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The Full Cost of Electricity (FCe-)

Integrating Community Values into the Full Cost of Electricity

PART OF A SERIES OF WHITE PAPERS

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THE FULL COST OF ELECTRICITY is an interdisciplinary initiative of the Energy Institute of the University of Texas to identify and quantify the full-system cost of electric power generation and delivery – from the power plant to the wall socket. The purpose is to inform public policy discourse with comprehensive, rigorous and impartial analysis.

The generation of electric power and the infrastructure that delivers it is in the midst of dramatic and rapid change. Since 2000, declining renewable energy costs, stringent emissions standards, low-priced natural gas (post-2008), competitive electricity markets, and a host of technological innovations promise to forever change the landscape of an industry that has remained static for decades. Heightened awareness of newfound options available to consumers has injected yet another element to the policy debate surrounding these transformative changes, moving it beyond utility boardrooms and legislative hearing rooms to everyday living rooms.

The Full Cost of Electricity (FCe-) study employs a holistic approach to thoroughly examine the key factors affecting the *total direct and indirect costs* of generating and delivering electricity. As an interdisciplinary project, the FCe- synthesizes the expert analysis and different perspectives of faculty across the UT Austin campus, from engineering, economics, law, and policy.

In addition to producing authoritative white papers that provide comprehensive assessment and analysis of various electric power system options, the study team developed online calculators that allow policymakers and other stakeholders, including the public, to estimate the cost implications of potential policy actions. A framework of the research initiative, and a list of research participants and project sponsors are also available on the Energy Institute website: energy.utexas.edu

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This paper is one in a series of Full Cost of Electricity white papers that examine particular aspects of the electricity system.

Other white papers produced through the study can be accessed at the University of Texas Energy Institute website:
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Integrating Community Values into the Full Cost of Electricity

Jason A. Wible, *LBJ School of Public Affairs*
Carey W. King, *Energy Institute and Jackson School of Geosciences*

The University of Texas at Austin

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ABSTRACT:

This white paper examines recent examples for the expression of public values in community energy decisions and asks if these values should be considered as one of the inputs into a model for the cost of electric service. The success of public policies that permit the advance of technology to de-risk and lower the cost of distributed energy systems is allowing individuals to generate their own electricity. However, it is also enabling a parallel movement towards community or values-based energy systems. Four common expressions of this movement are considered here: 1) District energy utilities, 2) Community-owned renewable generation, 3) Community approved use of eminent domain, and 4) Community Choice Aggregation (CCAs). This white paper provides brief examples for the first three options before reviewing Community Choice Aggregation in detail. Finally, a case study is made for the most recent CCA to form in the United States, Sonoma Clean Power.

INTRODUCTION

Are community values a mandatory input into the cost of electricity? *The Full Cost of Electricity* project at The University Texas incorporates a broad spectrum of variables into the cost of electricity.

A series of recent studies produced by groups from academia, government, and the financial sector have examined the cost of electricity through a narrower lens. In May of 2014, Brookings published *The Net Benefits of Low and No-Carbon Electricity Technologies*. This analysis builds on a framework from Paul Joskow (2011) who claimed that levelized costs are not the appropriate measure to rank energy technologies. Instead Joskow and Brookings argue for incorporating the variability of demand based on time-of-day into the cost of electricity. Using this method, Brookings conducts a net-benefit analysis for new generation capacity based on three variables: 1) avoided emissions costs based on a range of carbon prices, 2) avoided fuel costs based on time of day and fuel type, and 3) avoided or net capacity capital costs for an equivalent 99% reliability of generation.

The financial advisory and asset management firm, Lazard, publishes an annual *Lazard's Levelized Cost of Electricity Analysis –Version 9*. Lazard chose to use a levelized costing technique to calculate the price of electricity for various technologies. They consider overnight capital costs, financing, taxes, labor, fixed operation and maintenance cost (O&M), and variable O&M including fuel. Lazard also makes some cost allowance for energy storage and a price on carbon. However, they do not include stranded costs related to distributed generation; network upgrade, congestion costs; integration costs; costs of complying with environmental regulations (e.g., carbon emissions offsets, emissions control systems; social and environmental externalities, including, for example, the social costs and rate consequences for those who cannot afford distribution generation solutions); or the consequences of conventional generation technologies that are difficult to measure (e.g., nuclear waste disposal, environmental impacts, etc.).

Finally, U.S. EIA publishes the Annual Energy Outlook for which calculating the expected cost of electricity from different energy technologies is a key input to the model. EIA utilizes the Electricity Market Module (EMM) for this purpose as a component of the National Energy Modeling System (NEMS). The EMM includes sub-modules for capacity planning, fuel dispatching, and finance and pricing. The fuel-dispatching sub-module uses the existing stock of generation equipment types, their operation and maintenance costs and performance, fuel prices to the electricity sector, electricity demand, and applicable environmental regulations to determine the least-cost way to meet demand. The sub-module also determines transmission costs and pricing of electricity. The finance and pricing sub-module uses capital costs, fuel costs, macroeconomic parameters, environmental regulations, and load shapes to estimate generation costs for each technology [1].

These three studies use a subset of the variables that are considered in the broader *Full Cost of Electricity* project. Each of the models relies on the assumption that the lowest-cost source of electricity, based on the varying inputs, will be chosen in the market place. Viewing electricity as an undifferentiated commodity, economic rational choice theory (RCT) tells us that individuals and communities will choose the lowest cost source since the utility for electricity is satisfied regardless of the source. However, there are a growing number of examples where this is not what is happening in the market place. Individuals or communities who adopt distributed energy, abandon incumbent utilities and

source their own low-carbon electricity, are often making judgments that may include personal or community values before they buy. If we consider these values as a positive input into the utility function, this behavior is not inconsistent with RCT.

This raises an important question for the *Full Cost of Electricity* project. Is our objective limited to determining the cost for differing sources of electricity generation? What are the non-economic reasons that customers have to choose how they purchase electricity, and do they provide a predictive capability for the adoption and costs of future energy sources? For the latter, incorporating individual and community values may be necessary.

COMMUNITY ENERGY

The success of public policy combined with technology in de-risking and lowering the cost of distributed energy is allowing individual households to create their own electricity. However, it is also enabling a parallel movement towards community energy systems. This movement is taking four common forms: 1) District energy utilities, 2) Community-owned renewable generation, 3) Community approved use of eminent domain, and 4) Community Choice Aggregation (CCAs). This white paper will provide brief examples of the first three options before reviewing Community Choice Aggregation in more detail. Finally, a case study is made for a recent CCA formed in the United States, Sonoma Clean Power.

DISTRICT ENERGY

Neighborhood energy utilities, also referred to as district-energy systems, are one example of community energy that is being enabled by emerging technology and permitted by local public policy. These systems allow power, heating, or cooling to be generated at a central location in a neighborhood to service a defined local area. The energy sources used are often waste heat or steam from some nearby process, like waste water treatment. In dense urban settings, they can provide another option to provide heat and light for neighboring buildings.

Some university campuses employ district energy systems, and the University of Texas at Austin is one of the best examples. The UT-Austin campus operates as a separate grid within the city of Austin with 140 MW of electric power capacity from natural gas combustion turbines. This power provides the campus with a supply of compressed air and chilled water for air conditioning (equivalent to 6,600 average houses) while the waste heat provides for building heating and hot water to the campus buildings. This model is growing in the northeastern United States as hurricane Sandy highlighted the benefits of such an approach for easing recovery from the effects or natural or manmade disasters.

Another example; Vancouver (Canada) has a strong environmental consciousness and is leading in the developing of these types of district systems. Since 2007, the city has required that the developer of any large tract of land do a feasibility study that examines whether a district-energy system is possible [2]. In September of 2014, the United Nations Environment Program (UNEP) released an advanced summary of a forthcoming report; *District Energy in Cities: Unlocking the Full Potential of Energy Efficiency and Renewable Energy*. UNEP identifies cities as the consumption point for 70% of global energy with half of this energy used for heating and cooling [3]. Using systems that combine district heating, district cooling with combined heat and power (CHP), thermal storage, heat pumps and/or decentralized energy, UNEP finds that district energy systems could reduce overall capital investment in the power sector by 7% through 2030 with an investment savings of US $795 billion [3]. By actively pursuing these savings, neighborhood based energy is expected to be an important source of energy for Vancouver in the coming years.

COMMUNITY RENEWABLE GENERATION

Community-owned electric generation provides a similar model to district energy systems in which energy is produced and used locally, often on public land, with public values providing a key motivation for initiating the projects. For example, Denver County, Colorado is pursuing a program for community-based solar power. Officials from Xcel Energy, the EPA, and the Colorado State Land Board joined solar developer Clean Energy Collective (CEC) to open community solar facilities located in public spaces. The newest array has been developed on a 5-acre site at the Evie Garrett Dennis School campus in northeast Denver [4]. Through the community solar model, any Xcel Energy customer in Denver County can purchase individual panels in the shared arrays, up to enough panels to offset all of their electricity needs on an annual basis. This mechanism enables anyone in the community to participate in a renewable

energy system whether they own a home or not. Renters and businesses in leased buildings, which normally would not have the option to install rooftop solar panels, are able to choose to source their energy from a shared community asset.

The state of Minnesota passed legislation in 2013 that seems set to move community solar gardens into rural areas of the state. The law requires Xcel Energy to administer a community solar gardens program for projects that may be up to 1MW and establishes no limit on the number of community solar projects that may be developed. The law provides the following specifications for subscribers to the community solar gardens:

- Subscribers to solar gardens will receive a bill credit for the electricity generated in proportion to the size of their subscription.
- Individual subscriptions must be at least 200 Watts, but may not be sized at more than 120 percent of average annual subscriber energy consumption (in combination with other on-site distributed generation).
- Subscribers may live in a county adjacent to county where the solar garden is located [5].

As reported by Minnesota Public Radio (MPR) in December of 2014, this final clause allowing subscriptions to solar arrays in adjacent counties can potentially drive a major economic development opportunity for rural counties adjacent to Minnesota's larger cities. The adjacent smaller cities and rural areas have much more open space available and at lower cost than urban developments. MPR interviewed Eric Pasi, VP of Business Development for local solar developer Innovative Power Systems during the broadcast. Said Pasi, "In 2007, when I started, there were maybe eight contractors that did specialty work like we do. (Recently), I was at a kickoff meeting at Xcel for information on the application process, and there were 90 people in the room….I would say, in 2006, this was a $10 million dollar industry in the state. Next year, it could be hundreds of millions of dollars of economic opportunity." [6]

The community energy projects described above in Boulder and Minnesota provide options for renters, businesses, or homeowners without suitable rooftops for solar systems to purchase renewable energy. An innovative public program in California extends this option to low-income renters in multi-tenant housing. Established in October 2008, the Multifamily Affordable Solar Housing (MASH) program provides incentives for the installation of PV systems on and around low-income family housing. MASH establishes a technique called virtual net metering (VNM). Through virtual net metering, California utilities distribute the kilowatt-hours generated from the PV system to the individual tenant's accounts based on the relative size of the rental unit in the same manner that affordable housing rents are established [7]. Driven by lower-cost technology and enabled by public policies with a foundation in community values, these examples demonstrate both the creation new market opportunities and broadened access to renewable energy systems.

COMMUNITY APPROVED USE OF EMINENT DOMAIN

In Boulder Colorado, citizens are more forcefully insisting on sustainable energy that is aligned with the majority-community values. In 2013, the local utility provider, Xcel Energy, spent more than $500,000 to advance a ballot measure that would restrict Boulder's exploration of a locally owned alternative to the monopoly utility [8]. However, in November 2013, the community voted more than 2-to-1 against the initiative. Consequently, Boulder has envisioned a city-owned electric utility that "maximizes local benefit rather than shareholder returns, that generates power in town rather than importing it, and that maximizes renewable energy instead of clinging to fossil fuels." [8]

This type of action presents a similar challenge to the shareholder-controlled utility model that the rural electric cooperatives used for

electricity distribution in the 1930's. Rural electric cooperatives also had the objective of maximizing local benefit rather than shareholder returns, but in the case of cooperatives, the extension of power lines to small, isolated rural communities could not be economically justified. In response, the government provided various subsidies so that rural communities could achieve the benefits of electrification. Today, government subsidies are again the key enabler of cost reductions in distributed energy technologies. The Boulder case may be the first in a growing number of attempts to restructure electricity distribution because new technology threatens to undermine the natural monopoly that existed due to economies of scale.

Today, Boulder is taking the next step to build a community-based energy system and actively seeking to take control over the local electric transmission and distribution infrastructure. With voter approval, the city is moving to use eminent domain to acquire as much as $214 million worth of Xcel Energy Inc.'s transmission lines and substations [9]. City spokeswoman Sarah Huntley said, "Xcel has one of the most carbon-intensive energy supplies in the country. We realized that if we did not address that problem, we probably were not going to make the kind of progress on climate we as a community want to make." [9]

COMMUNITY CHOICE AGGREGATION

Community Choice Aggregation (CCA) provides communities an alternative to eminent domain that allows for less-aggregated, values-based choices in electricity generation, while leaving ownership of the transmission and distribution assets with the incumbent utility. CCA allows communities to pool electricity demand in order to purchase power on behalf of residents, businesses, and municipal facilities within the jurisdiction [10]. Six states passed CCA laws as part of electric restructuring legislation in the late 1990s and early 2000s: California (2002), Illinois (2009), Massachusetts (1997), New Jersey (2003), Ohio (1999), and Rhode Island (1997) [11]. As of October 2014, Utah, Colorado, New Mexico, Hawaii, and Connecticut were investigating passage of CCA laws, and New York, Delaware, and Minnesota had legislation or state studies pending [12].

The dramatic reductions in the cost of renewable technology, spurred by decades of public investment, play a major role in enabling CCAs. Paul Fenn, author of California's Community Choice law AB117, writes "Community Choice is creating a major new business development opportunity not only for electric service providers (ESPs) but also for renewable energy, energy efficiency, conservation, and distributed generation vendors, integrators, service companies and developers. With the secure, regional long–term contracting environment created by this law, energy innovators face a major, even historic opportunity in California." [13] Fenn goes on to say that CCAs are not just about cost and climate change but also protecting residents, businesses and public agencies against energy and fuel price volatility, improving local energy security, and creating a potentially huge new market for local energy technology companies [13].

As the name implies, CCAs are freed to act as directed by and on behalf of their local community. However, there are risks to communities in taking these actions as acknowledged by the California Energy Commission (CEC) in their 2009 Community Choice Aggregation Guidebook. CEC outlines detailed political, financial, administrative, and regulatory risks faced by communities that chose to adopt CCA. The negative consequence of many of these risks is that electric rates for CCA customers rise above the rates charged by IOUs causing customers to defect. Customer defections would cause the rates to rise further for remaining CCA customers leading to the familiar utility 'death spiral' that may have significant undesirable consequences for both the local government and its bond ratings.

California has been the leader in public policy support for distributed energy technology. The state is also playing a leading role in the CCA movement, reaping the benefits of twenty-five years of stable state-level public support for

sustainable energy technology. Governor Davis signed California's Community Choice Law in September 2002 [13]. However, the Marin Energy Authority, California's first CCA, was not formed until 2009 to provide power for Marin County and eight of its cities and towns [14]. Addressing California's continuing leadership position in 2012, Paul Fenn said, "If successful, these programs will be world leaders in climate action and green-power development." [14]

It is important to distinguish between individual consumer choice and CCAs as representing a community-wide decision. *At a basic level, a CCA is attempting to create a new smaller municipal utility within an existing larger monopolistic utility region.* The CCA might or might not own generation, transmission, and distribution assets. But CCAs are not the only method by which a consumer can express "values" in purchasing electricity.

Individual consumer choice exists for some residential customers in unbundled electricity markets such as the Electric Reliability Council of Texas (ERCOT). For the example of ERCOT, consumers outside of municipal or cooperative utility regions can choose their electricity service provider from a multitude of plans that vary rates ($/kWh), contract times (e.g., monthly, annually, month-to-month), and by source of generation (e.g., renewable energy). In essence, these consumers can express their *individual* values via choice of retail providers. It is still possible that several individuals could collectively bargain for a "community" purchase of electricity from available retail electricity plans or push for a new retail plan that best expresses their values. However, the point is that these consumers already have some ability to make "value-based" purchases as individuals and might not see the need to join a community effort.

Continuing with the example of ERCOT, other customers reside within monopolistic municipal (e.g., Austin Energy, CPS of San Antonio) or cooperative utilities (e.g., Pedernales Electric Cooperative, Inc., Bluebonnet Electric Cooperative). It is possible that these customers represent a "community" that is able to express their values in such a way to guide investments in the utilities. For example, in the City of Austin, citizens can act to influence their representative(s) in the City Council and the City Council in turn sets the priorities for Austin Energy. However, should the community seek a value-based change in direction for the utility that does not occur then individual consumer choice may be limited.

IMPLICATIONS FOR CENTRALIZED UTILITY BUSINESS MODEL

Community energy, in any of these four summarized forms, may be dismissed as a small or insignificant trend. But history suggests such a dismissal would be imprudent. The present business model for production and delivery of electricity to consumers is a complex web of processes managed by the federal government and various states. The current patchwork has evolved through attempts to meet local needs in the most efficient way, at the lowest cost, while mitigating any negative effects of local decisions on the wider population. The historic balance achieved in the United States is being undercut today by changing technology. When viewed in this context, community energy efforts may be the initial steps towards another re-definition of the electricity-delivery business model, bringing decisions from the state level down to much smaller communities.

Investor-owned utilities recognize this possibility. For example, in the 2013 Annual Shareholder Reports published in 2014, both PG&E and Southern California Edison list CCA as material and competitive risks to their businesses. In the Risk Factors section of their report PG&E writes, "PG&E Corporation's and the Utility's financial results could be affected by the loss of Utility customers and decreased new customer growth due to municipalization, an increase in the number of community choice aggregators, increasing levels of "direct access," and the development and integration of self-generation and distributed generation technologies." [15] PG&E lists, as an additional risk factor, that

local government agencies may exercise eminent domain to acquire the Utility's facilities to provide utility service to their local community, as in being seen in Boulder, CO today.

However, the utility industry is not entirely passive and utilities can also shift strategy. As stated by the Edison Electric Institute's 2015 Wall Street Briefing [16]: "It is widely understood that since the early 2000s electric utilities have been renewing their focus on the customer and business strategies that align with state regulators. In fact, between 2002 and 2013, the industry has moved from a balance sheet that was roughly 60 percent regulated to one that's closer to 75 percent regulated." Seeing a need both for investments in regulated parts of the electricity supply chain and for securing revenues in a competitive spaced for electricity sales, the utility industry seems to be shifting toward business with a regulated and guaranteed rate of return.

CASE STUDY: SONOMA CLEAN POWER (SCP)

In order to better understand the mechanisms through which communities form and operate CCAs, Sonoma Clean Power is presented as a case study here.

California initiated the path to electricity market deregulation in 1994 when the California Public Utility Commission (CPUC) issued the "blue book" to study electric power industry restructuring in California. Following this study, in September 1996, Assembly Bill 1890 was enacted to restructure the California electric utility industry and implement retail direct access. AB 1890 established a requirement for an Independent System Operator (ISO) to operate the transmission system and a Power Exchange (PX) to operate a wholesale power market, which the investor owned utilities must sell to and buy from in order to meet the power needs of their customers [17]. This deregulation, along with a series of subsequent reforms, set the stage for AB 117, signed into law by Governor Davis in September 2002.

AB 117 builds on existing California law that authorizes entities to aggregate electrical loads, and defines an "aggregator" as one of those entities that provides electricity supply services, including combining the loads of multiple end-use customers and facilitating the sale and purchase of electrical energy, transmission, and other services on behalf of these customers. The bill extends this existing concept by allowing local communities to form community choice aggregators and authorizes the CCA to aggregate the electrical load of interested electricity consumers within its boundaries [18]. Customers within the local jurisdiction are enrolled in the CCA as the default option after being afforded multiple opportunities to 'opt-out' and retain service with the incumbent utility provider.

AB 117 establishes a series of planning and operational requirements for CCAs. One requirement mandates that the perspective CCA file an implementation plan with the Public Utilities Commission. In August 2013, SCP filed the *Community Choice Aggregation Implementation Plan and Statement of Intent* with CPUC to detail the perspective CCA's roadmap for satisfying the requirements of AB 117. This document outlines SCP's plans for customer notification, rate setting, procurement, contingencies for termination of the CCA, and other reporting requirements as described by AB 117. The organization's primary organizational goals are listed in a Joint Powers Agreement (JPA) described below. The emphasis of the JPA is local jobs, local control, and the reduction of GHG at the county level, issues that would have previously been addressable only through the use of eminent domain.

As of May 1st 2014, Sonoma County Power (SCP) began offering tens of thousands of ratepayers energy. By the end of 2014, this number was anticipated to grow to around 160,000 customers as the CCA rolled out to the cities of Windsor, Sonoma, Cotati, Sebastopol, Santa Rosa and Cloverdale, as well as all of the unincorporated areas in the county. SCP offers a 'CleanStart' plan comprised of 33% qualifying renewable sources (wind, solar, geothermal, biomass, etc.) and an 'EverGreen' plan comprised of electricity that is both 100% local and renewable (starting with geothermal + adding solar over time). As of mid-2015, SCP has retained 90% of eligible customers (customers are defaulted to "opt in" to SCP) with 10% electing to remain with the incumbent, PG&E. PG&E will continue to handle transmission, billing, metering and grid maintenance for all customers. However, for SCP customers, PG&E will stop charging for generation but will continue to charge for the energy delivery services and various regulatory fees. Because PG&E and SCP provide separate electric services, a customer's bill will include charges from both PG&E and SCP. A sample billing statement for SCP customers may be found here.

On October 24th, 2014 SCP released v.3 of the CCA's *2014 – 2018 Resource Plan* incorporating public comments made since August 2014. The plan covers the period from May 2014 through

the end of calendar year 2018. A Joint Powers Agreement that sets the policy framework guides both Sonoma Clean Power and this resource plan. The JPA outlines the following purposes:

1. Reduce greenhouse gas emissions related to the use of power in Sonoma County and neighboring regions.

2. Provide electric power and other forms of energy to customers at competitive costs

3. Carry out programs to reduce energy consumption

4. Stimulate and sustain the local economy by developing local jobs in renewable energy

5. Promote long-term electric rate stability and energy security and reliability for residents through local control of electric generation resources

The JPA goes on to state that local renewable energy projects are the intended method to meet these organizational goals, and any sourcing of non-local renewables or renewable energy credits (RECs) will be transitional measures.

Portions of this mission, as captured by the Joint Powers Agreement, diverge from the traditional electricity business model in California. First, SCP has set top-level GHG goals that are specific to the county jurisdiction. Utilities with broader service areas may consider the desired electric generation mix of a local government, but this would not be expected to be their core purpose. Secondly, SCP sets a goal to reduce energy consumption in the county that has a basis in the community values, adding credibility. IOUs have fiduciary responsibility to shareholders that make the goal of selling less electric power more difficult to fully embrace. Thirdly, SCP has local job creation as an integral component of the organizational purpose. IOUs do have a requirement under the California renewable portfolio standard to source a percentage of their renewable electricity from within the state. However, it is not expected that the utility would place job creation for a specific local jurisdiction as a higher priority than sourcing the lowest cost electricity that meets regulatory mandates. Finally, SCP is able to plan for long-term energy supplies that are consistent with community values and make these decisions under local control. This would not be an option in dealing with a third party IOU whose interests must also be considered in a contract negotiation. In these ways, the focus for SCP is shifted away from pure cost minimization by design. While costs to the consumer have not increased to date, it is yet to be seen whether all of the goals outlined by the CCA will be achieved over the longer term with no increases in rates ($/kWh).

POWER SOURCES AND RESOURCE ADEQUACY

In order to maintain a robust electrical system, CCAs in California are required to meet many of the same requirements as the incumbent utilities. CPUC requires all load serving entities (LSEs) to demonstrate that they have procured electricity supplies that are sufficient to meet customer demand. SCP will file annual and monthly reports documenting that the CCA has procured sufficient electric capacity including a reserve of an additional 15% of total forecasted electric load [19]. A new requirement, named Flexible Capacity, took effect on January 1st, 2015 and requires SCP to maintain a specified percentage of generation capacity that can increase and decrease output quickly to meet changes in demand [19].

SCP must also comply with the California RPS requirements. For renewable generation above the level of the California RPS, set at 23.3% for 2015, SCP will follow the same guidelines that have been established for PG&E. SCP will also file an annual power source disclosure with the California Energy Commission (CEC), matching the requirements placed on the IOUs. Finally, SCP is exempted from the both the Mandatory Reporting Regulations (MRR) for GHG emissions established by AB32 and from the companion Cap and Trade requirements. However, the generation facilities from which the power is sourced will be responsible for MRR and AB32 reporting. In order to make a transparent comparison with PG&E, SCP has elected to

voluntarily report GHG emissions under the same parameters for the MRR and Cap and Trade.

In order to satisfy the requirements described above, as well as internal goals of 33% renewable energy and 70% carbon-free energy in the first year of operation, SCP has entered into contracts with two primary suppliers, Constellation (a subsidiary of Exelon) and Calpine Corporation. These contracts and other electricity sourcing initiatives are described below.

SCP will receive local and renewable energy from the Geysers geothermal facilities located in Sonoma and Lake counties. This contract is set at 10 MW of continuous supply today and will increase to 50 MW through 2018, meeting 23% of total anticipated demand at that time. Customers who elect for SCP's EverGreen plan guarantee that Sonoma Power will purchase a sufficient supply of 100% local and renewable electricity on behalf of the community to meet contracted demand. It should be noted that these are financial constructs and individual householders are not being supplied electricity directly from the local, renewable sources. However, the selection of EverGreen plans will increase aggregate demand for these electricity sources and enables the development of facilities such as Geysers.

Constellation, a subsidiary of Exelon, was chosen as a principal electric generation supplier. SCP has secured enough carbon free energy (mostly large hydro) to meet the organization's GHG reduction goals for 2014, 2015, and 2016. According to the Draft Resource Plan, this electricity is priced competitively and allows SCP to offer an initial generation mix with a 30% lower emission factor than PG&E [19]. In personal correspondence, SCP stated that the large hydro electricity is generated in the Pacific Northwest. Reporting on generation from specific facilities looks backward one year and will not be available until the completion of SCP's first full year of operation later in 2015.

SCP is taking multiple additional approaches to meet the long-term objective of local and renewable energy. In a press release dated 22-Oct-2014, SCP announced a 20 year solar contract with Recurrent Energy for 40 MW of capacity to be built near Lemoore, CA, located in the San Juaquin Valley south of Sonoma. SCP committed the initial 30 MW to this project in June 2014 allowing the development to move forward. The new contract brings the total commitment to 70 MW, which are intended to meet renewable energy goals in 2017 and 2018 [19].

Two policy based mechanisms take additional steps towards the local and renewable goals. In August of 2014, SCP launched a feed-in-tariff program called ProFIT. This program will allow local renewable projects sized less than 1 MW to sell electricity back to SCP with 20-year agreements at pricing intended to be attractive to the developer [19]. In personal correspondence, SCP stated that a standard fixed rate is provided for all power delivered to SCP. In 2015 this fixed price was $95/MWh for 10 or 20 years regardless of the time of day. Developers can apply for three bonuses and an incentive that can bring the offered price up to $135/MWh. For comparison, the average (spot) wholesale electric price at the California ISO (CAISO) NP15 hub was $51.89 for 2014 [21]. This approach underscores the longstanding tension between funding by taxpayers and funding by ratepayers. The people of California pay for the electricity used in California. Nearly all of them both pay taxes and buy electricity. Incentives and subsidies redistribute costs to tax payers for rate payers, obscuring the true cost of electricity to achieve a public objective.

A separate policy establishes a local net-energy metering program called NetGreen, which allows customers to install small distributed-energy systems to offset their electric energy requirements and sell excess power back to the grid [19]. In personal correspondence, SCP stated that for NetGreen customers (customers with solar on their homes or businesses used primarily to offset usage), the price credited for generation is their CleanStart rate and is identical to the price they would otherwise pay for usage. If a customer is on a Time-of-Use rate, the price they are credited will vary on time of day. If a customer overproduces at any point, they are given an additional $0.01/kWh beyond the retail rate for all net excess production. Both of these policy mechanisms

have demonstrated success in California in recent years and should be expected to contribute to local economic benefit up to the program caps by incentivizing the development of local renewable projects and distributed systems at households.

Finally, the remaining 30% of electricity, which will also be sourced from Constellation Energy, is mostly from natural gas fired generation. The contract extends through December 31, 2016 and was also competed for by Direct Energy and NRG, both Houston-based companies. The Sonoma Clean Power Authority Business Operations Committee held a meeting on October 20, 2014 for which the agenda was published online. This agenda includes a copy of the Master Power Purchase and Sale Agreement between Exelon Generation Company and Sonoma Clean Power Authority. Section 2.7 of this contract states clearly, "The Energy provided under this Confirmation may be procured from unit-specific sources, provided such resources are not coal or nuclear, under terms and conditions to be agreed between the Parties." [21] This is an example of how the CCA structure may allow local governments to place community values ahead traditional state-wide values under conventional regulation.

Recognizing the potential benefit of placing energy purchasing and pricing into local hands and allowing the local community to determine what type of energy mix best serves its needs, a growing number of California communities, including San Diego and Monterey, are actively considering implementing a CCA [22].

With these examples as a guide, the Full Cost of Electricity project recognizes that technology has lowered costs to a level where it may not be necessary to aggregate needs and values at a statewide level to meet cost and reliability requirements. As this happens, there will be more pressure for local control of local electricity production and distribution. This is not expected to be a simple transition as it could redistribute energy income within a state with significant political and financial impacts. The future business models in the electricity sector will depend heavily on assigning or allocating costs of changing business models that move to more local control in order to improve the discussion of the potential costs and benefits to society overall. ■

REFERENCES

[1] *Annual Energy Outlook 2013 with Projections to 2040* (Washington , DC: U.S. Energy Information Administration, April 2013), http://www.eia.gov/forecasts/aeo/pdf/0383%282013%29.pdf.

[2] Frances Bula, "Vancouver's 'District Energy Utility' Can Heat Entire Neighborhoods," *CityLab*, October 10, 2014, http://www.citylab.com/tech/2014/10/vancouvers-neighborhood-energy-utility-can-heat-entire-neighborhoods/381337/.

[3] *District Energy in Cities: Unlocking the Full Potential of Energy Efficiency and Renewable Energy* (United Nations Environment Program, 2014), http://www.districtenergy.org/assets/pdfs/UN-Sept-2014/UN-DistrictEnergyinCities-Advanced-summary12pagerlowres.pdf.

[4] "Relief for Xcel Energy Customers Seeking Clean Energy Options | Clean Energy Collective." August 28, 2014 (accessed March 22, 2015 at http://www.easycleanenergy.com/Shownews.aspx?ID=6c1d7b88-d658-4733-9d3a-ce93daaded68).

[5] "Community Solar Gardens (Xcel Energy)," accessed January 21, 2015, http://mn.gov/commerce/energy/topics/resources/energy-legislation-initiatives/xcel-communiity-solar-gardens.jsp.

[6] Jennifer Vogel, "Community Solar Gardens Go Rural," *Minnesota's Rural Expansion of Solar Power* (Minnesota Public Radio, December 17, 2014), http://www.mprnews.org/story/2014/12/17/ground-level-solar-garden.

[7] *Multifamily Affordable Solar Housing Semiannual Progress Report* (California Solar Initiative, June 30, 2014), http://www.cpuc.ca.gov/NR/rdonlyres/AEDBD868-53A3-4365-BF0E-388469D6A570/0/June2014MASHSemiAnnualProgressReport_FINAL.pdf.

[8] John Farrell, "People Power Beats Corporate Utility 2-to-1 in Boulder," *Grist*, accessed October 8, 2014, http://grist.org/politics/people-power-bests-corporate-utility-2-to-1-in-boulder/.

[9] Evan Halper, "Communities Going into Power Business to Cut Cost, Carbon Footprint," *Los Angeles Times*, September 1, 2014, http://www.latimes.com/business/la-fi-sonoma-power-20140902-story.html.

[10] "MCE: Green Power Community Choices," January 2014, http://marincleanenergy.org/sites/default/files/key-documents/MCEGeneralPresentation1.15.14_0.pdf.

[11] "Green Power Network: Community Choice Aggregation (CCA)," *U.S Department of Energy*, accessed November 3, 2014.

[12] "Lean Energy U.S.," accessed October 23, 2014, http://www.leanenergyus.org/.

[13] Allen Whitney, "Community Choice Aggregation: Giving Consumers Access To Clean Energy," accessed October 8, 2014, http://thinkprogress.org/climate/2012/10/15/1006681/community-choice-aggregation-giving-consumers-access-to-clean-energy/.

[14] Katharine Mieszkowski, "New Group Seeks to Bring Greener Power to Marin - NYTimes.com," December 19, 2009, http://www.nytimes.com/2009/12/20/business/energy-environment/20sfpower.html?_r=1&.

[15] *PG&E Corporation and Pacific Gas and Electric Company: 2013 Annual Report* (PG&E Corporation and Pacific Gas and Electric Company, 2013), 35, *PG&E Corporation and Pacific Gas and Electric Company: 2013 Annual Report* (PG&E Corporation and Pacific Gas and Electric Company, 2013), 35, http://investor.pgecorp.com/files/doc_financials/2013/2013%20Annual%20Report%20-%20final.pdf.

[16] Powering Possibilities, Electric Power Industry Outlook, The Edison Electric Institute's 2015 Wall Street Briefing, February 11, 2015 (http://www.eei.org/resourcesandmedia/industrydataanalysis/industryfinancialanalysis/Documents/Wall_Street_Briefing.pdf).

[17] "Electricity Restructuring by State," *U.S. Energy Information Administration*, May 2010, http://www.eia.gov/electricity/policies/restructuring/restructure_elect.html.

REFERENCES *(Continued)*

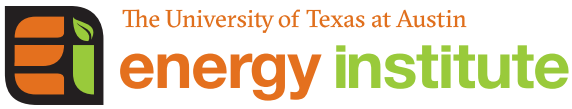
[18] *Assembly Bill No. 117*, 2002, http://www.leginfo.ca.gov/pub/01-02/bill/asm/ab_0101-0150/ab_117_bill_20020924_chaptered.pdf.

[19] *SCP Resource Plan Draft v.3: 2014-2018 Resource Plan* (Sonoma Clean Power, October 24, 2014), https://sonomacleanpower.org/wp-content/uploads/2014/08/SCP-Resource-Plan-Draft-v0.3-clean.pdf.

[20] "Wholesale Power Prices Increase across the Country in 2014 - Today in Energy - U.S. Energy Information Administration (EIA)," accessed January 22, 2015, http://www.eia.gov/todayinenergy/detail.cfm?id=19531.

[21] "Agenda: Sonoma Clean Power Authority Business Operations Committee," October 20, 2014, http://sonomacleanpower.org/wp-content/uploads/2014/10/SCPA-Business-Operations-Committee-2014-10-20.pdf.

[22] Jim Fielder, "Community Choice Aggregation," April 29, 2014, http://cf.valleywater.org/Water/Where_Your_Water_Comes_From/Water%20Supply%20and%20Infrastructure%20Planning/Climate%20Change/CCAmemo201404.pdf.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