The 51st State

A Cooperative Path to a Sustainable Future

Prepared By: The National Rural Electric Cooperative Association

February 27, 2015

NRECA

A Touchstone Energy® Cooperative

TABLE OF CONTENTS

Executive Summary

The hypothetical 51st State should be designed to ensure reliable, affordable, safe and environmentally-responsible power. Investments in the 51st State's electric system should not be made in isolation. The electricity sector is complex, and each segment of the grid is affected by every other. In order to achieve reliability, affordability, safety and environmental responsibility, the ideal electric system in the 51st State should not promote specific policies or technologies. It should instead strive to achieve the best mix of resources. The 51st State should have an appropriate market structure designed so that a Load Serving Entity (LSE) such as an electric cooperative can optimize the system in ways that benefit all consumers. As LSE's, consumer-owned, consumer-directed not-for-profit private entities, cooperatives have the obligation to provide such a market structure and complete, transparent information to their member-owners in order to facilitate their ability to make informed decisions.

The 51st State should have a regulatory framework that accounts for the rights and responsibilities of all stakeholders. It should also leave the regulatory compact intact in order for the utility to continue to meet its obligation to serve all consumers and to make investments necessary to provide reliable, safe and affordable service. An experienced decision-maker is necessary to balance competing policy goals and oversee the system as a whole while also remaining accountable to the public. An electric cooperative fulfills both of these criteria.

Finally, the 51st State should be designed to allow for the continued growth of the solar and Distributed Energy Resources (DER) markets. Consumers in the 51st State must be aware of the true costs in order to make informed decisions regarding Distributed Generation (DG) projects. DG projects must be cost-effective so that all costs are considered and cost shifting does not occur.

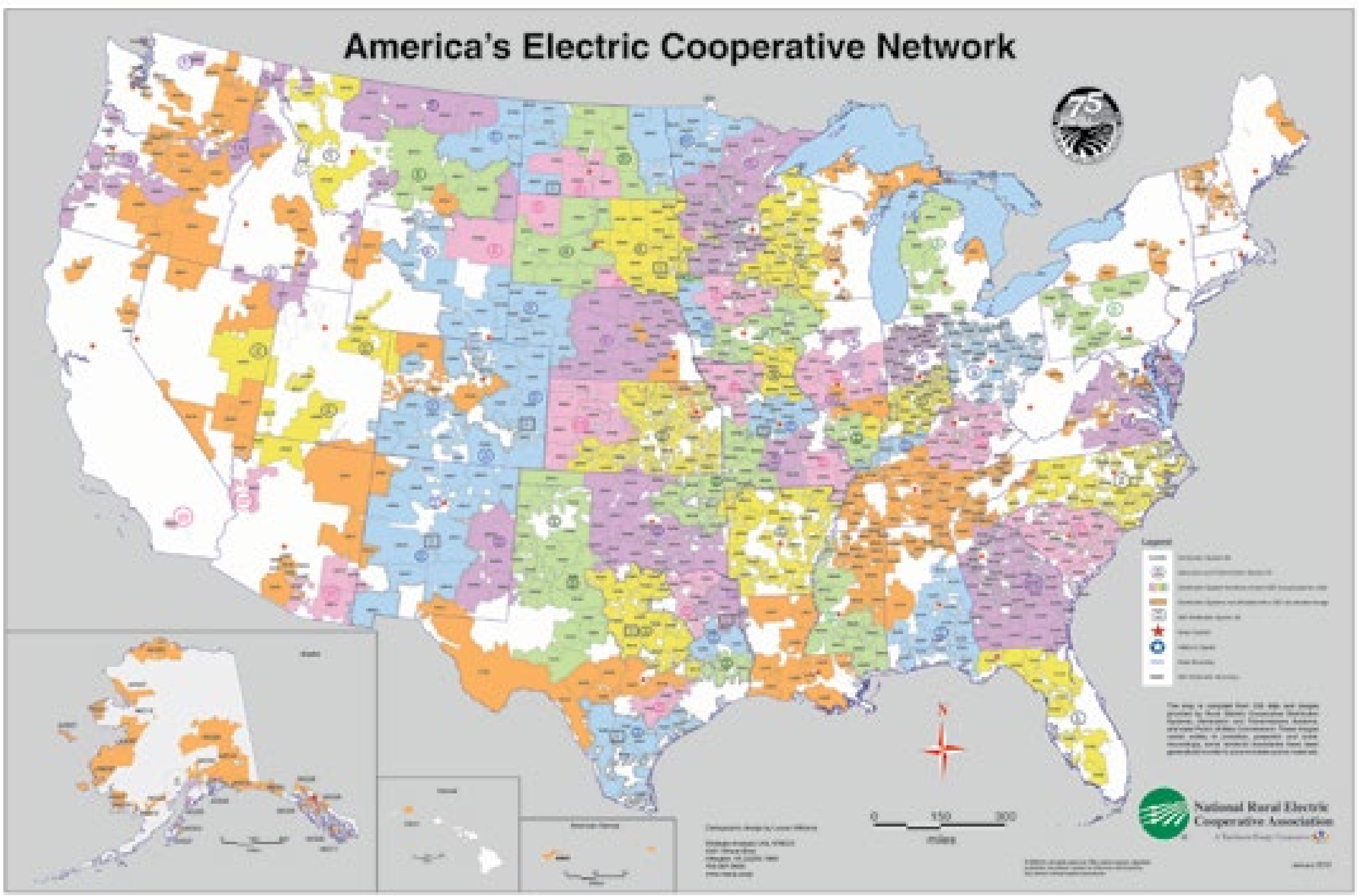
Background and Introduction

The 51st State Initiative

The National Rural Electric Cooperative Association (NRECA) appreciates the opportunity to submit a proposal to the Solar Electric Power Association's (SEPA) 51st State Initiative. As described by SEPA, this is an opportunity for stakeholders to have a constructive dialogue surrounding the development of a hypothetical 51st State to create a foundation for a more positive conversation about the costs and benefits of distributed energy resources (DER) and, in particular, solar distributed generation. The 51st State assumes a blank slate with no pre-existing programs, conditions, market structures or even rate designs, except for national policies and regulations such as the federal Investment Tax Credit (ITC). The following report will describe in detail NRECA's proposal for a framework that balances the goals of affordability, reliability, safety and sustainable clean energy.

Electric Cooperatives

NRECA represents 904 rural electric cooperatives, serving an estimated 42 million people in 47 states. This includes 19 million businesses, homes, schools, churches, farms, irrigation systems, and other establishments in 2,500 of 3,141 counties in the United States.



Electric cooperatives are private, independent, non-profit electric utility businesses owned by the customers they serve. Co-ops are incorporated under the laws of the states in which they operate and established to provide at-cost electric service. Co-ops are governed by a board of directors elected from the membership which sets policies and procedures that are implemented by the cooperatives' management.

Distribution cooperatives are the foundation of the electric cooperative network. They are the direct point of contact with the member-owners in the delivery of electricity and other services. *Generation & Transmission cooperatives* (G&Ts) provide wholesale power to distribution co-ops through their own generation or by purchasing power on behalf of the distribution members.

In addition to providing high-quality electric service, electric cooperatives are deeply committed to their communities. They empower members to improve the quality of their lives through economic development and revitalization projects, job creation, improvement of water & sewer systems and assistance in delivery of health care and educational services.

Co-ops serve an average of 7.4 consumers per mile of line and collect annual revenue of approximately $16,000 per mile of line. This is compared to investor-owned utilities that average 34 customers per mile of line and collect $75,500 per mile.

Overview

The electric utility industry is undergoing a period of transition. From environmental regulations, slow load grow and cheap natural gas prices, to more cost-competitive DG and advanced communications technology, it faces numerous challenges and opportunities. Despite these developments, consumers will continue to demand safe, reliable and affordable power. As such, investments cannot be made in isolation since investments in one part of the electric system will impact the system as a whole. The ideal electric system is one that can balance competing policy priorities and local conditions in order to achieve the optimal investment in resources.

Over the coming years, some consumers will face an increasing number of choices of distributed and renewable energy technology to support their need for reliable, affordable and environmentally compliant power supply. Several such options are being actively pursued by NRECA and its member cooperatives, with the goal of providing our cooperative member-owners with a clear, transparent and fully descriptive market structure and database for cost-effective distributed and renewable technologies. Cooperatives have the obligation to provide such a market structure and complete, transparent information to its member-owners to facilitate their ability to make informed decisions. From the cooperatives' perspective, the market structure must not be designed to increase the penetration of any particular distributed or renewable technology. Rather, it should provide co-op members with the tools they need to choose which technology options work best for them. The market structure NRECA and its members envision, for instance, will so inform members—with the understanding that if the co-op member chooses the more expensive rooftop solar unit the market structure should facilitate that choice.

The 51st State market structure should:

1. Ensure that all distributed and renewable technologies are available to the interested consumer, and no one technology is promoted over any other;

2. Provide transparency regarding the cost impacts and direct or indirect (hidden) subsidies between consumer classes associated with each technology.

Co-ops have a strong track record of providing excellent service, and are a trusted resource. With cost-effectiveness in mind, co-ops are positioned to provide DER services to member-owners through a variety of technologies. This service is possible because they are member-owned and locally-controlled. Co-ops can invest in resources that make sense for the local community so that economic benefits stay in the area. Community solar projects provide an excellent example of how an electric cooperative can meet local desires for renewable energy in a cost-effective manner.

This report is intended to describe in greater detail a consumer-centric structure consistent with the cooperative perspective.

Existing Electric Industry Backdrop

The existing electric industry backdrop must be the starting point for the 51st State. While the vision of a 51st State may embrace radical ideas about the future structure and regulation of industry segments, it nevertheless must grapple with the reforms to the existing industry required for that vision to be achieved. While the 51st State may include transitional mechanisms required to move the industry from where it is today to where it could be tomorrow, NRECA believes that the 51st State must be created within the context of the existing electric industry's physical and institutional structure. It should not *per se* require rejecting existing institutional and policy structures.

Foundations of the 51st State

The 51st State must be designed with a broad perspective so that investments are not made in isolation. The optimal electrical system is not one that minimizes environmental costs such as carbon dioxide, nitrogen oxide, sulfur dioxide or mercury emissions. Neither is it one that only maximizes reliability, resilience, security, renewable generation, distributed generation, advanced technologies, or energy efficiency. Nor is it one that minimizes cost. The optimal electrical system is one that balances all of these goals, which reflect our nation's desire for safe, reliable, affordable, and environmentally-sustainable electricity. This will meet the needs of all consumers today, tomorrow, and 30 years into the future. The 51st State should be designed around this concept of an integrated system that optimizes resources for the benefit of consumers.

The 51st State should be grounded in the following principles, in line with providing reliable, safe, affordable, and environmentally-compliant power supply:

a. *Reliable power system operation*. Power resources and the delivery infrastructure must be adequate to serve loads under nearly all conditions.[1] The power system must therefore be resistant to outages of power system facilities and to adverse weather. It also must be resilient for quick restoration when outages do occur.

b. *Efficient power system operation*. The power system must be committed to and dispatched at least cost, without discrimination between demand and supply-side resources and without discrimination between utility and non-utility resources.

c. *Efficient investment*. Investment should comprise the least-cost combination of conventional power resources, DERs, and delivery infrastructure. "Investment costs" must be broadly defined to include not only the capital costs of investments but also the expected operating costs of those investments over their lifetimes. Tariff design should provide investors with: 1) incentives to build, upgrade, or retain in service those facilities that are part of that least-cost combination; 2) incentives to design facilities so that they provide valuable services (such as quick response to changing power system conditions); and 3) a reasonable opportunity to recover their costs.

d. *Equity*. There should not be cross-subsidization or discrimination among ratepayers. Those who choose DER with its additional costs on the system must not be subsidized by others, either through financial incentive policies for DER or allocating costs of serving DER customers.

e. *Financial stability*. Producers want revenues that are stable or increasing over time, and consumers want

1 Throughout this paper, the term "power resources" refers to generators that provide electrical energy, regulating and operating reserves, and/or ancillary services such as voltage control; to loads that are available to vary with the power system's needs, thereby providing energy, reserves, and/or ancillary services; and to storage devices that can help balance supply and demand. "Delivery infrastructure" refers to transmission and distribution systems.

electricity bills that are stable or decreasing over time.

f. *Safety*. Appropriate state and federal regulations should be put in place to ensure the safety of consumers and utility workers.

g. Consumer awareness. A cornerstone of the 51st State is putting consumer needs first in ways that empower them to make well-informed decisions about their energy services.

h. Appropriate regulatory framework. A regulatory framework must balance the costs and benefits new services and technologies impose upon all consumers as well as the utility system.

i. Cost-effective DER. If developed properly, DER can potentially provide consumers and society with many benefits, including economic savings, improved environmental performance, and greater reliability.

j. Fair rate treatment. There is no uniform rate methodology in the 51st State, but all rate structures must be based on fair rates that reflect cost of service while appropriately compensating LSEs for providing the infrastructure and grid resources needed to ensure safe, reliable affordable power at all times for all consumers.

Market Structure of the 51st State

A time-tested and proven model to build and maintain the optimal electrical system is when investments are made by an LSE whose long-term relationship with their consumers and communities is based upon their foundational obligation to provide service (*i.e.* the regulatory compact). The LSE would integrate generation, transmission, distribution, and customer-side resources in an optimal fashion. The LSE would also have the obligation and motivation to invent, innovate, improve, and change if and when that change benefits those it serves. Electric cooperatives are ideally situated to serve such a role.

The electric cooperative business model involves consumer ownership, consumer control and not-for-profit operation. As a consumer-owned, consumer-directed, not-for-profit entity, the cooperative's only goal is to provide long-term reliable, affordable electric service to its member-owners. Because cooperatives are governed by a board of directors democratically elected by consumers in local districts served by the cooperative, co-ops are very responsive to local consumer desires on issues such as distributed generation (DG).

A cooperative has an obligation to serve local consumers, by optimizing the system to meet local needs while balancing the different goals mentioned above. This is because of their broad perspective on the industry, not-for-profit nature, and proven ability to achieve economic delivery of power despite very low consumer density. This is clearly demonstrated by continuing co-op leadership in the development and application of advanced technologies and concepts such as the smart grid, automated metering, demand response and grid modernization.

> ***The electric grid is very complex, and every investment has an impact on the entire system.***

Electric cooperatives understand that in order to provide long-term, reliable and affordable electricity to their member-owners, they must not look at resources and investments in isolation or without also exploring alternatives. The electric grid is very complex, and every investment has an impact on the entire system. For instance, if the cooperative or its members invest in DG but the cooperative does not invest in the infrastructure upgrades to accommodate it, then the co-op or its members will not realize the benefits of the DG investment, and its ability to deliver long-term, reliable and affordable electric service will be impaired.

Product Definitions and Market and Regulatory Structures Depend on Contestability

The structure of the market for each of the unbundled generation, transmission, and distribution services depends on the extent to which the product or service is contestable[2]. Public policy reforms, under the Public Utility Regulatory Policies Act (PURPA) and the Energy Policy Act of 1992, and technological change have combined to make the generation segment of the industry contestable and therefore subject to limited competition.

Pricing of generation services should be based on market values reflective of the characteristics of the resource and the temporal and locational aspects of service provision. In other words, variable and firm power should be treated differently. The market should allow direct comparison of like-products, comparing apples to apples, not apples to Fords as is so often done in analysis comparing levelized Cost of Energy (LCOE) of dispatchible and non-dispatchible resources. Transmission and distribution services, as well as services related to real-time grid management and reliability, are generally not contestable and so should remain as regulated services or self-regulated under a utility business model such as an electric cooperative.

Pricing and Tariff Design Should Promote Efficient Decisions and Outcomes

Pricing structures, including tariffs, should be compatible with traditional industry goals in a manner that minimizes discrimination among resources and among customers. To the extent possible, common incentives should be given to all resources in order to achieve least-cost investment. These incentives should induce resource owners to provide power products when they can do so efficiently; induce investors to build, upgrade, or retain in service those facilities that are part of least-cost combination of investments; and induce investors to design facilities so that they provide valuable services. The resulting prices should allow resource and delivery service providers reasonable opportunities to recover their capital and operating costs.

Energy and Reserve Services

In principle, the efficient prices of energy and reserve services equal the respective marginal costs of those services at each time and place. If all generators received and all consumers paid these ideal prices, then the lowest-cost resources would provide electric power services at all times and consumers would use only that electricity that had value greater than marginal cost.

In the wholesale markets of the RTOs, the locational marginal prices of energy and the zonal prices of reserve services approximately achieve this ideal at the transmission level. For regions not covered by RTOs, marginal costs of energy and reserve services can be derived from generation cost data available to system operators. While marginal costs may be available at the transmission level, they are not directly available at the distribution level at which most consumers and much DER is located. In the absence of congestion in distribution systems, distribution-level marginal costs can be derived from transmission-level marginal costs if there are adequate data on energy losses within distribution systems. The quantification of distribution congestion costs may be problematic, however, and is related to the problem, described below, of paying for distribution system infrastructure.

2 Contestability is defined by Investopedia.com as "An economic concept that refers to a market in which there are only a few companies that, because of the threat of new entrants, behave in a competitive manner." http://www.investopedia.com/terms/c/contestablemarket.asp

Computational difficulties aside, consumers and DER served by distribution systems should face energy and operating reserve prices that reasonably reflect the relevant transmission-level marginal costs. To the extent that parties served at the distribution level see such prices, they will have incentives to behave efficiently regardless of whether they are served by a utility, a Distribution System Operator (DSO), or a microgrid. If prices are closely aligned with marginal costs at the interface between a utility on the one hand and a DSO or microgrid on the other, the utility will be financially indifferent to the efficiency of commitment and dispatch within the DSO or microgrid. The benefits of efficient commitment and dispatch within the DSO or microgrid will accrue to parties within those entities; and the regulator and the utility need be concerned only with the cost and reliability impacts of the net flows into or out of the DSO or microgrid.

Pricing Distribution Services

Distribution costs are related to the characteristics of the maximum power that the utility reasonably expects to flow over the distribution system—even when the sun is not shining and the wind is not blowing. In traditional systems, power flowed one way, from the transmission system toward consumers. With DER, power flow can be bidirectional – from the utility to consumer locations and from consumer locations within the distribution system to the utility. Thus, in a world with DER, the characteristics of the maximum power flows include both directions of flow.

Distribution costs are mostly the capital costs of the facilities that provide distribution services. The costs of maintaining these facilities depend upon weather and upon the quantities, types, and ages of the facilities.

Recovering Cost of Existing Facilities

Because distribution costs are related to the characteristics of maximum power flows, the costs of existing distribution facilities should be allocated among customers according to reasonable expectations of each of their maximum power flows. These may be determined by a number of methods:

Historical experience. If customers are demand-metered, the utility can reasonably expect the distribution system to be used to the maximum extent that they have done so in the past. This implies that distribution charges may be based upon past and present (ratcheted) demand.

Member-owner facility power limits. If a member-owner's facility allows them to consume and produce a certain number of kW of power, the utility may reasonably expect that the customer will potentially use the distribution system up to those design capabilities. This expectation needs to consider the direction of flows and whether simultaneous consumption and production of power can dependably offset one another. The information used to implement this method needs to be updated over time to account for customers' occasional redesign of their facilities and for customers' changing use of their facilities.

Consumer type. For consumers with similar energy consumption, it may be reasonable to have standard expectations regarding the customer's use of the distribution system. This method needs to be updated over time to account for any significant changes in consumers' uses of electricity.

For customers with self-generation or who are located within DSOs or microgrids, what goes on behind-the-meter is none of the utility's business except to the extent that it affects reliability (or can reasonably be expected to affect), flows through utility facilities and public safety or can result in inequitable allocation of costs among consumers. The utility may thus have an interest in the reliability of behind-the-meter generation because this reliability can affect the types and quantities of distribution infrastructure that the utility must provide to serve behind-the-meter loads when behind-the-meter generation fails.

There will be a diverse set of loads and generation within a DSO or microgrid. As such, the DSO's or microgrid's payments to the utility for distribution service may be less than the sum of what the individual consumers within it might have otherwise paid the utility. In some cases, such as a microgrid for a high-rise apartment building, the diversity and the consequent savings may be small; while in other cases it may be significant. In all cases, the consumers will bear some costs for the operation of the DSO or microgrid, which will offset at least a part of the savings in utility distribution system charges.

Recovering the Cost of New Distribution Facilities

In a world with DER, the rules for determining the need for distribution system upgrades can be substantially the same as at present, with two main exceptions. First, additional upgrades will be required to deal with reverse flows from consumers toward the grid. The costs of distribution upgrades to deal with such reverse flows – and with potential generation overloads – are logically allocated to the owners of the generators who cause those reverse flows and potential overloads. Second, DER may create new low-cost dispatch options that can substitute for upgrades, in which event DER owners should earn compensation for their dispatch services, the costs of which will need to be recovered along with the costs of any upgrades.

The rules for distribution system access will depend upon the rules for determining the need for distribution system upgrades and for allocating upgrade costs. These rules will be developed through the 51st State's regulatory framework. They will also generally guarantee access to consumers and provide access for DER according to DER owners' willingness to pay for necessary upgrades. It is likely that there will be some situations in which, as the distribution system reaches its load-carrying capacity, queues will be necessary for DER seeking to interconnect with the power system.

In principle, customers should pay for their shares of the benefits of upgrades that are built on their behalf. Except for facilities that serve a single customer, these shares may be difficult to calculate and will surely differ from one situation to another. In particular, while it may be relatively easy to assign upgrade costs to customers who are near the locations of the upgraded facilities, customers at more distant locations may also benefit from the upgrades. To some extent, engineering analyses can be used to identify the generators and loads that benefit from particular upgrades and to assign shares to those generators and loads. Nonetheless, the estimation process is subject to uncertainties and is complicated by the fact that the benefits of an upgrade will occur over its decades-long life. This means that the beneficiaries will likely change over time and the benefits will depend upon uncertain and dependent on future conditions.

Regulatory Structure of the 51st State

If the 51st State is going to balance the current and future needs of consumers while providing safe, affordable, reliable, clean and sustainable electricity, there must be a regulatory framework equipped with the tools to meet this objective. In order to do this, we must give the job of regulation to experienced decision-makers who can promote and implement good ideas with long-term value. The challenge for local regulatory authorities is to see how each of the goals they seek to pursue fit together. They must also adjust expectations on each goal, prioritize among goals, and hold utilities accountable while leaving them free to find the best means to achieve the regulators' priorities in light of their local conditions. Frequently, these are disparate objectives and as such, need one central decision-maker that understands all the components that go

> ***... we must give the job of regulation to experienced decision-makers who can promote and implement good ideas with long-term value.***

into finding a path to attain the objectives. Decision-making cannot be competitively bid; it must be retained by an entity that has the expertise to balance the needs of all parties. This entity must have assurances that its rights and responsibilities are known.

> ***The co-op structure is ideal for providing safe, affordable, reliable electricity.***

The electric cooperative model achieves this goal in large part because it is centered on a regulatory compact. Co-op rights and responsibilities are balanced. The co-op is authorized to serve a specific territory, in return for which it has an obligation to serve all consumers in that territory and to make investments necessary to provide safe, reliable and equitable service. The co-op structure is ideal for providing safe, affordable, reliable electricity. As not-for-profit consumer-owned entities, co-ops invest revenues back into their systems to meet the evolving needs of their member-owners.

The co-op structure provides the tools to incentivize solar deployments in ways that are reasonable and fair and do not shift costs to other customers. Co-ops can do this through (1) establishing rate structures that equitably compensate solar consumers for net excess generation, (2) ensuring that solar customers pay their share of system costs, and (3) establishing standards for solar technologies to safely and reliably interconnect to the system.

Electric cooperatives also support tax credits and other governmental funding for DG technologies and invest in R&D projects aimed at lowering solar costs, as discussed subsequently.

Another cornerstone of the co-op framework is accountability. This supports rather than diminishes the ability to be flexible in meeting the evolving needs of customers. The local co-op is in the best position to understand and balance its customers' needs, such as controlling energy costs, clean energy options, and maintaining a high level of service. Accountability requires the co-op to safeguard all consumer needs, not just a subset. There must be an array of regulatory or policy tools that interact effectively to achieve a 51st State that is accountable and flexible.

The emergence of an expanded portfolio of services and technologies provides consumers with greater control over their energy services and costs. Co-ops are the trusted advisors to their member-owners. Co-ops are also embedded in their communities and can build on their business relationships to empower consumers to make decisions that benefit all consumers and the community. Community engagement, coupled with obligations to serve under the regulatory compact, enables the co-op to balance adopting new technologies, increasing demands for consumer-specific services and third party vendors with providing safe, affordable and reliable services.

By contrast, a pure market-driven structure cannot support the integrated process that is essential to meeting the consumer-centric cooperative goals for the 51st State. A deregulated market structure consists of factions that compete for business without regard to the principles of rate equity or reliable service. Disaggregated interests cannot optimize a resource portfolio and make complex decisions to accomplish a wide range of consumer and policy goals, while keeping the lights on.

Rate Equity and Fixed Charges

As not-for-profit entities, electric distribution cooperatives must return any margins beyond the costs of maintaining and operating their systems. They must maintain reasonable equity to their member-owners, either directly or through rates. If rates are based primarily on usage (variable costs), DG/DER can threaten cost recovery and lead to cross subsidization and, as penetration grows, system degradation.

However, those member-owners installing DG/DER are still reliant on the grid for power much of the day, even those who on a net basis are generating more power than they use. Everyone connected to the grid is reliant on its infrastructure to ensure reliable power 24/7.

Since many DG/DER resources are expensive to install, this can lead to lower-income consumers subsidizing wealthier consumers who are more likely to have the financial resources to install DG/DER. This is a particular challenge to electric co-ops given their higher distribution costs due to low density, especially those that serve territories that include areas of high or persistent poverty.

> ***... many cooperatives are moving towards covering much or all of their fixed costs through fixed charges ...***

To address this problem, many co-ops are moving towards covering much or all of their fixed costs through fixed charges, called facilities, customer, or access charges. Most co-ops have at least some level of these charges, though in many cases these are not adequate to cover fixed costs. The goal is to align rates with costs, so that to the extent possible fixed rates cover fixed costs, and variable rates cover variable costs due to usage. This is a strategy for dealing both with DG/DER, and energy efficiency/conservation measures such that sales and cost recovery are de-linked and declining or flat sales will not undermine the maintenance of the distribution infrastructure.

Implementing fixed charges requires a clear rate strategy and effective communication. These charges are also often phased in to avoid rate shock and member unrest. Another option being pursued is higher fixed charges or other standby or member-specific charges for customers deploying DG/DER, which assures fixed cost recovery from these customers for costs incurred to provide service.   Other cooperatives are considering other rate designs, including 3-part residential rates with a demand component. The 51st State should allow reasonable rate flexibility for utilities to address challenges to maintaining the grid. In the case of electric cooperatives, most are self-regulated through their democratically elected boards, and should be allowed to design rates to maintain their businesses with the support of their members.

How does the 51st State Integrate DG and Other Technologies?

The Cooperative Platform for DER in the 51st State

Safety, affordability, and reliability can be achieved while incorporating cost-effective DER. If DER is to be implemented in the distribution system, local cooperatives are well positioned to understand the impact, and how to optimize benefits and minimize costs to member-owners. The 51st State should not be designed to achieve higher penetrations of any specific technology. Instead, it should be designed to provide consumers unbiased, transparent information regarding the cost effectiveness of various technology options in the local area. Then, consumers can decide if technologies such as solar or wind is right for them. It comes down to local needs, local wants, and local control.

However, there are some important caveats. First, a member-owner's choice should not be subsidized in any substantial matter by other member-owners. Second, all member-owners should pay for their actual use of the cooperative grid. Third, if the member-owner's choice requires additional investment in the grid for the safety or reliability concerns, the cost of that investment will accrue directly to that mem-

> ***The 51st State should not be designed to achieve higher penetrations of any specific technology.***

ber-owner. Finally, the co-op should provide appropriate rates and other mechanisms to support and simplify the member-owner's choice, while ensuring that their choice does not harm or increase the cost to other member-owners.

The local cooperative board is best positioned to balance the equities and art of any ratemaking based on their memberships' wants and needs, and impacts on their system. As consumer-owned, consumer-controlled, not-for-profit private entities, cooperatives are todays "DSOs" of choice.

Distributed generation does not operate in isolation, either from the grid that must be expanded to enable DER to operate safely, reliably, and efficiently, or from regulatory policies in place to determine prices for non-distributed generating sources. In fact, EPRI's analysis of the "Integrated Grid"[3] supports the obvious conclusion that a planned distribution grid will be more efficient and cost less than an unplanned grid, while data regarding the cost of solar facilities consistently shows that utility/community scale solar can be built at significantly lower cost than rooftop solar. Moreover, any metrics for evaluating generation and grid technologies must have the flexibility to recognize that state and local circumstances determine input assumptions that are essential to accurate and equitable planning. Utilities subject to state and local regulation must retain the authority to assess these circumstances and make determinations based on local priorities.

Cooperatives Advance DER While Achieving Traditional Goals

Electric cooperatives are a trusted resource for their member-owners. This makes them ideally situated to offer consumers the ability to pursue DER projects with local conditions in mind. In fact, the nation's electric cooperative consistently score highest in measures of customer satisfaction in the utility sector.

Across the nation, distribution cooperatives have been deploying DER to meet the needs of their members, supplementing the power they purchase from the market of through their member-ownership in a G&T. Several co-ops have a long history owning or purchasing power from small hydroelectric facilities. More recently, distribution co-ops have developed or purchased projects from a variety of technology types, including wind, landfill gas, geothermal/waste heat, anaerobic digesters, and PV solar. Applying the seventh cooperative principle of "concern for community," local ownership and governance of DER development in co-op territory can serve the economic interests of their communities.

In recent years, photovoltaic (PV) solar has become the fastest growing distributed resource pursued by distribution co-ops. There are numerous business models available for co-ops. For instance, the co-op could purchase power directly from a third-party wind or solar generator ***(See figure 1 Okanogan)***, and charge a specific price to member-owners who are interested in renewable energy. The cooperative could also choose to own a solar generation plant or manure digester and charge member-owners a rate to purchase that power. Co-ops also provide incentives for member-owners to install their own systems ***(See figure 2 Sulphur Springs)***. Of all these models, the fastest growing today is community solar.

> ***Across the nation, distribution cooperatives have been deploying DER to meet the needs of their members ...***

The community solar model offers a very attractive model for increasing deployment of PV solar, allowing any consumer who wishes to participate to do so. This includes renters or those who do not have suitable roof space or credit for installation at their home or business. Ownership can be retained if a participant moves else-

3 Electric Power Research Institute, The Integrated Grid: A Benefit-Cost Framework, Final Report, February 2015.

where within the same utility's territory, or can be sold back or transferred if they move away.

The community solar model is a particularly good fit for cooperatives since they are by their nature consumer-centric organizations ***(See figure 3 Duck River)***. Electric cooperatives across the country are embracing the community solar model as part of their solar development driven by several cooperative principles. More than 50 cooperatives are pursuing community solar programs in 23 states, with 33 community solar arrays already online and at least 32 more planned.[4] As these programs become more established and interest grows, the arrays are growing in size. Those already online average a little over 200 kW, but those currently in development are averaging closer to 600 kW, with several new arrays in the 1-2.5 MW range. Several of the pioneering cooperatives have already expanded their original projects or added additional arrays as strong member participation and interest drives expansion of their community solar programs.

Local "democratic member control," the second cooperative principle, and relatively compact territories make it easier for co-ops to assess the needs and wants of their member-owners. Most community solar participants are residential consumers, which matches well with co-ops that sell the majority of their power to residential member-owners.[5]

Given their lower consumer density, rural areas often lack options for sales, installation, and maintenance from third-parties for rooftop PV solar. In these areas, a community solar program can offer a competitive or superior service in their communities. Some co-ops have chosen to construct and operate their own community arrays, often with financing and business support from the co-op network. Other cooperatives have chosen to work in close partnership with solar developers, focusing on running their community solar program but leaving it to their partner to build and operate the arrays. Some cooperatives have done both, working with a partner on their first project to gain experience and then pursing the next on their own as their program expands. However they choose to proceed, these co-ops are responding to those member-owners who want solar power and are willing to pay for it.

Electric cooperatives across the country are embracing the community solar model as part of their solar development driven by cooperative principles.

Business models like utility or community-scale solar systems are generally much more cost-effective than rooftop solar systems.[6] (***See figure 4 for an example of Tri-State's utility-scale solar project)*** Properly designed community solar programs, for instance, provide a solution to the challenge of cross-subsidization by covering the full costs of solar deployment through voluntary participation. Even small community solar arrays are typically larger than those installed on residential and commercial rooftops, and they can be optimally sited both to capture sunlight and for interconnection with existing electric infrastructure. These arrays can be scaled based on consumer interest, and because all of their generation goes onto the grid they provide more reliable and predictable generation from the standpoint of the local utility, who can integrate this solar capacity into their resource and reliability planning.[7] Finally, the utility takes care of all of the installation, operations, insurance, and maintenance. This arrangement makes community solar more cost-effective, offering more bang for the buck and providing a win-win for all ratepayers.

4 These numbers will likely be out of date very quickly.

5 Nearly 60% of co-op energy sales are to residential consumers, compared to less than 40% for investor-owned and municipal utilities.

6 "Utility Community Solar Handbook." Solar Electric Power Assocation. <http://www.solarelectricpower.org/media/8189/sepa-utility-community-solar-handbook_final-1-.pdf>.

7 This as opposed to third-party rooftop installations using net metering, where the local utility is often lacks comprehensive information on installations in their territory and generation is first used on-site.

The Power of a Network

While electric cooperatives are generally small, the sixth cooperative principle of "cooperation among cooperatives" lets them leverage a national network of resources and expertise. In other words, co-ops in the 51st State would not be alone, but could draw upon a wider Co-op Nation spanning 47 states, over 800 distribution systems, a national trade association (NRECA), and a wide ecosystem of co-op created organizations that provide economies of scale around specific co-op needs.

Distribution co-ops are the foundation upon which a larger framework of support organizations has been erected. This allows distribution co-ops to remain locally focused while also giving them the ability to scale-up through cooperation when needed. Ultimately, this entire network is owned by the member-owners who live on co-op lines.

Many distribution co-ops banded together to create G&T cooperatives to achieve economies of scale for wholesale activities, pooling resources to purchase wholesale power and, where necessary, build their own generation and transmission resources. Most states also have a statewide trade association to coordinate activities and advocate at the state level, and NRECA was created to do the same at the national level in 1942.

Additional organizations have been formed to build scale to provide employee benefits, research, finance, insurance, billing, and other services. Some of these organizations are housed at NRECA while others are associate members. Electric co-ops have created a variety of professional organizations and work groups and also hold regular conferences where staff and officers can discuss common challenges and solutions.

One example in the DER arena that captures this unique co-op advantage is the NRECA-led and DOE SUNSHOT funded Solar Utility Network Deployment Acceleration project, or SUNDA. The goal of the effort is to develop a "PV system package" consisting of engineering designs; business models, financing and insurance options; and optimized procurement that will drastically reduce soft-costs. This project creates a set of tools that will enhance the ability of co-ops to design, finance, deploy and operate utility-scale solar PV systems at their facilities more easily and at a lower cost.

Over 14 electric cooperatives are involved in demonstrating the SUNDA concept and validating the system designs and business models that include community solar projects as well as traditionally-owned PV as part of a common generation portfolio.

This is one of many initiatives NRECA and the electric cooperatives are pursuing to address foundational issues that enable a quick scale-up and deployment of renewable technologies if and when the economics make sense. This includes the creation of engineering impact and financial models, developing utility training, addressing interoperability and cyber security issues, develop vehicles for co-op to co-op sharing of experiences, and ensuring access to quality products at competitive prices.

OKANOGAN COUNTY CO-OP FACILITATED THIRD-PARTY COMMUNITY SOLAR:

(Figure 1)

Okanogan County Electric Cooperative (OCEC), located in eastern Washington, has members enrolled in one or the other of two community solar projects. One is owned by OCEC, the other by members of the cooperative through a local nonprofit corporation. By mid-2020, the second project will become the property of Winthrop WA. OCEC launched its community solar project in 2010 in response to a state production incentive of $1.08/kWh extended to community solar that offered a potential return on investment in the range of 20 percent through 2020. The project's 20.3 kW system was fully subscribed in less than two weeks. Thirty-one cooperative members purchased shares that started at $5,000 per share. OCEC pays the member-investors annually through June 2020 for the kWh produced at the average wholesale cost of power for the preceding year.

With the community solar project fully subscribed, there remained a long list of members seeking to join. Unfortunately, the rules of the state incentive program capped the size of the utility community solar projects owned by small utility companies. Thus, to fill the demand for participation in a community solar project, a second project (Winthrop project) was organized by a local nonprofit organization, with the town of Winthrop as the host (and eventual owner) of the solar system. Under the state rules, incentive payments to non-utility owned solar projects are not capped. Consequently, the Winthrop project signed on 49 OCEC members to build a 22.8 kW system that is expected to provide a potential 30 percent return on investment.

SULPHUR SPRINGS VALLEY CUSTOMER SOLAR INCENTIVES:

(Figure 2)

Sulphur Springs Valley Electric Cooperative Inc. (SSVEC) is a distribution cooperative serving consumers in Arizona. When the Arizona Corporation Commission (ACC) passed the Environmental Portfolio Surcharge (EPS) program, Sulphur Springs Valley created the SunWatts Program in 2005 to provide incentives to promote efficient investment in solar projects. In 2006, the ACC revised the Arizona EPS program which then became the Renewable Energy Standard and Tariff (REST) program. REST program rules require utilities to produce 15 percent of their electricity from renewable sources by 2025. Utilities are given flexibility in how they meet this standard, but their plan must be approved annually by the ACC. The REST program levies a surcharge on all electric bills based on energy use and rate levels to fund various renewable energy programs. From the surcharge on electric bills of $.00988/kWh totaling no more than $3.49 per month, SSVEC receives about $200,000 annually that underwrites successful solar rebate programs, performance-based incentives, and loans. In addition to its member incentive programs, SSVEC worked with the Cooperative Finance Corporation (CFC) to secure $11 million from the Clean Renewable Energy Bond (CREB) program to help fund the installation of 20 kW solar systems at 41 schools in their region. This would create a total of 820 kW of installed solar capacity on schools. The installed solar will save each school approximately $500 on monthly electric bills. A grid-connected solar system also is being commissioned with a $6 million loan to construct two substations, one 1-1.5 MW and one 250 kW facility.

DUCK RIVER SPONSORED COMMUNITY SOLAR:

(Figure 3)

Duck River Electric Membership Corporation (DREMC) is a cooperative power distributor of the Tennessee Valley Authority (TVA). TVA currently offers a consumer program called the Green Power Providers program. The program is offered to all consumers located within the service territory of a distribution utility that is served by TVA. It is a feed-in-tariff style program, which offers a 20-year contract to purchase the energy generated from eligible solar systems. For the first 10 years of involvement, the participants are promised the retail rate for all generation, plus an additional incentive. For the final 10 years, the participants are promised the retail rate for all generation. Currently, the additional incentive rate for the first 10 years of participation is $0.09/kWh.

DREMC noticed an increasing interest in the TVA Green Power Providers program from its members, and the cooperative became the first TVA distributor to develop a community solar program in combination with the TVA program. DREMC formed a limited partnership between itself and its participating members. The cooperative serves as the general partner, assuming the management and operating responsibilities for the entire partnership. The partnership's sole purpose is the operation of the solar farm. At the time the cooperative started its solar farm, the incentive from TVA was $0.12 per kWh and members purchasing ownership in the project received that incentive for the remaining portion of the original 10-year contract term.

Participating members purchase limited partnership interests in increments that are equivalent to investing in one-half of a solar module for a current cost of $600 per share. In exchange, the participant signs a subscription agreement, which entitles the subscriber to earn a share of all profits realized by the partnership applicable to the participant's portion of investment in the solar farm, including the TVA incentive. Participating members receive a bill credit for their share of generation produced from the project through "panel production credits" each month; benefits of federal tax incentives also are passed on to subscribers.

Members no longer able to participate in the community solar program can sell or donate their production panel credits to any other member of DREMC that has an active electric meter. Otherwise, credits can continue to be credited to the current account holder for the previous participant's billing address. Similar to the terms TVA Green Power Providers program, the DREMC community solar program will run for a 20-year period, starting on the date of program commencement (August 2012) and ending in August 2032.

TRI-STATE G&T UTILITY SCALE SOLAR:

(Figure 4)

Tri-State Generation and Transmission Association (Tri-State) is a wholesale power supplier serving distribution cooperative territories throughout Colorado, Wyoming, Nebraska and New Mexico. Tri-State members are bound by Renewable Portfolio Standards (RPS) in Colorado and New Mexico. A 2013 Colorado law mandated that 5 percent of retail electricity generated must be from renewable sources by 2015, increasing to 10 percent by 2020. New Mexico has similar RPS standards, with 5 percent renewable energy required by 2015, increasing by 1 percent each year, reaching 10 percent in 2020. New Mexico also requires utilities to provide voluntary renewable energy options to their customers. Tri-State will be able to meet these targets because in 2009 it inked a 25-year agreement to purchase electricity from the 30-MW Cimarron Solar Facility, which became operational in December 2010 and has the potential to serve the equivalent of 9,000 residential customers. The cost of the electricity is spread among Tri-State's member distribution cooperatives. The project also generates renewable energy credits for New Mexico, which helps fund other renewable energy projects in the state.

Conclusion

America's electric cooperatives are an integral part of today's utility sector, and will continue to be so in the 51st State. Above all, NRECA believes that the electric system should be designed to promote a balanced approach. Such a system would create an optimal blend of investments to support safe, reliable, affordable, and environmentally sustainable power. This includes a market structure that optimizes resources and balances investments through co-ops. It also includes an effective regulator that is able to enforce the regulatory compact and weigh policy options with a long-term perspective. It is clear that co-ops are in an ideal position to achieve these goals at the same time as they respond to local desires regarding DER.

For additional information, contact:

Jay Morrison
Vice President, Regulatory Issues
(703) 907.5825 or jay.morrison@nreca.coop

Jan Ahlen
Regulatory Advocate, Regulatory Issues
(703) 907.5859 or jan.ahlen@nreca.coop

NRECA
A Touchstone Energy® Cooperative

4301 Wilson Blvd. | Arlington, VA | 22203 | NRECA.coop