

Shining Brighter: Farmer Perspectives on California's Renewable Energy Program



USDA NRCs

Net Energy Metering Aggregation (NEMA) Progress Report

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About CalCAN

The California Climate and Agriculture Network (CalCAN) is a network of sustainable agriculture advocates, farmers, ranchers and agricultural experts that advances state and federal policy to realize the powerful climate solutions offered by sustainable and organic agriculture.

This report is available on the CalCAN website.

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Executive Summary

California farmers and ranchers produce more renewable energy than their counterparts in any other state in the country. However, there is still enormous untapped potential for agricultural operations to offset their energy needs, save money and contribute to the state's energy and climate change goals.

The California Climate and Agriculture Network (CalCAN) interviewed growers who have installed solar, as well as solar industry representatives involved with agricultural projects, to better understand what is working and what can be improved in the state's efforts to encourage on-farm renewable energy. This progress report uses their experiences and insights to tell this story from the field level. Here, we specifically look at Net Energy Metering (NEM), which allows electrical customers to receive credit for the renewable energy they produce, and Net Energy Metering Aggregation (NEMA), a program variant that lets agricultural customers generate energy in a single location and allocate those credits across multiple meters on contiguous properties.

Findings and Recommendations

Improve Outreach and Education — After more than two years of NEMA, many growers still lack access to reliable information on the program and its benefits. The California Public Utilities Commission (CPUC) and/or California Energy Commission (CEC), working with the utilities and partners in the solar industry, should develop farm-focused materials on NEMA to increase outreach and education on NEMA in order to better reach more growers throughout the state.

Fix the Confusing, Outdated Billing System — Agricultural customers are confused (and occasionally frustrated) by kinks in the utilities' NEMA billing procedures, which are prone to errors and delays. Utilities should invest in efficient, automated, user-friendly billing practices to simultaneously avoid customer complaints, improve program transparency, and enhance customer confidence and satisfaction with the program.

Map Local Grid Infrastructure and Share Upgrade Costs — Farms interested in going solar can be hit with exorbitant grid upgrade costs they are unable to predict due to a lack of granular information about the current grid setup. The CPUC should further increase grid transparency by requiring utilities to provide easily-accessible mapping tools that show the available capacity on existing grid infrastructure near their customers. Additionally, the CPUC should develop policy on how to fairly distribute ad hoc local grid upgrade costs among the customers, utilities, and state.

Build Flexibility to Address Changing Management Needs — NEMA requires customers to lock in to a static meter arrangement, whereas agricultural management is highly dynamic year-to-year. The CPUC and utilities should establish an option for NEMA operators to adjust an existing arrangement (such as adding or deleting a meter) to avoid inefficiencies and suit customers' needs.

Allow Operations with Non-Contiguous Land Holdings — The current CPUC rules exclude operations from aggregating meters between land parcels that happen not to touch one another. This 'contiguous' rule seems to run contrary to the reality that California farms often grow crops on unconnected pieces of land in the same geographic region. The CPUC should consider what changes to this rule could induce farms with disconnected parcels to make use of NEMA without unfairly burdening the utilities or other customers.

Facilitate Technical Assistance to Ensure Accessibility and Success — On-farm renewable energy decisions are complex, while growers lack guidance on who to trust and what to do. The CPUC should provide a directory of recommended solar consultants/advisors for growers to reference, and establish a fund through which farmers may apply to receive free or discounted technical assistance services. The CPUC should also develop an online self-calculator tool to estimate energy savings under NEMA, giving farmers an objective baseline when discussing options with solar installation companies.

NEMA is shining a new light on agricultural renewable energy production, encouraging more California farms and ranches to install solar and increasing the efficiency of on-farm systems—all while helping the state meet its aggressive climate change goals. After two years of implementation, now is the time for the utilities and the CPUC to make important improvements to meter aggregation to ensure NEMA achieves its full potential.

Introduction

California farmers and ranchers produce more renewable energy than their counterparts in any other state (see sidebar). On-farm solar, wind and bioenergy production offer agricultural producers the opportunity to offset their energy needs, save money and help the state in its efforts to shift energy generation away from fossil fuels.

Moving to more renewable sources also helps to cut down on the greenhouse gas emissions that contribute to rising temperatures and greater weather extremes. As agriculture has much to lose with a changing climate, on-farm renewable energy production offers multiple benefits to producers and the state.

In this progress report, the California Climate and Agriculture Network (CalCAN) looks at one program that is intended to make it easier and more attractive for California farmers and ranchers to produce renewable energy: Net Energy Metering Aggregation (NEMA). We wanted to know what has been working since its inception in 2014 and what can be improved in the implementation of NEMA.

Exponential Growth of On-Farm Solar

The number of farmers and ranchers interested in producing their own energy from the sun has increased exponentially over the years across the country. The USDA conducted its first survey of on-farm energy production in 2009, then repeated the survey during the 2012 Census of Agriculture. California is leading the country with the greatest number of farmers and ranchers producing solar energy on-farm, with a 186% increase in participation between 2009 and 2012.

Number of Farms with On-Farm Solar Production

	2009	2012
U.S. Total	7,986	36,331
California	1,906	5,445

Background: Net Energy Metering Aggregation

Net Energy Metering (NEM) enables customer-generators (i.e., energy customers who generate their own renewable energy like solar, wind or bioenergy) to receive credit for the renewable energy they produce. Such customers are only billed for the net difference in value between the kilowatt hours (kWh) they produce and those they consume, plus applicable charges and fees. NEMA is a variant to this program, allowing renewable energy generators to distribute the energy credits they produce on one electrical meter (the ‘generating meter’) to other customer-owned meters located on contiguous properties (see Table 1 for a comparison of NEM and NEMA).

Table 1: Differences between NEM and NEMA¹

	Configuration	Allocation of Energy	System Design
Net Energy Metering (NEM)	Requires a unique array for each meter to be offset, and array must be physically connected to the meter.	Energy produced (in kWh) nets only to the single meter connected to the array	System size (in kW) is effectively limited by the load on a single meter, regardless of how much energy is consumed across the operation
Net Energy Metering Aggregation (NEMA)	Allows one array ² to serve customer’s consumption on unlimited meters, regardless of meters’ locations within a contiguous, solely-owned property of set of properties	Energy produced (in kWh) can be credited across multiple meters	Enables customer-generator to install one larger system designed to offset energy consumption across an entire operation

1 CalCAN’s NEMA Fact Sheet (<http://bit.ly/2dGWfKS>) explains in further detail how NEMA works and the advantages it can provide. Also, CalCAN’s website (www.calclimateag.org) details the legislative work by CalCAN and our allies to champion the establishment of NEMA in California.

2 One MW is the maximum size allowed for a single arrangement under NEM 1.0. NEM 2.0, approved by the California Public Utilities Commission in January 2016, has no maximum system size. See footnote 3.

NEMA is especially valuable for energy customers who have multiple electrical meters, such as schools and other public institutions, commercial facilities, along with agricultural operators who have multiple or large land parcels that require electricity at numerous locations on-site. Before 2012, California law prohibited the power generated from an on-site renewable energy facility on one meter to be counted against the energy consumption on other meters. Many farmers who wanted solar to offset most or all of their energy consumption would have to connect a separate solar array to each meter. This costly and impractical requirement often made significant investments in on-farm renewable energy highly inefficient and cost prohibitive for many California growers. Additionally, growers now have the option to install solar in strategic centralized locations and not next to meters in faraway fields.

This NEMA progress report explores how the program is working and provides recommendations for improving the program and accelerating the successes of on-farm renewable energy in California.

Methods: Highlighting Agricultural Voices

To explore NEMA's effectiveness for California farmers and ranchers, we conducted 12 phone interviews between June and September 2016. We focused on farmers and solar industry representatives involved in the installation of solar photovoltaics. While NEMA is available for on-farm wind and bioenergy production, the vast majority of on-farm renewable energy systems in California are solar arrays.

At the time of this writing, NEMA had only been available to California customers for just over two years, and our interviewees included some of the pioneering farmers using the program. Because NEM 2.0 was not yet in effect,³ we did not discuss its implications with our interviewees. Our interview pool included a diverse set of on-farm solar participants: nine California farmers and ranchers ranging in acreage, crops, and locations across the state (eight of whom are operating



³ In January 2016, pursuant to Assembly Bill 327 (2013), the California Public Utilities Commission finalized the NEM Successor Tariff or 'NEM 2.0', which makes some minor but not insignificant changes for NEM and NEMA customers. On or before July 1, 2017, any customer seeking to interconnect under a NEM will, among other things, be required to pay non-bypassable charges (NBCs) of about 2 cents for each kWh that is not directly offset at the generating meter. This new requirement will disproportionately impact NEMA customers because they will be unable to avoid any of the NBCs on aggregated meters that are not directly connected to a renewable energy system. This change—along with new application and interconnection fees—are expected to have a noticeable impact on the economics of NEMA for most operations.

under either NEM or NEMA and one farmer considering solar at the time of the interview); one on-farm energy services consultant; and two experts from a solar installation firm specializing in energy systems for agricultural operations—specifically an interconnection specialist and a billing analyst. Eight of the nine growers we interviewed are customers in the Pacific Gas & Electric (PG&E) service area, the largest service area in the state; the ninth grower resides in Pacific Power’s service area.⁴ Our solar industry representatives have clients in Southern California Edison (SCE) territory as well as PG&E, and confirmed for us that their experiences with NEMA implementation were similar in both utility service areas.

Our questions gave interviewees a chance to explain their solar installation processes in their own words, highlighting their motivations for installing solar, the benefits of their project, challenges in the process, and areas for improvement. Below we explore challenges with NEMA and opportunities for improvement as we seek to further reduce the energy-related greenhouse gas impact of our farms and ranches.

NEMA Implementation: Findings & Recommendations

A. NEMA’s Role: Missing Outreach and Education

Over half of the farmers interviewed had thought about installing solar for many years before actually doing so – several for as long as 10 years. Because of the high initial capital investment, farmers have taken their time assessing the risks and rewards of solar installation. Decisions to install usually came when the right combination of opportunities coalesced, ranging from ease of grid connection and billing (e.g., NEMA), tax incentives, cost-sharing options (e.g., with the California Energy Commission), grants (e.g., USDA’s Rural Energy for America Program [REAP]), and individual farming situations (e.g., a profitable year to help fund the initial capital outlay).

For two interviewees, NEMA was the main motivation for finally deciding to install solar. A farmer with over 5,000 acres in crop production called NEMA “[the] only reason we did this. [We] looked at solar prior to this and were told we would have to put solar up on every separate well we had—and that was totally impractical.” Technicians from the solar installer stated that they almost exclusively install 1 MW NEMA systems – sometimes multiple 1 MW arrays for a single agricultural client. The energy service consultant has seen a spike in on-farm solar installations, touting NEMA as a “significant boost for growers to put in solar.”

A farmer on an 80-acre orchard suggested that NEMA contributed to the mix of incentives available for solar: “We were aware NEMA was in the works, it was an encouraging factor.” But there were other major factors inspiring his solar installation, including a USDA REAP grant, financing options for their panels, and the right tax incentives.

An almond farmer near Merced installed his first two solar arrays under the NEM program before aggregation existed, but as he is now thinking about installing additional solar for his farming

Why Go Solar?

Our farmer interviewees use their on-farm solar energy mainly to power irrigation systems, with secondary uses for cold storage, freezers, and housing. One farmer is offsetting 40 to 75 percent of his energy consumption from his energy production. Solar arrays range in size from 12 kW to 1 MW across all of our interviewees’ operations. The smaller operations have realized cost savings of around \$8,000 to \$13,000 per year, while larger operations have seen savings of approximately \$300,000 annually.

Farmer interest in solar went beyond the economics of the systems. For example, a farmer in Northern California mentioned: “We make decisions based on more than just finances. We believe in global warming.” A Central Valley farmer explained how he also believes that solar benefits more than his own operations: “Everyone should have solar in rural areas. It’s good for the world, good for the environment.” Another fruit and vegetable farmer saw how on-farm solar aligns with both his organic farming principles (viewing renewable energy as part of a whole systems approach to sustainability), and as a way for his customers to support alternative energy.

⁴ Pacific Power serves all of Del Norte and Siskiyou Counties, and parts of Shasta and Modoc Counties.

property, aggregation makes a lot of sense. He said that his current array often generates more energy than is consumed on that meter over the course of a year, making aggregation an economically viable option moving forward.

For three farmers, the NEMA program was not fully understood. In two of these cases, the farmers installed their solar arrays prior to NEMA, using the basic NEM program. These two organic farmers explained that they do not produce excess energy on any of their current arrays, so they believed aggregation would not benefit them economically. It was not understood that for future arrays, NEMA could still be a viable option for them. The third farmer was unaware that he was operating under NEMA, which we determined during our interview.

Recommendation

While NEMA can indeed motivate the move to on-farm solar, a lack of understanding of the program and its benefits within the grower community may be hindering its adoption on a larger scale. Further outreach and education on NEMA is needed to better reach more growers throughout the state. We suggest that the California Public Utilities Commission (CPUC) and/or the California Energy Commission (CEC) work with the utilities and partners in the solar industry to develop farm-focused materials on NEMA.



Fetzer/Bonterra

B. Customer Billing: Confusing, Outdated

NEMA is essentially a billing procedure that enables excess energy produced on one solar array to count towards the energy used across multiple meters under the same farm business. Therefore, how that billing procedure operates for the grower is important. Over half of our interviewees cited confusing, complicated billing as a significant obstacle for NEMA participation. For example, one farmer claims that he gets multiple billing reports for his NEMA project from PG&E that are all hard to understand: “To this day if you ask how much [money] I have saved, I can’t tell you.”

From the perspective of an energy services consultant, the billing issue is an unnecessary hurdle that can be, and should be, worked out. Farmer clients can go an entire year with incorrect billing. Fortunately, most eventually receive correct payments or credits, however this is a significant issue for the growth of NEMA. In the agriculture sector, practice adoption often spreads through word of mouth; widespread billing confusion becomes a potential deterrent for others considering renewable energy on their farm or ranch.

Recommendation

Improving billing efficiency for NEMA should be a top priority for both the utility companies and customers. With the popularity of NEMA and its continuation as an option under NEM 2.0, it will be more cost effective for utilities to implement a streamlined, consistent billing system. Thus, we suggest that the utilities invest in cost-effective, fully automated and user-friendly billing procedures that remove the frustrations and delays currently associated with the program. This will avoid customer complaints, improve program transparency, and enhance customer confidence and satisfaction with the program. In an era of “smart billing” for urban accounts, similar billing features should be available for the programs/tariffs that rural and agricultural customers rely upon.

C. Interconnection: Unfair Costs, Unnecessary Ambiguity

Half of the interviewees cited challenges with getting projects connected to the grid as a major hurdle to NEMA implementation. In one case, a farmer sought to expand his energy production by installing more solar arrays, but he was prevented from doing so because the utility would have required very expensive equipment upgrades to serve the additional load on the local grid. In another instance, a rancher decided to downsize her solar project because the utility company wanted her to pay \$50,000 to \$70,000 to help upgrade the substation before she could connect her project to the grid.

The solar industry consultants we interviewed noted that when a proposal for an on-farm solar installation project is submitted, it can take as long as a year for the utility providers to assess the load requirements and determine what (if any) grid equipment upgrades will be needed to handle increased capacity. In the initial planning stages of a project, installers and their clients often have no way of knowing in detail the capacity of local grid infrastructure. This leads to ambiguity in project budgets and may unnecessarily place projects on heavily loaded lines when other options are available. These unpredictable project budgets and project delays can exacerbate frustrations with NEM and NEMA among farmers and ranchers.

Recommendations

- 1) The high cost of interconnection highlights the need to upgrade some grid components; however, putting the onus of local grid upgrades on rural farmers and ranchers is not working. It is time for a new approach. The CPUC should develop policies to more fairly distribute ad hoc local grid upgrade costs among the customers, utilities, and state (e.g., on-bill financing, cost-sharing and/or loan-ownership programs).
- 2) While the CPUC has recently taken some action to improve transparency and cost certainty for projects seeking to interconnect,⁵ existing mapping tools are not very useful for the purposes of project planning. The CPUC should further increase grid transparency by requiring utilities to provide easily-accessible mapping tools that



5 CPUC Decision 16-06-052 (June 23, 2016) enables developers to request additional information on the costs and requirements for interconnecting a given project. It also restricts final interconnection costs to within 25% of initial interconnection cost estimates, providing a greater degree of cost certainty than was previously available.

Economics: Smaller Farms Unable to Use all Benefits of Solar

Several of our interviewees noted that renewable energy tax credits, in addition to NEM and NEMA, are what ultimately made going solar pencil out for their operations. However, in our interviews a number of smaller farmers mentioned that the tax incentives are really only valuable if you are in a high tax bracket – “you have to have a profitable year in order to take advantage of it.” A 250-acre organic farmer mentioned that he has not yet been able to use his solar tax credit because he has maxed out his deductible with other tax credits each year since installation. Another organic farmer, growing fruit on 80 acres, observed that “They say payback is five to six years [for solar], but that’s only for top tax brackets. Our [payback period] is more like eight to 10 years.”

A couple of producers also commented on the enormous upfront cost of their solar arrays, for which they had to take out loans with interest—further lengthening their payback period.

With the state’s heavy promotion of distributed renewable energy through its various policies and climate goals, and with the numerous untapped opportunities to expand on-farm renewable energy, California should continue to ensure incentives and resources are working for a diversity of agricultural operations and consider options that make solar a practical option for all (e.g., cost-sharing programs, income-based incentives, etc.).

show the available capacity on existing grid infrastructure near their customers. It is a win-win for all parties: installers will choose connection points with available capacity whenever possible, utility providers will better understand the infrastructure they manage, and farmers will spread the good news.

D. Changing Plans: NEMA Lacks Flexibility

One farmer and all solar industry interviewees highlighted a lack of flexibility in the NEMA program for making any changes to an existing aggregation arrangement. For example, after one farmer had installed his solar project, aggregating two meters, he decided to add an additional meter to his arrangement. However, when he added the third meter he was required to forfeit the credits he had accrued during the relevant 12-month billing period before his consumption and production were ‘netted’ (‘trued-up’) with the utility.

Our technical expert interviewees confirmed that their customers have also been required to forfeit credits when altering an arrangement, claiming that this penalty was not explicitly written in the NEMA rules.

NEMA is a static arrangement, whereas agricultural operations are dynamic, with changing crops, seasons, and water availability, to name a few of the shifting variables. Such variables will impact where it is most efficient to allocate renewable energy credits; a program designed largely for agricultural operators needs to have parallel flexibility.

Recommendation

Many programs that result in long-term contractual agreements still leave room for periodic adjustments, akin to the ‘open enrollment period’ for health care benefits. Similarly, there should be a period of time each year during which NEMA operators can make a change to their existing arrangement (such as adding or deleting a meter from the arrangement). This opportunity for alterations to NEMA systems—perhaps during the final month of the 12-month billing cycle—would not add load, but only shift around where credits are applied, resulting in few demands on the utility except for adjustments to the account’s billing set-up. The CPUC might authorize utilities to charge a reasonable fee to cover the specific cost of making billing set-up adjustments. Farmers and ranchers should have upfront clarity about their options to continuously evolve their operations and how NEMA can work within a dynamic management setting.

E. Linking Multiple Land Parcels: Overly Strict Rules

Many California farms operate multiple parcels of land—some directly touching one another, others not. NEMA was developed, in part, to address this issue by enabling growers to distribute their energy credits across these multiple parcels of land. Ironically, however, the CPUC determined that for a meter to be aggregated, it must be on a parcel ‘contiguous’ to the parcel with the generating account, and has interpreted the statute that created NEMA rather strictly. This ‘contiguous’ rule

seems to run contrary to the reality that California farms often grow crops on unconnected pieces of land in the same geographic region.

At least two of our farmer interviewees operate multiple parcels that are geographically close, but not contiguous, and have installed separate solar arrays at each of their non-contiguous properties (at considerable cost). Were NEMA rules modified to allow for meter aggregation between parcels that are close but not necessarily contiguous, these farms and others like them would only have to build and interconnect a single system to offset their operation's full load—thereby satisfying the original intent of NEMA, while reducing the number of costly and complex interconnections a utility has to deal with.

Recommendation

The CPUC should consider what changes to the contiguous rule could induce more farms to make use of NEMA without unfairly burdening the utility or other customers. For example, the CPUC could determine that parcels within a certain radius of the generating meter qualify under the statute and should be allowed within a customer's aggregation arrangement.

F. Technical Assistance: Important for Success

Over half of the farmers interviewed made some mention of an outside consultant as a huge benefit to helping them install solar, and in some cases claimed it was the only way they could have installed solar because of the complicated and technical process of working with the utilities.

In many of our interviews, the farmers pointed out that they are not solar experts, and often did not know how large their systems were or what their electrical tariff was (i.e., NEM vs. NEMA). The consultant we spoke with identified the largest hurdle for farmers as a "lack of clarity" in solar installation. Farmers are busy farming, and often do not have the time or expertise to closely engage with the system design and installation process. While most of those we interviewed had the resources to hire technical assistance, the apparent need for technical assistance as a pathway to on-farm solar development is of considerable concern.

An organic farmer we spoke with who has yet to install solar on his 140-acre fruit orchard, but has been considering it for years, provided this perspective: "There are so many different options. A maze of information. Financial gurus that work for solar come and analyze energy bills, give you 20-year scenarios and tax credits. After a while your eyes glaze over, there is no way a normal mortal can comprehend solar deals." He suggested there is "no guidance for farmers, no one that you trust to guide you."

Recommendations

- 1) The CPUC should provide a directory of recommended independent solar consultants/advisors based on certain standards—just as municipalities provide pre-vetted lists of solid waste haulers or e-waste drop-offs. This information source should also include transparent and unbiased information on what issues and benefits farmers can expect when they enter into an on-farm solar contract.
- 2) With the residential NEM program, many utilities provide an online self-calculator where customers considering the program can model how much money they can expect to save annually. A similar tool should be available for farmers seeking to utilize NEMA to estimate energy savings, giving them an objective baseline when discussing with solar installation companies.
- 3) The CPUC and/or the CEC should establish a fund through which farmers may apply to receive free or discounted technical assistance from qualified consultants/advisors, who can help them navigate the complexities of evaluating options for on-farm solar.

Moving Forward

NEMA is shining a new light on agricultural renewable energy production, encouraging more California farms and ranches to install solar and increasing the efficiency of on-farm systems—all while helping the state meet its aggressive climate change goals.

Our recommendations focus on making the program accessible, transparent, and farmer-friendly. Increased clarity and transparency of program billing systems and utility grid mapping will improve the program's efficiency. Cost-sharing options for grid equipment upgrades increase program accessibility, and developing trusted information sources about on-farm solar provides the support farmers need to make good decisions on how to invest their hard-earned money. Many of these lessons learned about NEMA can be applied beyond agriculture, also benefitting our schools and hospitals that produce renewable energy.

After two years of implementation, and with NEMA featured as an integral component of NEM 2.0, now is the time for the utilities and the CPUC to make important improvements to meter aggregation to ensure NEMA achieves its full potential. ■



