From "Utility of the Future" to "Communities of the Future"

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ABSTRACT

Increasing numbers of households in the United States are low-income, and they are underserved by residential energy efficiency programs and face barriers to distributed generation and innovative rate design. Moreover, poverty is increasing. Low-income households tend to live clustered in communities, many of which suffer from disinvestment across the housing, transportation, and community development sectors. Given these geographically related challenges, the "utility of the future" must have a community-based approach. The "utility of the future" phrase describes changes currently underway or anticipated in the industry, including advanced metering, rate design, and distributed generation. To date, this framework has been highly technical and internal to the utility industry. This paper makes the case for broadening the approach in order to serve more low-income households. Using research from Illinois and pilot program examples from Chicago and Minneapolis, this paper begins with (1) the current approach to energy efficiency and renewable energy by utilities in the United States and the simultaneous efforts by cities and local governments to lead on climate change policy; (2) demonstrates evidence that low-income households face several barriers to existing utility approaches; and (3) recommends a new framework, "communities of the future," in which utilities, cities, and nonprofit partners work together to connect low-income households to renewable energy, advanced rate design, and energy self-sufficiency while meeting city-level climate goals and breaking down utility program silos.

Introduction

This paper shifts the current discussion in the energy industry from the "utility of the future" to "communities of the future." In the energy context, we define "communities of the future" as those in which utility, nonprofit, and municipal partners deliver multiple benefits across siloed program offerings, including energy efficiency, microgrids, solar PV, and energy storage systems. Low-income customers stand to benefit the most from energy efficiency, distributed generation, and innovative rate design because they tend to live in more energy-intensive homes and pay a higher proportion of their income for utilities than higher-income households. The utility of the future framework is limited to stakeholders within the utility industry and too often does not consider the needs of low-income families. Meanwhile, community organizations in the fields of affordable housing and sustainable development prioritize environmental justice and resiliency in low-income communities.

The communities of the future approach brings together these disparate approaches and stakeholders to ensure that the benefits promised by the utility of the future, including increased generation from renewable energy, jobs in the clean energy sector, and local microgrids, reach those who need them most. This paper (1) outlines the current approach to energy efficiency by utilities and the simultaneous effort by cities and local governments to lead on climate change policy; (2) presents demographics and energy-related research on the low-income population in the United States, including their lack of access to energy efficiency, renewables, and other

components of the utility of the future framework; (3) recommends a new communities of the future framework and highlights several new and pilot programs in Illinois and elsewhere.

Utility and City Approaches

Utilities are a crucial player in encouraging reduction in energy use, via a variety of strategies, including energy efficiency, demand response, distributed generation, and a host of other programs. At the same time, cities, counties, and other municipalities are increasingly leading efforts to combat climate change by passing policies and setting ambitious greenhouse gas (GHG) emissions targets. This section discusses existing approaches to energy efficiency by both utilities and cities.

Utility Approaches

Many in the utility industry anticipate significant disruption brought on by extreme weather and climate change, regulation, and economic pressures to decarbonize and decentralize. The industry is responding to increasingly erratic weather wrought by climate change, demand for renewables and distributed generation by customers, and threats to their business model as more third-party actors enter the utility market. In February 2015, one utility CEO predicted that there will be more changes in the next 10 years than there have been in the past 100 (Pyper 2015). Many in the industry are willing to preemptively adapt, and this process is sometimes called "utility 2.0" or "utility of the future." Some of these preemptive changes are outlined below.

Several major utilities in the United States are actively adapting and planning for these changes, while others are slower to change. In New York, the REV (Reforming the Energy Vision)[1] initiative was launched by Governor Andrew Cuomo to spur regulatory changes that foster distributed generation, microgrids, renewable energy, and more. The New York Public Services Commission (PSC) plays a key role in REV, holding hearings, inviting public comment, and launching initiatives to foster energy efficiency and renewables. In Illinois, initial talks are underway between utilities and the Illinois Commerce Commission (ICC) about frameworks for the utility of the future. Meanwhile some utilities have begun to implement pieces of the vision ahead of formalized agreements. For example, ComEd, the electric utility for the greater Chicago area, has partnered with the U.S. Department of Energy (DOE) to implement a microgrid in the Bronzeville neighborhood of Chicago. The microgrid will feature several aspects of the utility of the future, including local generation from solar PV, a neighborhood-based microgrid, and advanced metering technology. This project is discussed in more detail in the "Communities of the Future" section.

As they adapt to the changing industry landscape, utilities are also seeking innovative ways to serve the low-income population. For example, DTE Energy, the electric and gas utility for the Detroit area, has piloted programs that provide anticipatory assistance before a financial crisis, pathways to self-sufficiency, arrears forgiveness, energy efficiency education, and, respect for the low-income customer. The program has seen dramatic improvements in disconnection rates, customer satisfaction, and energy efficiency (DTE Energy 2015).

Despite these demonstrated successes, low-income programs are often thought of as distinct efforts from the utility of the future frameworks. Utilities that are actively engaging in

[1] For more information, see http://www.dps.ny.gov/REV/

public discussions about the utility of the future, such as in California, New York, Illinois, and other states, tend to focus on the technical aspects of distributed generation, grid enhancement and security, and rate design, and less on the customer experience on the other side of the meter. Moreover, low-income programs for energy efficiency tend to be siloed from the rest of a given utility's existing program portfolio, further exacerbating the distinction between a utility's modernization efforts on behalf of ratepayers versus programs that are seen as particular to a certain subset of customers.

City-Level Approaches

U.S. cities are increasingly leading efforts to reduce energy use, help residents and building owners save money on energy costs, preserve affordable housing, and meet broader economic and sustainability goals. Many leading municipalities have developed climate action plans with aggressive targets and have sophisticated strategies for reducing energy use by sector. New York City, for example, recently launched OneNYC, a campaign with interrelated goals to address income inequality, spur economic growth, and reduce greenhouse gas emissions 80 percent by 2050, relative to 2005 levels.

A primary strategy to meet such ambitious and interrelated goals is to improve the energy performance of the building stock, as it constitutes such a large portion of energy use in many cities. To that end, cities, counties, and some states have enacted programs and policies that mandate energy efficiency directly or encourage it indirectly. These include energy benchmarking ordinances,[2] which more than a dozen municipalities have passed; building code updates; and community level economic development, housing, land use, and transportation policies.

Although small- and mid-sized cities have shown great leadership, many face declining tax bases and, as a result, declining discretionary budgets. Too often, an ambitious climate change agenda is not backed up with funding to launch and support programs.

The Relationship between Household Income and Energy Efficiency

This section presents evidence that the low-income population in the United States is large and growing, and, furthermore, that these households face structural and programmatic barriers to many of the fastest growing trends in the energy industry, such as solar energy and energy efficiency. A given household's access to energy efficiency programs can vary based on a number of factors, including, but not limited to: availability of programs, incentives, and rebates; whether or not they own or rent their home; and the cost of energy efficiency upgrades. In turn, many of these factors are inextricably linked to the household's income.

Median household incomes have not recovered since their pre-recession peak. In 2014, average household income was 6.5 percent lower than in 2007 (DeNavas-Walt and Proctor 2015). Moreover, change in income since 1999 has not been consistent across the income

[2] See, for example, the City of Chicago's Energy Benchmarking program, which is administered by Elevate Energy. A report on the second full year of the program can be found here: http://www.cityofchicago.org/content/dam/city/progs/env/EnergyBenchmark/2015_Chicago_Benchmarking_Report_Web_16DEC2015.pdf

distribution. The least affluent households saw income decline between 7 percent and 16 percent, while those in the 90th percentile saw an increase in income of 3 percent over the same time-period (DeNavas-Walt and Proctor 2015).

The Low-Income Population Is Growing

The definition of "low-income" can vary, and here we present two definitions.[3] First, the U.S. Department of Health and Human Services (HHS) defines low income as 150 percent of the Federal Poverty Guideline (FPG). HHS uses this income threshold for the Low-Income Home Energy Assistance Program (LIHEAP) as well as for a variety of other programs, from free and reduced price school lunch to Medicaid. Second, the U.S. Department of Housing and Urban Development (HUD) defines low income as 80 percent of the Area Median Income (AMI), which is set for each major rental market and includes both city limits and outlying suburban areas.

As shown in Table 1, the FPG is a much more stringent income metric, and was equivalent to $35,775 in 2014 for a family of four (HHS 2014). The AMI, by definition, varies for each major urban area in the United States. To take the Chicago market as an example, 80 percent AMI was $72,400 for a family of four in 2014, which in turn was more than three times the FPG of $23,850 for the same year. Almost 600,000 Chicago households, or 58 percent of the more than 1 million total households, would be considered low-income according to the HUD definition of 80 percent AMI. Approximately 381,000 Chicago households, or 37 percent, would be considered low income according to HHS guidelines.

Table 1. Federal Low-Income Definitions and City of Chicago Examples

Income Metric	Establishing Authority	Geography	Income Equivalent, Chicago	Low-Income Designation	Low-Income Equivalent, Chicago	Number of Qualifying Households, Chicago
Federal Poverty Guideline (FPG)	HHS	National	$23,850	Household income <=150%	$35,775	380,620 (37%)
Area Median Income (AMI)	HUD	Metro Fair Market Rent Area4	$72,400	Household Income <=80%	$57,920	599,365 (58%)

Source: American Community Survey 2013 5-Year Estimates, HUD Income Limits

[3] We present two definitions used by U.S. federal agencies, but others outside government have attempted to craft alternative measures of income. In particular, The Center for Women's Welfare at the University of Washington publishes the "Self-Sufficiency Standard", which accounts for housing, food, childcare costs, and others, is based on local cost of living standards, and is available for dozens of family compositions. More available here: http://www.selfsufficiencystandard.org/node/3

[4] These rental markets are based on commuting distances and can include the suburban outlying areas as well as urban centers of a city.

However defined, the low-income population across the United States is growing. From 2007 to 2014, the U.S. poverty rate grew from 12.5 percent to 14.8 percent of the population, or more than 46.7 million people (DeNavas-Walt and Proctor 2015). In addition to the raw numbers on income and poverty, scholars are increasingly measuring income inequality and social mobility. One study found that geographic areas where it was more difficult for children to achieve higher levels of income and education than their parents (termed intergenerational social mobility) were marked by both increased racial segregation and income inequality (Chetty et al 2014). In Chicago, researchers studied a range of socioeconomic indicators in its neighborhoods from 1970 to 2010 and identified relatively few neighborhoods had seen economic growth and that instead the majority of neighborhoods saw decline and disinvestment over the years (Voorhees Center 2014).

Low-income Families Are Left out of Clean Energy Programs

While the number of low-income households has been increasing, energy efficiency and renewable energy programs have not grown apace, nor have they met the unique needs of each community and income level by testing multiple program offerings and approaches. Low-income families face a number of barriers to wider uptake, including (1) a lack of funding and dedicated low-income programs at the state and local level; (2) lower-quality housing and more intensive energy consumption; (3) a perception of being "hard to reach;" and (4) a lack of income and assets to purchase or invest in energy efficiency and renewable energy. Due to these barriers, low-income communities are increasingly outpaced as more affluent households become increasingly efficient.

Low level of dedicated funding. Funding for energy programs that serve low-income households are categorized as either programs to make the housing stock more efficient or programs that provide assistance to pay for utility bills. Because utilities often have a role in funding and potentially administering both funding streams, it is vital that they understand the current context while embarking on future business planning. In 2014, states invested more than $7.3 billion in electricity and natural gas energy efficiency programs (Gilleo et al 2015). Of the 36 states that had ratepayer-funded energy efficiency programs in 2014, approximately 29 required low-income programs.5 In many states, the proportions of funds granted to these programs versus the total residential energy efficiency budget do not reflect the proportion of low-income households in the state. In Illinois, for instance, the 2013 low-income residential energy efficiency programs represented 7 percent of the overall utility residential budget (Evens 2015).

At the same time, funding for LIHEAP, the primary source of utility bill assistance in the United States, has been decreasing. Currently LIHEAP does not reach all of those households that meet the income requirements: from 2000 to 2009, between 13 percent and 21 percent of eligible households actually received aid (Perl 2013). The recession and associated economic stimulus caused an increase in funding for several years, and from 2013 to 2015 federal allocation levels reached between $3.2 million to $3.3 million per year (HHS 2016). In 2013, the most recent year for which data is available, 6.7 million households were served by LIHEAP (HHS 2016), which marked a return to pre-recession funding levels. While the utility industry

[5] Authors' estimate based on Gilleo et al., 2015.

should be commended for playing an active role in these programs, it is clear that the funding and participation levels do not adequate match the size and severity of the problem facing low-income families.

More energy intensive homes. Low-income communities are not monolithic, but there are some indications that they can live in more energy intensive homes than more affluent households. Low-income households' homes use 21 percent more energy per square foot than a typical home (Wolf and Berger 2009). Program data from Elevate Energy, an energy efficiency program implementer based in Chicago, supports these findings: households in low-income neighborhoods in Chicago consume more electricity and gas per square foot than households in more affluent communities.[6] Also in the Chicago area, households enrolled in LIHEAP spend approximately $85 more per year for electricity in multifamily housing than those not receiving assistance (Evens 2015). Opower has found that low-income utility customers consume more energy than wealthier customers in some regions, although the opposite is true in other parts of the country (Berelson 2014). Low-income households tend to live in older housing, smaller units and houses, and with more residents per household, contributing to these differences.

Information and program gaps. There is mounting evidence that low-income families and communities have unique barriers to accessing and participating in programs ostensibly targeted at them. Barriers include, but are not limited to: lacking information about available programs and assistance; preferring to communicate in a language other than English; juggling multiple jobs and therefore having difficulty being at home for an energy assessment or other service; meeting the sometimes stringent and complex requirements for program eligibility, including income verification; and prioritizing the daily stresses of jobs, housing, and childcare over home energy costs (Schwartz 2014).

Because the low-income population for a given utility is so diverse and the barriers are so varied, it is critical for utilities and program implementers to first understand the population and their needs. To that end, the utility industry has made some effort to better understand the low-income population and design programs tailored to their needs (see for example, Treadway 2015). An industry-funded research review of low-income customers and programs suggested that understanding a given population's competing priorities is critical and recommended that programs employ an engagement approach that includes education, communication through trusted advisors in the community, and integrated programming across existing silos (Schwartz 2014). An example of a successful utility-run low-income program is in California, where the program achieved a 32 percent participation rate for a monthly bill discount program for low-income customers. Key success factors included tailoring messaging, marketing the program in languages other than English, and conducting outreach via varied channels (Rasmussen et al. 2014). This program also revealed barriers for low-income families, which included lacking the flexibility to be home for contractor appointments, distrust in contractors, and difficulty providing the required documents to verify income (Rasmussen et al. 2014).

High energy burden. For low-income families, utility costs account for a larger share of their income than for higher-income families (Drehobl and Ross 2016). As shown in Table 2, in the 10 most populous states, the poorest households spent between 24 percent and 37 percent of their

[6] Unpublished Elevate Energy analysis

income on home energy costs (Colton 2015). These estimates at the state level are borne out in surveys of low-income households. A study of families in the Bronx found that nearly half of survey respondents were "energy insecure," meaning that they spent more than 10 percent of their income on energy expenses. A majority reported either skipping energy bills or making partial payments during at least one or two months of the previous year (Hernandez 2015).

Table 2. Energy Costs as a Percent of Income, 10 Most Populous States (2014)

State	Poverty Level: 50% FPG	500-100% FPG	100-125% FPG	125 – 150% FPG
California	24%	13%	9%	7%
Texas	31%	17%	11%	9%
Florida	28%	15%	10%	8%
New York	31%	16%	11%	9%
Illinois	26%	14%	9%	8%
Pennsylvania	33%	18%	12%	10%
Ohio	32%	17%	12%	10%
Georgia	31%	17%	11%	9%
North Carolina	36%	19%	13%	10%
Michigan	37%	20%	13%	11%

Source: Colton, R. 2015, May. 2014 Home Energy Affordability Gap.

A Growing Divide

Perhaps due to these barriers, and certainly compounded by the increasing size of the low-income population, there is evidence that low-income households are not accessing energy efficiency to the same extent as more affluent households. At the national level, recent research from the University of California, Berkeley, indicates that of the $18 billion spent on federal clean energy tax credits, only 10 percent went to households in the bottom three income quintiles (Borenstein and Davis 2015). These investments, which include energy efficient windows, furnaces, air conditioners, water heaters, insulation materials, and photovoltaic systems, are the foundation of many state and utility energy efficiency programs.

Some worry that as more households become more energy efficient and increasingly use more solar PV and distributed generation, they will pay less to support the fixed costs of the energy systems in the United States. Hawaii, given its geographic isolation and higher-than-average electricity costs, has provided an early example of the future for other states that increasingly adopt solar power. On Oahu, over 12 percent of electricity customers have rooftop solar panels, and those without solar are being left behind to pay for the fixed costs of the electric grid (Lyte 2015). This so-called "utility death spiral" has been highlighted as cause to ensure that low-income households have equal access to renewable energy and distributed generation (see for example, Caperton and Hernandez 2013).

Importantly, low-income households are just as interested in conserving energy and practicing "green" behaviors as more affluent households. Various surveys have shown that low-income households have motivations similar to other households even when their utility bills are included in rent. Low-income households have expressed desire for smart grid technology and are motivated by goals other than simply saving money, much like more affluent utility

customers (Schwartz 2014). Despite this demand, barriers exist to participation for many low-income families, including lack of capital to invest in energy efficiency or renewables and the inability to pay their utility bills via traditional banking methods.

Low-Income Families and Utilities

Many households lack access to financial services and credit, making participation in distributed generation or other aspects of the utility of the future nearly impossible. More than 57 percent of American adults (or 138 million people) report that they are struggling financially (Gutman et al 2015). In Illinois, 7 percent of households reported being fully unbanked, meaning that they lack a savings or checking account, and 17 percent of Illinois households were underbanked, a broader term encompassing households that have a bank account but also rely on alternative financial services like payday loans or other non-bank loans with high interest rates and fees (Burhouse and Osaki 2012). Nationally, more than one third of Spanish-speaking households lack both a savings and a checking account, a rate nearly three times that of the general population (Burhouse and Osaki 2012). For households that are struggling financially or lack a checking account, investing in energy efficiency and renewable energy is out of reach.

Given these financial issues, many low-income households simply cannot pay their bills via traditional methods. According to one survey, 41 percent of low-income households pay their utility bill by cash, 38 percent by check, and only 3 percent used online banking (SGCC 2014).Thus, many low-income households easily slip into a cycle of late or missed payments because they simply cannot use the payment method preferred by the utility, which is typically online automatic payment linked to a checking account.

Solution: "Communities of the Future"

In the context of increasing poverty rates, the moral and economic urgency of addressing climate change, and the demonstrated commitments of utilities and municipalities to becoming more energy efficient, Elevate Energy proposes a new framework – communities of the future – in which utilities, cities, and other partners work together to leverage the annual $7 billion in energy efficiency investments to break down silos in existing programs, meet communities' unique needs, and serve low-income households with the same level of customer service and accommodation as they would a key account. This solution is comprised of three parts below.

I. Align Utility Strategies with City Goals

First and foremost, cities and utilities should work collaboratively to align utilities' existing energy efficiency and renewable energy portfolios with city, county, or state climate change mitigation strategies. A singular example of this strategy is the Minneapolis Clean Energy Partnership (CEP), which grew out of a realization in 2014 that the City of Minneapolis could leverage upcoming franchise agreement discussions to ensure that utilities worked collaboratively with the City to meet its climate and energy goals. [7]

The process began with a suggestion by advocates that Minneapolis create a municipal power company instead of re-negotiating the franchise agreements with Xcel Energy and CenterPoint Energy, the city's electric and natural gas utilities. As covered in the press, "[the

[7] For more information, see http://mplscleanenergypartnership.org/

activists] timed their pressure to coincide with the impending renewal of franchise agreements set to expire at the end of 2014 by suggesting a citywide referendum be added to the ballot" (Jossi 2014). The agreement is the first of its kind in the United States in which the City and utilities are charged with meeting the goals of low or no carbon energy, improved social equity, and a reliable and safe distribution system, to name a few (City of Minneapolis 2013).

II. Treat Low-Income Customers as Key Accounts

Second, electric and gas utilities should consider low-income communities in their service territories as key accounts. It would constitute a paradigm shift if utilities thought of low-income customers as a key constituency, as they do with industrial customers, for example. The general approach to industrial customers is to help those that face economic challenges since the loss of their energy load not only reduces utility margin directly, but also has ramifications for the entire regional economy. The fundamental concept is the same with respect to low-income communities, although the multiplier effect is not quite the same in scope and scale.

The size of the low-income population and the associated energy consumption is often several times larger than that of a single industrial customer. While the low-income population is not monolithic and needs tailored programming and messaging (Schwartz 2014), one could imagine a shift in thinking from utilities seeing this customer segment as source of higher than average customer service costs to proactively improving service in order to encourage broader economic development. Utilities already seek to attract and retain large industrial customers because of the resulting increased revenues. Likewise, utilities could assist low-income communities in keeping more dollars in their communities. By improving financial conditions for those customers, arrearages are reduced, and the cost of serving these customers goes down.

III. Build Communities of the Future

Third, rather than set goals, design programs, and spend ratepayer funds on siloed utility-of-the-future aims, utilities and cities should work across disparate funding streams at the community level. HUD's Community Development Block Grant, for instance, encourages economic and community development at the local level. More recently, Enterprise Zones and Promise Zones are efforts at the federal level to leverage cross-discipline funding and strategies from housing, education, and criminal justice to improve outcomes for residents of high-poverty areas. Many of the problems facing low-income communities are interrelated, and thus interrelated solutions have been promoted to address them.

In the Chicago neighborhood of Bronzeville, the electric utility, ComEd, and a local nonprofit dedicated to energy efficiency, Elevate Energy, are partnering to pilot a communities of the future approach. ComEd, in partnership with U.S. Department of Energy (DOE) will implement a microgrid that serves the neighborhood and is connected to an existing microgrid that serves the campus of the Illinois Institute of Technology (IIT) (Lu et al 2015). Elevate Energy will engage local community groups in Bronzeville in understanding the benefits of a microgrid, solar PV, energy storage systems, and energy efficiency, with a particular focus on low-income populations. In particular, Elevate Energy will document and communicate the environmental and social benefits of the system including economic development, greenhouse gas emissions, jobs and community resiliency, with a particular focus on the benefits to low income communities.

Conclusion

The changes underway in the utility industry present an enormous opportunity for cities, utilities, and community partners to work together to build communities of the future. This community-focused framework pivots from the focus on the utility of the future to one in which local communities are engaged; their needs are understood; and the benefits of a modern grid, renewable energy, and sustainability are equally shared by all those across the income distribution. Incomes in the United States have increased for the wealthy few, while stagnating or decreasing for low-income families. There are increasing signs that more affluent communities are pursuing renewable energy and alternative rate design, while low-income communities still face many barriers. The utility of the future framework often focuses on meeting program goals and innovating within the industry, but it too often ignores the needs facing low-income customers. Meanwhile, many cities have aggressive goals to reduce greenhouse gas emissions, but little funding to implement related policy.

Cities, utilities, and communities can work together to solve these interrelated problems by aligning city climate change goals with utility energy efficiency and renewable energy programs; viewing low-income communities as key accounts whose economic growth and stability can deliver benefits to the grid as a whole; and working at the community level to leverage disparate programs and funding streams to address interrelated problems in a holistic way. The result will be communities of the future, wherein low-income communities are more energy efficient, less reliant on aging infrastructure, and more resilient to future climate or economic shocks.

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