial amount of the total load and preventing that amount from contributing to the system peaks. Finally, the program benefits the environment by replacing fossil fuels with clean, local solar electricity.

For more on the Sunna Project, go to S-W Cooperative Electric’s renewables web page: https://swce.coop/swce-field-services/renewables/.

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6 A mixing valve allows a hot water heater to provide comfortable hot water service regardless of what time of the day the heaters draw power.
References:

BENEFICIAL ELECTRIFICATION IN ACTION:
Green Mountain Power’s eHome Initiative

In the summer of 2014, the city of Rutland, Vermont — which claims to be the Solar Capital of New England — became the launch pad for a new offering from Green Mountain Power (GMP) known as the eHome Initiative, a comprehensive home energy makeover program. Begun as a demonstration project, the eHome Initiative helped transform a drafty 1920s home into a highly efficient solar-paneled dwelling dubbed the Energy Home of the Future. The approach was so successful that GMP turned the demo into a pilot program and then into a full-scale initiative.

Once customers express interest in the eHome Initiative, GMP sends energy experts to visit their homes, and together they determine the services and products needed. These can include solar panels, cold-climate heat pumps, heat pump water heaters, weatherization services, energy efficiency upgrades, and even mobile apps for remotely controlling energy usage. The range of offerings is so broad, in fact, that GMP now considers the eHome Initiative not as a program that offers products but as a service that engages customers. Once a plan is agreed upon, GMP assists customers in working with vendors and contractors and even provides financing support.

The eHome Initiative encourages consumers to install solar and to electrify new loads. This electrification qualifies as beneficial, because it meets one or more of the three conditions without adversely affecting the other two. Consumers — both participating and not — save money over the long run from the local solar installations and reduced fossil fuel usage. GMP is better able to manage the grid by knowing where new solar is coming online. Finally, the program benefits the environment by replacing fossil fuels with clean, local solar energy.

Photo courtesy Green Mountain Power
Additional Resources


