Using A Community Energy Co-op to Address Electric Distribution System Reliability: A Description and Assessment of Initial Experience in Chicago

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ABSTRACT

This paper focuses on an innovative community-based intervention effort (the Chicago "Community Energy Cooperative") which is designed to apply geographically targeted demand-side resources to address electric distribution system reliability concerns. Because the formal evaluation of this effort has not yet taken place, the purpose of this paper is to provide a description of the intervention strategy and an assessment of the initial experience of the project to date. The author has been peripherally involved with the development of the Co-op project and has assisted in planning for the forthcoming formal evaluation. Additional details about that evaluation will be provided at the conference. In the meantime, this paper seeks to provide some useful descriptive information about this interesting intervention approach, as well as some discussion of early lessons learned.

Introduction

For each of the past three summers, electric system reliability problems have been headline news in several areas of the country. In 1998 there were power interruptions, brownouts, and requests for voluntary curtailments in Chicago, Colorado, Michigan, and New York; in 1999 blackouts occurred in New York City, Chicago, Long Island, New Jersey, the Delmarva Peninsula, and the South-Central states; and in the past year rolling blackouts occurred in California and there were close calls in several regions, including the Pacific Northwest, Pennsylvania/New Jersey, and New England (Nadel, et. al., 2000).

In addition to the direct costs and inconvenience of electric service interruptions, these reliability problems are frequently accompanied by large hikes in the market price of electricity. Across the country, electric systems are struggling with growing demand, tight supply, and an aging transmission and distribution infrastructure. Some have termed the situation a "crisis".

These circumstances have led to a strongly renewed interest in "demand-side" program strategies as an important category of resources that could help alleviate these electric system reliability problems. A number of key states, including California and New York, have recently announced major increases in funding for energy efficiency program efforts. Policymakers, regulators, utilities, and other stakeholders are looking for creative approaches to help bring demand-side resources into play.

The purpose of this paper is to describe the initial experience of a unique community based demand-side strategy being attempted in one of those reliability-challenged areas listed above. That strategy is the Chicago Community Energy Cooperative. This innovative partnership between a major investor owned utility and an experienced community non-profit organization provides an intriguing model which, if successful, could be a valuable resource for reliability-challenged utility systems across the nation.

Context For This Project

In order to understand the context in which the Community Energy Co-op was created and developed, it is important to have some brief background information about the two key institutions involved in this effort: (1) the utility, Commonwealth Edison ("ComEd"); and (2) the community group, the Center for Neighborhood Technology (CNT).

ComEd. Commonwealth Edison is the principal utility subsidiary of its parent company, Unicom (which recently merged with PECO and is now called Exelon - -scorecard anyone?). ComEd serves over 3.4 million customers (8 million people) in northern Illinois, covering about one-fifth of the state of Illinois. It serves nearly 400 municipalities, including the city of Chicago. It's T&D system consists of more than 1.5 million poles and towers, 500,000 transformers, and 740 substations. Total annual revenues for ComEd are in excess of $7 billion.

In the late 1990s, ComEd had been under growing criticism for service quality problems and under-investment in distribution system reliability. The situation reached a critical level in the summer of 1999, however, as three major outages occurred in ComEd's service territory. In the two weeks preceding the first outages, the Chicago area experienced intense heat and humidity. From July 22 through July 30, ComEd recorded a new daily peak load on seven different days. On July 30, ComEd recorded an all-time peak demand of 21,243 MW for its northern Illinois service area, and on that afternoon and evening a major outage occurred at the Northwest substation in Chicago. Two additional major outages were also experienced in the city that summer. An investigation by the U.S. Department of Energy "Power Outage Study Team" concluded that all three events were caused by failure of distribution system components under severe high load conditions (DOE, 2000).

It is not an overstatement to say that ComEd suffered substantial public relations damage from these incidents. In addition, ComEd increased its financial risk by facing certain punitive costs if outages re-occurred, including a pledge to credit customers for one month's electric service if they experienced a power outage exceeding eight hours. Together, these factors created a significant incentive for ComEd to consider new and innovative ways to respond to their system reliability challenges. The Center for Neighborhood Technology saw and responded to that opportunity.

Center for Neighborhood Technology. The Center for Neighborhood Technology is a Chicago based, but nationally known, non-profit organization committed to developing and implementing creative approaches to community development. For nearly a quarter of a century CNT has been working with communities throughout the Chicago metropolitan area, on a wide variety of issues. They have a long history of involvement in the energy area, including: organizing and convening the Chicago Energy Commission in the early 1980's; operating a program for performance-based energy efficiency retrofits in the late 1980's that served over 1,000 apartment buildings, institutional facilities and commercial buildings; and establishing a cooperative bulk purchasing arrangement with hundreds of multifamily buildings and small commercial enterprises in the early 1990's. In addition to these major efforts, CNT had stayed active in a variety of energy and utility related issues throughout the 1990's, and was well-situated to step forward with a proposal to help address the electric system reliability problems being experienced by ComEd.

Forging the Alliance. Although ComEd and CNT had historically experienced a somewhat adversarial relationship, they had been able to maintain a dialogue on a number of issues. In 1998 CNT and utility senior management were already discussing the potential of "microgrids" in the new restrctured utility environment. The events and circumstances surrounding ComEd's reliability difficulties presented the opportunity for direct cooperation and collaboration. In mid-1999 the President and CEO of CNT met with the CEO of ComEd to discuss the concept of a community-based strategy for improving distribution system reliability. The concept was immediately attractive, but it took a rather lengthy period of negotiations before a 'memorandum of understanding' was signed in January of 2000. A formal funding agreement was finally negotiated and signed in June of 2000, with ComEd agreeing to provide $14.7 million dollars in start-up funds over three years, to help establish the Community Energy Cooperative (the CEC).

Objectives Of The Project

From the outset, the CEC has been a project with dual objectives. Reflecting the fundamental missions of the two "parent" organizations, those objectives are to: (1) reduce peak electricity demand and thereby reduce utility and customer costs and improve system reliability; and (2) build a vibrant community organization focused on reducing community energy costs and providing economic, environmental and social benefits to the community. These objectives are generally complimentary, but sometimes involve compromise and trade-offs in terms of project focus and tactics.

This demand side focus of the CEC helps to distinguish it from the more common image of an "energy cooperative". Most such energy cooperatives formed in the past two decades (e.g., see Holt & Bird, 2001 for a description of several), had as their primary mission the purchase of lower-cost power or other energy commodities for their members, albeit with occasional use of energy efficiency to help members lower their energy bills. The mission of the CEC is quite different, as it is focused explicitly on reducing demand on the utility system, through a combination of increased efficiency, load management, distributed resources and energy storage. However, if successful in its demand reduction and community organization objectives, the CEC would consider adding an energy commodity purchase function at some point in the future.

Geographic Targeting - - A Key Feature

One of the key features of the Chicago CEC project that helps make its potential so promising is the concept of geographic targeting. Industry analysts (e.g., EPRI, 1992; Moskovitz, 2000) have written about the need to be able to target special demand-side strategies to specific high-cost areas within the distribution system, and here was a perfect opportunity to do just that. ComEd's 1999 reliability problems were a function of distribution system overload, not generation supply. Therefore, ComEd was particularly in need of solutions that could be targeted, and not just indiscriminately applied system-wide. The Center for Neighborhood Technology was an ideal entity to respond to that need because it had long held to a central philosophy that "place matters", and had extensive experience at targeting and working with specific communities in a variety of issue areas, including energy efficiency.

CNT staff worked with ComEd staff to identify a list of 75 distribution substations and feeders that were "stressed" and in need of reliability improvements. Those in need of immediate hardware upgrades were taken off the list because there would not be time to field a community intervention, and candidates with near to mid-term needs were identified. From that group, a "short list" of specific communities served by those stressed substations and feeders were identified as candidates for the initial pilot tests. Ultimately, the community of Pilsen was selected as the first intervention site. (More about Pilsen later.)

Program Descriptions

The CEC began initial program operations in the spring of 2000. These activities could be grouped into three broad categories, each with a distinct administrative and implementation structure within the Co-op.

C&I Load Management

The C&I Load Management Program focused on identifying and recruiting larger-sized customers (i.e., load greater than 200 KW) who would be willing to curtail load for short periods of time when called upon, in exchange for a cash incentive. CEC and ComEd staff identified potential members for the program from ComEd's existing customer base. Eligibility was based on location (i.e., substation and feeder load considerations); individual customer load data; participation in existing ComEd load management programs (i.e., to avoid overlap and potential "double-dipping"); energy commodity supplier (customers buying their commodity from a different supplier would receive less incentive because there was no "energy" value to ComEd for their load curtailment); and other logistical concerns.

Once the Co-op identified a ComEd customer as a potential member to target, Co-op and ComEd staff began a series of "high touch" steps to recruit the customer into the program. Where ComEd field staff had an existing relationship with the customer, they were used as an initial conduit for information. Then, there was an initial in-person meeting with the customer, Co-op staff, and if appropriate, the ComEd field staff. If these initial contacts were successful, an engineering audit of the facility was performed, to help identify opportunities for load management. The results of the engineering audit were then presented to the customer, and an initial "letter of intent" was signed. Following further analysis, including specific rules and payment arrangements, a formal "member agreement" was signed.

Once participation was officially established, the Co-op provided and installed special interactive metering equipment, to monitor, in real time, energy consumption and load at the site. Both the Co-op and the customer could view and monitor trends in customer usage on the internet. This equipment would provide the data necessary to compute load reductions and the associated customer incentive.

Incentive Payment. The Co-op had negotiated with ComEd to receive $150/kW for each KW load reduction delivered by the C&I Program. The Co-op member (customer) was to receive $100/kW incentive from the Co-op as their incentive payment. The remaining $50/kW was divided into two categories: $30/KW was allocated to a Co-op "community fund" to support miscellaneous projects that would benefit the community (rules on distribution of those funds have yet to be developed); and $20/kW was allocated to help pay the operating expenses of the Co-op and it's programs. In addition, ComEd paid the Co-op 50% of the market value of energy, on an hourly basis, for each hour of load reduction delivered. The Co-op, in turn, paid the member 2/3 of that payment, and retained 1/3 to support the Co-op. If the member was obtaining its energy from an independent supplier rather than ComEd, then the energy portion of the payment from ComEd did not apply since ComEd was not directly benefitting from the energy value.

Community Focused Energy Efficiency

The central aspect of this program area was to work with community groups, individuals, and businesses within a community to achieve various end use energy efficiency improvements in residential homes and small businesses. Technologies addressed in the initial effort included replacement window air conditioners, replacement refrigerators, residential lighting (CFLs and torchiere turn-in), and commercial lighting retrofits. A variety of intervention techniques are being tested, including the use of a community "storefront" for appliance exchanges, raffles for free replacement appliances, and direct-install services. Per the discussion above, one key corollary objective in these activities is the creation of a Community Energy Cooperative membership base in the targeted community.

The location chosen for the initial test of the Community Energy Co-op concept was the community of Pilsen, an older, established, largely Hispanic community on the near Southwest side of Chicago. Pilsen is primarily composed of residential and small to medium commercial buildings, and is in an area of the distribution system with a history of electric reliability problems. The community includes approximately 10,000 households, and most of the buildings are of a mid-1900's vintage or earlier, which should enhance the prospects for finding energy-efficiency opportunities.

Demonstration Projects

This was somewhat of a catch-all category, to encompass a variety of demonstration projects to test strategies to reduce load, other than traditional energy efficiency. Technologies to be addressed included things like thermal storage, micro-turbines, and photovoltaics, with the demonstrations to be located in the targeted distribution areas. These were primarily intended for commercial and multi-family residential types of properties.

Initial Results

Given the short lead time and the fact that this was a brand new organization, program efforts for the summer of 2000 were generally regarded as a pilot test and initial exploration of the program concepts. With that in mind, the following information summarizes the initial program results.

C&I Load Management

The C&I Load Management Program was a major area of focus in 2000 and was the first Co-op program to get into the field. Despite some initial turf squabbles with ComEd field representatives, this program got up and running in time for the summer season of 2000 and was well-received by customers. A total of 24 different organizations in the targeted areas signed on to the program, ranging from industrial facilities to commercial properties to municipal facilities.

Unfortunately (or perhaps fortunately from ComEd's overall perspective), the summer of 2000 in Chicago was relatively cool and ComEd did not face any occasions where they needed to call for load curtailment. However, in order to test the performance of the program, ComEd called for a load management 'event' on August 29th, from 1:00 to 4:00 PM. Co-op members responded with a total of 10MW of load reduction, of which 8.7 MW of coincident peak reduction was verified. Individual customer performances were verified by the Co-op and by ComEd via the metering equipment, and were used as the basis for incentive payments. Overall, incentive payments to achieve this demand reduction (and the associated avoided energy consumption) amounted to approximately $1.1 million.[1]

Community Focused Energy Efficiency

Reflecting its status as a brand new organization, the initial focus of the CEC was to establish itself as a credible and tangible entity. During 2000 the CEC established two offices: the headquarters office in the historic Tower building in Wicker Park (located near the CNT headquarters which was "incubating" the CEC), and a community storefront office in Pilsen. The headquarters office houses management, engineering and marketing staff, while the Pilsen office is the location for the community outreach and technical staff. By the end of 2000, the Co-op organization had grown to include about a dozen paid staff.

Given the very short preparation time for the summer of 2000, CEC activities focused primarily on creating an identity and establishing a presence in the community. A number of outreach meetings were held with community leaders from the business, religious and non-profit sectors. Energy program efforts focused primarily on two measures: replacement window air conditioners and energy efficient lighting.

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[1] As it turned out, because there was not actually a system supply shortage on the day of the test, the value of the avoided energy cost portion of the incentive was minimal.

In these initial efforts, these measures were used as much to develop recognition and membership in the Co-op as they were to capture energy savings. Through raffles and other promotional activities 1,300 members joined the Co-op, and over 200 received new high-efficiency window air conditioners to replace older, inefficient units. (The units selected for the program exceeded Energy Star qualifying efficiency levels, with a SEER rating of 10, and were sized at the lowest applicable capacity for the particular dwelling. They were acquired by the CEC in a bulk purchase arrangement.) Membership in the Co-op cost five dollars, and members received an energy efficiency kit with three compact flourescent light bulbs and other low-cost energy efficiency items (total cost approximately $45).

In addition to these primary residential strategies during 2000, there was a torchiere turn-in event and some limited distribution of high efficiency replacement refrigerators, using funding from the state energy office (the Department of Commerce and Community Affairs, DCCA). In the commercial sector, the CEC was able to conduct some lighting audits in preparation for initiating lighting retrofits, but no retrofits were actually conducted during 2000.

Quality Control. Although these initial efforts during 2000 focused heavily on organization-building, there was significant interest in laying the groundwork for an effective program to deliver energy savings. As a part of that effort, each of the window air conditioners replaced by the program was tested with metering equipment, so that a defensible estimate of savings from their replacement could be obtained and used in future program planning. The results of this testing indicated that the average demand reduction achieved per exchange was approximately 0.7 kW. Furthermore, the new units installed had numerous additional energy saving features ("Smart Cool" control of fan speed, an "Energy Saver" feature to avoid unnecessary cooling, and a "delay timer" to allow better management of operation time). Therefore, total savings from these replacements are likely to significantly exceed the simple kW metering results.

Two other quality control aspects of this program are also worthy of note. First, the new appliances (air conditioners and refrigerators) are only provided on a replacement basis. The old units are collected to ensure that the new appliances are not simply adding to load. Second, the old units are properly recycled, including the use of appropriate methods to capture refrigerants and dispose of any hazardous materials through environmentally sound procedures.

Demonstration Projects

The demonstration projects the CEC seeks to implement, by their nature, require significant lead times. As such, no specific projects were completed during 2000. One example of the type of demonstration being pursued is a project associated with a gut re-hab of an old industrial property into a 52 unit residential complex. The initial projections for the project would have led to as much as a 650 kW summer peak demand. CEC technical staff have been negotiating with the developer to achieve efficiency improvements, thermal storage, and on-site distributed generation measures that would lower the connected peak demand to 150 kW and reduce energy costs by over $20,000 per year. ComEd incentive payments would cover much of the incremental costs of the system, and would enable the CEC to have a demonstration project for the thermal storage and micro-generation technologies.

Plans For 2001

The overall theme for the CEC will be to expand the Co-op's pilot efforts in 2000 into a full operational mode that can continue to be scaled up in size over the coming years. The intent will be to demonstrate that substantial demand reductions can be achieved through the Cooperative model, that members can be empowered to work together to achieve collective results, and that the technologies demonstrated by the Cooperative have effective community applications.

All the details for the full spectrum of CEC programs for 2001 have not yet been finalized. However, the following material provides a general overview of the CEC plans in each program area.

C&I Load Management

Building off of the success of the year 2000 effort, the CEC hopes to expand the participation to have as many as 150 participating organizations, and have a total of 25 MW of load reduction available. The geographic range of the program will be expanded to include the new communities being targeted in the residential program (see below). Although the incentive payment level negotiated with ComEd for 2001 has been reduced somewhat for this program (to $110/kW, with the split between the customer and the Co-op yet to be determined), the CEC hopes that the geographic expansion and the positive experience of last year's participants will enable it to meet the target.

The Co-op is also working with ComEd to improve the data acquisition and on-line energy management capabilities of the program. This includes working with the ComEd metering department to take advantage of the latest metering technology. In addition, the CEC hopes to expand the impact of the program by working with participants to target opportunities to achieve longer-term load reduction. This would include energy efficiency (e.g., lighting retrofits) as well as thermal storage and distributed generation technologies. The thought is that as long as they are already working closely with these customers and doing on-site assessments, they might as well capture opportunities beyond just emergency load curtailment.

The Community Program

The CEC will continue to expand its operations in Pilsen, with a goal of 4000 members and the replacement of 1,800 window air conditioners in 2001. It will also move into several new communities (Little Village, Park Forest, Elgin and the Northwest side of Chicago), each with its own numerical goals. Primary residential measures will continue to include window air conditioners, with the addition of central air conditioning replacement in certain areas. There will also continue to be some limited inclusion of refrigerator replacement, and the use of CFL's as a recruitment incentive. Commercial energy efficiency efforts will focus primarily on providing audits and financial incentives for lighting retrofits. The potential for these activities is considered to be very high, because these communities have had little or no prior exposure to energy efficiency programs.

Communicating with residents and businesses and building awareness of these issues will also be a high priority for the Co-op. Since most people don't really have an understanding of energy use, peak demand, and other issues important to the work of the Cooperative, the CEC is developing a number of strategies for educating the community. These will include the use of a quarterly newsletter and a Co-op web site. In addition, one particularly innovative approach underway in Pilsen is a large public "kinetic" sign that will show a real-time community-wide load profile. (This real-time display would also be linked to, and available through, the web site.) The CEC is resolving data acquisition issues and the goal is to have a sign in place by summer.

The Co-op is also working with schools in Pilsen to implement energy education projects. The goals are to educate students, have students bring that knowledge home to encourage their families to become part of the Cooperative, and to look for opportunities to demonstrate photovoltaic technology on school roofs. If successful, this project may be expanded to other Co-op communities.

Lastly, as mentioned previously, one additional benefit from the demand reductions achieved by Co-op members is the contribution to the Community Benefits Fund. In 2001, the fund will be launched using the approximately $260,000 generated by year 2000 activities. The Cooperative is developing the guidelines for projects and the structure of how members will determine which projects receive funding. The announcement of the awards will come in late summer.

Demonstration Projects

The special demonstration projects component of the CEC will focus primarily on commercial and new construction opportunities to demonstrate thermal storage and distributed generation technologies. The thermal storage program will demonstrate the application of load shifting through ice making in air conditioning systems. These systems make ice at night to take advantage of lower rates and use the melting ice to provide daytime cooling that reduces or eliminates the need to run the compressor during times of high demand. For maximum load reduction, the Co-op will pair this technology with onsite generation. The Co-op will offer two types of onsite generation: first, the demonstration of new microturbine technology, and second, the conversion of existing diesel generation to include the ability to use natural gas.

Evaluation

The first formal process and impact evaluation for the Community Energy Cooperative is also planned for 2001. An RFP for this evaluation is being developed in the spring, with results intended to be available in mid-fall of that year. Short of having the results of this full evaluation available, the following section presents some of the major "lessons learned" thus far, and identifies key challenges facing anyone seeking to replicate this kind of community-based strategy for achieving demand reductions and addressing electric system reliability problems.

Lessons Learned/Key Challenges

No-one said this was going to be easy, and the experience thus far has demonstrated that it is not. In the interest of aiding those who might seek to apply this type of community-based demand-side approach in other regions, the following observations are offered.

Watch out for "turf" squabbles with the existing utility. This can occur at several different levels. At a threshold level, many of the key departments in a typical utility (e.g., the Distribution Planning Department) tend to be rather traditional in their thinking, and are very "hardware" oriented. To them a "community-based demand-side" effort can seem very "fuzzy" and undependable, and getting their cooperation (which is crucial) can be difficult.

At another level, most utilities do have some kind of on-going demand-side programs (e.g., interruptible rates, load-shed agreements, etc.). It is easy for existing program staff to view a new "outside" effort as a nuisance, if not a threat. In this situation, clear operating guidelines and boundaries are essential in order to avoid "stepping on each other's toes" in the field.

Ultimately, to overcome these obstacles, the utility management commitment to cooperate with the community-based effort must be clear and unambiguous. Beyond that, the ideal result would be to have existing utility staff become incorporated into the process and actually come to feel some ownership of the new effort.

Challenges regarding the relationship with the utility are greatly compounded when the utility staff

are in an environment of organizational restructuring, as was unfortunately the case with ComEd and their corporate merger with PECO. These circumstances can create a general climate of uncertainty and anxiety, which makes coordination and cooperation more difficult. In addition, there is a heightened risk of losing key utility personnel. (This happened in the ComEd case, when a key vice president who had championed the project left the company.) Finally, the merger increased the already-present pressure to focus on short-term financial results.

Support of top management in the utility is absolutely crucial. Each of the first two bullets are examples of problems that would be difficult, if not impossible, to overcome without solid support from utility top management. The Chicago CEC has been very fortunate to have a utility CEO that was in on the initiation of the project and has been unwavering in his support for following through with the effort. There have been junctures in the process where the project might not have continued without that support.

There are occasions when the dual objectives of "building a community co-op" and "achieving measurable demand reductions" can come into conflict. Activities to educate citizens and recruit organization membership in the co-op can be seen as taking time and resources away from activities to just go out and "get the savings". The fundamental question to be examined in this project is whether using the co-op as the mechanism to acquire the savings delivers a portfolio of benefits (including demand reduction) that is robust enough to justify the extra effort.

Educating the community on the issues of load reduction and electric system reliability, and on their role in those issues, is a very difficult challenge. One of the core premises behind the community energy cooperative approach is that you can achieve synergistic beneficial effects by creating a "community" awareness and motivation to help manage their electric load. It is probably not surprising that this is turning out to be a key challenge. The subjective assessment of key observers is that the CEC thus far is more typically characterized by residents in the target community as "that 'free air-conditioner' program", and has not yet made the breakthrough into the identity of a community energy management effort. Of course it is still very early in the process, and some innovative communication and educational methods are being developed to address this challenge.

Establishing appropriate payment levels for the load reduction impacts is a very difficult, yet crucial, issue. Estimating localized distribution system avoided costs can be a very difficult and contentious issue. Avoided costs can be defined in different ways, and can change significantly over time as local load patterns change. Much time and effort was spent examining this issue in the CEC project, and in the end the initial $150/kW compensation level agreed to for the C&I load management program was a subjective compromise intended to fall within a "zone of reasonableness".[2] It was adopted with the explicit recognition that it was an initial value to get the project started, and would likely be modified over time. Although the value has now been modified for 2001, there is still no consensus agreement that it is now the "right" amount.

An additional complicating factor is the issue of what value will be assigned to load reduction benefits at the generation and transmission level. This issue was seriously confounded in the CEC case by two factors: the structural separation of generation under Illinois restructuring legislation, and the organizational structure of the utility after the merger with PECO. These developments left it very unclear as to what

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[2] It should be noted that good geographic targeting is the essential key to justifying compensation amounts at that level for distribution savings. There are areas within the distribution system where distribution avoided costs would be far below that level, and not enough to sustain demand-side interventions on that basis alone.

corporate entity would be realizing these benefits and how compensation from them might be obtained. In the end, the compromise compensation level essentially ignored the value of transmission and generation avoided costs. Ideally, community demand-side efforts in other jurisdictions would succeed in achieving appropriate compensation for benefits in all segments of the system: generation, transmission and distribution. Failure to recognize the full range of benefits, and focusing solely on the distribution level benefits, can severely limit the amount of demand-side resources that will appear cost-effective in any given jurisdiction (Kushler & Suozzo, 1999).

This distribution-focused, community-based approach presents new evaluation challenges. Traditionally, a resource acquisition type of demand-side program would be evaluated using a "bottom-up" type of approach, where individual participant impacts would be estimated and aggregated up to a total gross program impact. Because of the geographically targeted distribution system focus of the CEC effort, there is the potential to do a "top-down" type of impact estimation, by looking at system demand at the substation or distribution feeder level. This would have a couple attractive aspects. First, it would be a more direct and salient measure of tangible load change on the distribution system, which is of key interest to the utility. Second, it would allow for the potential of measuring the hoped-for synergistic effects of the "community" approach, that would be missed in a traditional bottom-up evaluation (i.e., the whole would be greater than the sum of the directly measurable parts).

On the other hand, this top-down approach presents a host of new methodological challenges, ranging from the difficulty of getting good time series data at the feeder and substation level to the thorny issue of identifying an appropriate comparison group. At the current time the CEC is proceeding with a bottom-up evaluation as a foundation, and investigating the practical feasibility of measuring impact at the substation or feeder level at some point in the future. However, that still leaves the following problem.

Traditional bottom-up impact evaluation will miss the synergistic effects of the "community" effort. If the Co-op model works as desired, traditional bean-counting of the direct impacts will miss the spillover and synergistic effects of the "community" intervention strategy. In some respects this is similar to the challenge facing market transformation programs, except that in this case many of the techniques pursued for market transformation are inappropriate or difficult to apply when the "market" is such a constrained geographic area. Short of perfecting a substation or distribution feeder evaluation methodology, this objective of estimating the total impacts of the community intervention model will present a significant challenge to evaluators. (This will be particularly important when compensation to the co-op is based on the amount of load reduction achieved. There will be a great need for defensible savings estimation methods.)

Conclusion

The Chicago Community Energy Cooperative represents an innovative attempt to bring demand-side resources to bear to address electric distribution system reliability problems. As with any new venture into uncharted territory, the CEC has encountered its share of obstacles and growing pains. This paper has attempted to describe the CEC approach and identify lessons learned and key challenges encountered thus far.

While it is far too early to judge the ultimate effectiveness of the CEC in its mission, the logic of geographically targeted community demand-side intervention remains compelling. It is not too soon to recommend that other utilities facing distribution system reliability problems begin to experiment with this type of demand-side intervention. The costs to initiate such experimentation are small and the potential pay-off is large.

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