Utility Business Models for Distributed Energy Resources in Massachusetts

A Report of the EPRI Distributed Energy Resources Public/Private Partnership

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REPORT DESCRIPTION

This report documents the business models for distributed energy resources (DER) employed by the regulated investor-owned utility companies serving Massachusetts. It describes the expected benefits of the DER models to utilities, customers, and society. The report also discusses successes and challenges of the DER business models, and provides recommendations for improving the utility business and regulatory environment in Massachusetts to encourage DER implementation.

Results and Findings

The Commonwealth of Massachusetts' policy, legislation, regulation, and programs along with innovative strategies by the investor-owned utilities are resulting in new business models for distributed energy resources. Governor Deval Patrick's policies to further energy efficiency and renewable energy and reduce greenhouse gas emissions in Massachusetts have led to two critical pieces of legislation in 2008: The Green Communities Act and the Global Warming Solutions Act. In addition, work led by the Massachusetts Technology Collaborative's Renewable Energy Trust to explore distributed generation issues and opportunities with stakeholders laid the foundation for regulatory action that will enable win-win DER business models for utilities. The key regulatory

The DER business models in action in Massachusetts include:

- **Customer-owned, utility-facilitated distributed energy resources**, involving utility incentives and rebates for energy efficiency, demand response, and distributed generation, including combined heating and power and solar photovoltaic systems.
- **Utility ownership of solar photovoltaic generating facilities** , involving utility purchase and implementation of PV on utility, customer, and government sites
- **Utility enhancement of distribution infrastructure to enable DER**, involving utility implementation of smart grid technologies to integrate distributed resources, communications capability to enable dispatch of distributed generators, and smart meters to empower customers to reduce energy use and peak demand.

Challenges and Objectives

One of the reasons DER is not as widely deployed as desired by some policy makers is that there is little financial incentive for utilities to encourage DER. DER does not readily fit the traditional utility business model of regulated return on investment and use of least cost resources. Massachusetts' recognition of this issue has driven the state to identify opportunities

to encourage DER through utility involvement. This report documents how utilities are responding to the state interest in DER and taking action.

Applications, Values, and Use

The value of documenting the Massachusetts business models is that other regions can use these results to help inform DER policy decisions and utility practices in their own regions.

Utility executives and managers with responsibility for integrating and implementing DER as well as regulators and other policy makers will find this report useful because it documents currently employed or planned utility business models resulting from new policy and regulatory action.

EPRI Perspective

Under EPRI's Distributed Energy Resources Public/Private Partnership, stakeholder collaboration work has shown that win-win business models are most likely to encourage integration of DER. Massachusetts has embraced the win-win approach and the result is that utilities are taking innovative action to meet Commonwealth of Massachusetts goals as well as their own business goals.

Approach

The four investor-owned utilities were interviewed to provide information on current business models, benefits, successes and challenges, and to make recommendations for future consideration.

Keywords

Distributed energy resources, DER, utility business models, solar photovoltaics, energy efficiency, demand response, combined heating and power.

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INTRODUCTION

Most distributed energy resources (DER) are customer owned in the United States and largely because of the lack of scaleable business models and/or regulatory drivers, utility interest in DER remains limited. EPRI's Distributed Energy Resources Public/Private Partnership brought stakeholders together to address this issue in a set of projects funded by state and federal organizations and utilities. The goal of the Partnership was to create business models and regulatory frameworks that reward electricity providers for integrating DER with win-win outcomes -- those that that realize societal benefits as well as benefit electricity providers, customers, and non-participants alike.

Purpose of Report

This report documents experiences in Massachusetts by electricity providers of working with state-of-the art business models for DER and identifies strengths and challenges of these models, and recommends future action to achieve win-win outcomes.

A description of DER business models and their strengths and challenges will be helpful to other utilities and state regulators and policy-makers that are interested in encouraging DER in their jurisdictions. The results may be used to drive change in Massachusetts and in other regions.

DER Partnership and STAC

Win-win business models were created by stakeholders in a project initiated by the EPRI DER Partnership in 2006 and sponsored by the California Energy Commission (CEC), the Massachusetts Technology Collaborative Renewable Energy Trust (the Trust), and the State Technologies Advancement Collaborative (STAC). These models were to be tested in pilot projects in California and Massachusetts. However, the project was discontinued in 2007 before pilot projects could proceed due to lack of progress in California within the timeframe of the CEC agreement. Although the STAC and CEC support was discontinued for the DER Partnership, the Massachusetts Renewable Energy Trust continued its independent work on pilot projects in Massachusetts. Through the support of the Trust, this report documents findings to date of the Massachusetts pilot projects with respect to DER business models. It also documents utility activities with distributed energy resources not related to the pilot projects, which are a result of policy changes in Massachusetts.

The Massachusetts DER Policy Situation

In recent years, Massachusetts has taken significant action toward encouraging distributed energy resources.

Directed by the Massachusetts utility regulator in 2002, the Massachusetts Technology Collaborative RET organized a distributed generation (DG) collaborative, a stakeholder group of utilities, vendors, consultants, and governmental and non-governmental organizations, to address benefits and concerns about distributed generation. By 2006, the DG Collaborative accomplished the following:

- Recommended DG tariff improvements
- Developed an interconnection process for distributed generation
- Explored the role of DG in distribution planning
- Recommended that further action by taken to better understand technical and policy aspects through MTC's Congestion Relief Pilots and the EPRI DER Partnership/STAC project
- Recommended that utility DG ownership be considered
- Recognized that disincentives of customer-owned distributed generation, such as lost revenues, need to be eliminated

In 2007, the Massachusetts utility regulator, the Department of Public Utilities, opened an investigation to consider alternative ratemaking treatment for DG, including addressing the disincentive of lost revenues through standby rates, performance-based rates, or decoupling revenues from sales.

In July 2008, the Department of Public Utilities ordered decoupling to be implemented through a base rate proceeding for each distribution company in Massachusetts. With this order, the Department showed that it recognizes that for utilities to take active roles with programs that reduce the sale of their product and thus their revenues, it is critical for utilities to be able to recover program costs, recover lost revenues, and have an opportunity to earn a return or gain an incentive for serving societal goals.

Also in July 2008, Governor Deval Patrick of Massachusetts signed The Green Communities Act, SB 2768, to expand alternative and renewable energy and energy efficiency efforts across multiple sectors, including electricity, buildings, and transportation.

The legislation mandates that Massachusetts' renewable portfolio standard grow 1 % per year beyond the current standard of 4 % in 2009, to provide 15 % of electricity generation by 2020 and 25 % by 2030. In addition, the Department of Energy Resources will establish an alternative energy portfolio standard requiring that a percentage of electricity be derived by approved alternative energy sources, including fossil fuel gasification with carbon capture and sequestration (CCS) technology; combined heat and power; flywheel energy storage; paper-derived fuel; or energy efficient steam technology.

The legislation also mandates that the state develop a plan to reduce total energy consumption 10% by 2017. Utilities are to invest in energy efficiency measures whenever doing so is more cost-effective than buying new power or constructing additional power plants. The bill mandates that by 2020, 25 % of electric load will be met using demand side resources including energy efficiency, load management, combined heat and power (CHP), and other measures. In addition, fossil fuel use in buildings will be reduced 10 percent below 2007 by 2020 through improved building equipment and efficiency measures.

In addition, the Green Communities Act allows electric and distribution companies to construct, own, and operate solar energy generating facilities, as long as they are no greater than 25 MW before January 1, 2009 and 50 MW after January 1, 2010. Cost may be recovered by gaining prior approval of the Department of Public Utilities.

In August 2008, Massachusetts Governor Deval Patrick signed into law the Massachusetts Global Warming Solutions Act, S2540. The act requires a reduction in greenhouse gas emissions of at least 80 % below 1990 levels by 2050. The bill calls for the Secretary of Energy and Environmental Affairs to set an interim target of between 10 and 25 % below 1990 levels by 2020, as well as targets for 2030 and 2040.

These legislative and regulatory actions demonstrate that Massachusetts is committed to reducing expanding renewable and alternative energy, increasing energy efficiency, and reducing the emissions of greenhouse gases.

Distributed energy resources, with focus on renewable energy and CHP, can contribute to these state goals. The ability of utilities to encourage these technologies while meeting their own business goals, thus remaining viable businesses, is crucial to the success of these state programs. This report describes the utility business models, discusses benefits to utilities and stakeholders, lists known successes and challenges to date, and makes recommendations for future improvements.

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NSTAR DISTRIBUTED ENERGY RESOURCES BUSINESS MODELS

EPRI and Renewable Energy Trust met with NSTAR's Penelope Conner, Vice President, Customer Care, and team members Frank Gundal and Joe Feraci on NSTAR's DER business models in Massachusetts and thoughts on future directions. This section summarizes their input.

Customer-Owned, Utility-Facilitated Distributed Energy Resources

NSTAR is piloting an integrated approach in Marshfield, Massachusetts, in the Marshfield Energy Challenge, a Massachusetts Technology Collaborative Renewable Energy Trust Congestion Relief Pilot project. The approach is to offer comprehensive integrated solutions for energy efficiency, demand response and renewable energy for residential and commercial customers in return for incentives and rebates to the consumers. NSTAR representatives conduct comprehensive energy audits on consumer premises to maximize energy efficiency, look for opportunities for demand response, and then, balance the need with solar photovoltaic systems sized for the new, reduced energy needs. The PV system would thus be less expensive. Efficiency measures may include lighting efficiency improvements; demand response measures include use of smart thermostats. The desired outcome is to minimize energy usage to enable use of the smallest PV system possible to minimize costs.

The cost of the incentives and rebates is funded by the Renewable Energy Trust.

Beyond the pilot program, NSTAR is developing NSTAR Solar to simplify solar PV applications for customers by providing rebates and pre-screened PV providers. But prior to selecting the solar system, as with the Marshfield pilot, NSTAR will help customers maximize energy efficiency. The funding for incentives and rebates for NSTAR Solar will come from system benefit charges.

This program is encouraged by Massachusetts Governor Patrick's policies on energy efficiency and renewable energy, and specifically, the Massachusetts Green Communities Act.

The benefits of the customer-owned/ utility-facilitated integrated approach include:

- For customers with energy efficiency, demand response, and PV on site: Reduced energy bills due to increased efficiency and reduced peak demand. A PV unit plus net metering that further reduces customer electricity bills. An incentive payment. Selecting the PV system is simplified by utility screening of the suppliers

- For nonparticipating customers and society: Environmental and carbon benefits of reduced energy use from energy efficiency improvements and peak demand reduction, and PV in place of fossil sources of electricity.
- For the utility: Addressing congestion issues in Marshfield. Reliability is a benefit if the utility can choose where to focus the load reduction or PV application. Absent the congestion issue, the goodwill experienced by customers who look to the NSTAR as the comprehensive energy expert who can help reduce consumer bills and expand the use of renewable energy.

  In the future through rate cases with the Department of Public Utilities, NSTAR expects to decouple revenues from electricity sales and to have the opportunity to earn an incentive for encouraging and achieving energy efficiency, demand response and renewable energy.

While specific successes and challenges are still to be determined, some have already been considered:

- Successes: Basing the current and future programs on a foundation of 25 years of energy efficiency; the appropriate support from the Commonwealth elected officials; the innovative mindshare of the corporation, and partnerships with trade allies, collaboratives, and other utilities. The Commonwealth legislation has enabled NSTAR to be able to achieve the win-win-win outcomes: values to customers, society, and the utility via regulatory proceedings.
- Challenges: The need for new technologies and research and development. The ability to ramp up programs and staff, and increase penetration – goals are to increase to 50% by 2009.

In the future, NSTAR sees growth in energy efficiency and even more innovation from the corporation. Despite the fact that NSTAR does not supply generation, there will be an even greater need to return to comprehensive integrated resource planning

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NATIONAL GRID DISTRIBUTED ENERGY RESOURCES BUSINESS MODELS

EPRI and Renewable Energy Trust met with Tim Roughan, Director of Distributed Resources, and Peter Zschokke, Vice President, Regulatory Strategy, to discuss National Grid's DER business models in Massachusetts and thoughts on future directions. This section summarizes their input.

Utility Ownership of Solar Photovoltaic Generating Facilities

National Grid is developing a program to install solar photovoltaic (PV) generating facilities on utility and state agency sites, with a stretch goal of installing 5 MW in time for the summer of 2009 peak. Additional sites may be added; up to 10 MW by the end of 2009. National Grid will file the program with the Department of Public Utilities (DPU) to request recovery of costs for the generating facilities

The Massachusetts Green Communities Act allowing utility ownership of solar PV has enabled National Grid to develop this program.

The benefits of the utility-owned solar PV facilities include:

- For customers and society: Enabling large-scale PV projects will help make PV more cost effective, while contributing to Commonwealth renewable energy goals and providing environmental benefits including carbon benefits. PV can be cost effective due to the ability of the utility to buy on a large scale thus achieving lower prices for the systems; to sell the energy and capacity to the ISO; and to take advantage of the 30% Federal tax credit. In addition, there is potential for increased reliability due to the generating facilities being located in congested areas. Finally, there are likely to be reduced costs to ratepayers because of the sale of energy and capacity, and potentially the renewable energy credits from the PV system.
- For the utility: The ability to earn a rate of return on the investment of the solar facility, and the ability to contribute to renewable energy goals.

While specific successes and challenges are still to be determined, some have already been considered:

- Successes: Utility ownership enables lower cost of facilities, siting in effective locations on the distribution system, and lower cost of services because of aggregation, such as sale of energy and capacity to the ISO.
- Challenges: The cost of the PV systems currently is still high, thus making benefits more challenging to realize.

Utility Enhancement of Distribution Infrastructure to Enable DER

National Grid received a grant from the Massachusetts Technology Collaborative Renewable Energy Trust to fund a Congestion Relief Pilot project. This project is focused on part of Everett, a city in Massachusetts with a congested distribution system. The objective is to test technologies and strategies for reducing peak loads in this part of Everett.

One aspect of the Everett Congestion Relief Pilot project is to dispatch capacity from a battery installed on a customer site in conjunction with solar PV, both owned by the customer. A distribution system communications capability is being designed to allow the utility to dispatch the battery at peak load times. The Congestion Relief Pilot funded the implementation of this customer-sited solar PV and battery facility.

The benefits of the utility distribution enhancement include:

- For customers and society: Enables greater use of PV and battery assets by dispatching the capacity when needed, thereby providing greater value to the grid. Increases the value of PV; supports meeting the renewable energy goal. Deferral of other more costly distribution enhancement by reducing congestion, meeting peak load with customer-owned generation.
- For the utility: A potential for increased reliability, which may increase customer satisfaction.

While specific successes and challenges are still to be determined, some have already been considered:

- Successes: The pilot project provides the opportunity to quantify the value of dispatchable capacity from battery storage in real operation.
- Challenges: It has been difficult to identify customers in Everett who are interested in using advanced technology, even when the technology is provided by the project funding.

Customer-Owned/Utility-Facilitated DER

Combined Heating and Power: As part of the Everett Congestion Relief Pilot project, National Grid is providing micro combined heating and power (CHP) systems to residential customers. The CHP systems are designed to be dispatchable by the utility. Objectives of the program include quantifying the benefits of dispatchable CHP and determining the level of rebate or financial incentives needed to induce customers to allow their micro CHP unit to be dispatched by the utility. The cost of the CHP units is funded by the Renewable Energy Trust. The vendor of the micro CHP projects is still developing this dispatch capability.

The benefits of the utility-facilitated/customer-owned CHP include:

- For customers with CHP on site: A no-cost CHP unit that provides heat and electricity.
- For nonparticipating customers and society: A potential for increased reliability, especially during peak periods when the CHP is dispatched by the utility to meet peak demand in a congested area. A potential for reduced overall system costs due to reduced

line losses and deferred distribution system upgrade. Reduced environmental impacts of the high efficiency CHP units.

- For the utility: Load relief that provides "insurance" to meet peak during high demand periods. Potential for a deferred distribution system upgrade. Increased reliability, which may increase customer satisfaction

While specific successes and challenges are still to be determined, some have already been considered:

- Successes: The pilot project provides the opportunity to quantify the value of micro CHP in residential applications and to understand customer behavior related to micro CHP.
- Challenges: It has been difficult to identify customers in Everett who are willing to accept a CHP unit, even when the unit is provided by the project funding.

Solar PV: Also under the Everett Congestion Relief Pilot project, National Grid is providing rebates to customers or third-parties for solar PV generating facilities installed on customer roof tops. Objectives of the program include quantifying the benefits of the solar facilities, and determining the level of rebate needed to induce customers to install PV. The cost of the rebates is funded by the Renewable Energy Trust.

The benefits of the customer-owned/ utility-facilitated solar PV include:

- For customers with PV on site: A reduced-cost PV unit plus net metering that reduces customer electricity bills.
- For nonparticipating customers and society: Potentially increased reliability, especially when peak insolation coincides with peak electricity demand. A potential for reduced overall system costs due to reduced line losses and deferred distribution system upgrade. Environmental and carbon benefits of PV in place of fossil sources of electricity.
- For the utility: Load relief that provides "insurance" to meet peak during high demand periods. Potentially deferred distribution system upgrade. Increased reliability, which reduces the potential of reliability penalties and may increase customer satisfaction.

While specific successes and challenges are still to be determined, some have already been considered:

- Successes: The pilot project provides the opportunity to quantify the value of solar PV on customer premises and to understand customer behavior related to solar PV.
- Challenges: It has been difficult to identify customers in Everett who are willing to accept PV units, even when a rebate is provided by the project funding.

Load Limitation/Demand Response/DR Services: Under the National Grid's targeted demand response program, of which the Everett Congestion Relief Pilot project is part, National Grid is providing incentives to customers to reduce load when called during peak electricity demand. National Grid also aggregates demand for ISO New England (ISO-NE) demand response programs to assist in the larger need for emergency load response during system emergencies. Objectives of the program include quantifying the benefits of demand response, determining the level of incentive needed to induce customers to reduce load, and analyzing the

value of aggregating demand response for ISO programs. The cost of the incentive payments is funded by both National Grid and the ISO-NE.

The benefits of the customer-owned/ utility-facilitated demand response include:

- For customers reducing demand: An incentive for reducing load when called.
- For nonparticipating customers and society: Potentially increased reliability during peak electricity demand. Potential cost reduction due to potentially deferred distribution upgrade.
- For the utility: Load relief that provides "insurance" to meet peak during high demand periods. Potentially deferred distribution system upgrade. Increased reliability, which reduces the potential of reliability penalties and may increase customer satisfaction. Payment by ISO-NE for demand and capacity.

While specific successes and challenges are still to be determined, some have already been considered:

- Successes: The pilot project provides the opportunity to quantify the value of load limitation and demand response, and demand response services.
- Challenges: It has been challenging to identify customers in Everett who are willing to reduce load on demand, even when they are paid to do so.

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WESTERN MASSACHUSETTS ELECTRIC DISTRIBUTED ENERGY RESOURCES BUSINESS MODELS

EPRI and the Renewable Energy Trust met with Northeast Utilities' Jim Robb, Senior Vice President, Enterprise Planning and Development; Claudio Borea, Project Manager; Carl Frattini, Manager, Enterprise Planning and Development; and Jennifer Schilling, Director, Business Planning, to discuss Western Massachusetts Electric's planned DER business models in Massachusetts and thoughts on future directions. This section summarizes their input.

Utility Ownership of Solar Photovoltaic Generating Facilities

Northeast Utilities is developing a Western Massachusetts Electric program to install up to 50 MW of solar photovoltaics (PV) on large commercial rooftops, landfills, brownfield sites, and utility sites. The program will be filed with the Department of Public Utilities by early 2009.

The solar PV facilities will be utility owned, operated, and maintained. The facilities may be installed by third-party installers. The utility will take power from the generation facilities and distribute to local customers or all customers; this to be determined.

Northeast Utilities will focus initially on the process and the business model, rather than focusing on individual projects. The strategy is to prove out integrating solar to the grid, focusing on opportunities and challenges related to integration with customers, the distribution system, energy markets and other areas as appropriate.

The utility will work through issues to develop an effective transaction structure. Northeast Utilities will analyze the values and benefits, identify key drivers, challenges, and opportunities, and work through issues to achieve a scalable and sustainable transaction structure. One of the determinations to be made is whether the PV facilities will be considered load reducers or generators.

By quickly proving the value and addressing issues, the program can potentially be grown in size with additional solar photovoltaics or expanded to other distributed renewable energy or other energy sources.

This business model is enabled by the Massachusetts Green Communities Act, seen by Northeast Utilities as the most effective state policy in the northeast.

The benefits of the utility-owned solar PV facilities to stakeholders include:

- For customers and society: This business model has the potential to achieve cost effective PV on the system that is contributing to the renewable energy goals of the Commonwealth and providing environmental benefits including carbon benefits. The PV may be cost effective due to the ability of Western Massachusetts Electric to access capital markets and to socialize the costs of the PV across the utility rate base.

  The business model will benefit customers and society by reducing the overall costs to upgrade distribution systems because the utility will install the solar PV on the system where it is most needed. In addition, it will create jobs related to installing and maintaining solar systems. These jobs will be sustainable based on confidence in the utility market, which will support ramping up a functional and sustainable supply chain.

- For the utility: The utility gains an opportunity to earn a rate of return on the investment of the solar facilities, and the ability to contribute to the Commonwealth's renewable energy goals. Use of distributed solar will help to minimize capital investment in the distribution system while maintaining desired reliability levels. The program allows the utility to cost effectively test new devices that will be part of the distribution system of the future and to determine the value of distributed generation to enhance distribution system operations and life. The utility will also learn how best to take advantage of the value of PV technology as well as the distributed nature of the technology. These learnings can be transferred to other distributed generation technologies as well.

While specific successes and challenges are still to be determined, some have already been considered:

- Successes: Northeast Utilities anticipates a number of factors that will lead to success:

  - The Green Communities Act does not pick technology winners, but provides a framework to enable the utility to take advantage of a diverse set of technology options to solve utility challenges as well as meet Commonwealth goals. The framework also includes a collaborative process with stakeholders, focusing on proving the value of the program, and if warranted, replicate or grow the program.

  - Distributed generation can provide a solution to utility challenges, such as the need to upgrade mature distribution systems, while simultaneously meeting customer and Commonwealth goals.

  - The relatively small footprint of Western Massachusetts Electric's territory in Massachusetts with a large potential of solar indicates a higher probability of a successful program.

- Challenges: Northeast Utilities sees a number of factors which offer challenges but not constraints:

    - The economically disadvantaged customer base in Western Massachusetts Electric territory may present economic challenges.

    - The current high cost of solar PV technologies.

    Both of these challenges are planned to be addressed by socializing the cost of the PV systems, which can be cost-effectively purchased by the utility, across all customers to limit the economic impact of the systems while offering the benefits of the renewable energy source.

Utility Enhancement of Distribution Infrastructure to Enable DER

Northeast Utilities recognizes that the distribution infrastructure in the Western Massachusetts Electric territory is mature and faces needs for upgrades. The Green Communities Act provides opportunities for distributed generation to help address upgrade needs while meeting state goals. A smart grid will enable plug and play flexibility to integrate distributed generation. Western Massachusetts Electric is considering smart grid technologies that will enable distributed generation integration. Smart grid technologies will also move the distribution system into the future to enable new services such as managing load centers utilizing distributed generation.

A business model under consideration by Western Massachusetts Electric is to invest in smart grid technologies to enhance and upgrade the distribution system that will enable effective use of distributed generation, including the utility-owned solar PV systems. A smart grid pilot will help define the framework and values of smart grid technologies.

The Massachusetts Green Communities Act encourages this business model.

The benefits of the utility distribution enhancement include:

- For customers and society: Enables more widespread use of distributed generation, including PV, by simplifying interconnection and dispatch or other means of accessing the distributed generation as needed. May encourage use of distributed generation to reduce congestion and limit peak load, thereby enabling deferral of other more costly distribution enhancements.
- For the utility: Rate of return investment on the distribution system enhancement. May encourage use of distributed generation as a means of reducing congestion, meeting peak load, and other grid values to be determined. These could enable deferral of distribution enhancements, and increased reliability, which reduces the potential of reliability penalties and may increase customer satisfaction.

While specific successes and challenges are still to be determined, some have already been considered:

- Successes:
    - The Green Communities Act encourages development of technologies, such as smart grid, that will advance the use of renewable energy technologies and energy efficiency.
    - Smart grid technology provides two-way communications that enable customers to make smart and cost effective energy choices.
- Challenges:
    - The quantifiable values of smart grid technologies may be limited at first, but are anticipated to bring far greater values that can be quantified once in place.

Recommendations

Northeast Utilities recommends that Massachusetts continue its approach of using a framework rather than selecting technologies because it enables flexibility to address specific needs and issues, and drives future plans to be developed based on results of the early learnings from the program. Program goals should be focused on how to support gaining critical experience with emerging technologies in the market in order to minimize risk profiles, and to help the technologies ramp up quickly to serve market needs effectively.

Specific changes should be developed based on results of the first few years of the programs with collaboration from stakeholders.

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UNITIL DISTRIBUTED ENERGY RESOURCES BUSINESS MODELS

EPRI and Renewable Energy Trust met with Unitil's Thomas Meissner, Senior Vice President and Chief Operating Officer, and team members George Gantz, Justin Eisfeller, and Kevin Sprague to discuss Fitchburg Gas and Electric Light Company's planned DER business models in Massachusetts and thoughts on future directions. This section summarizes their input.

Utility Ownership of Solar Photovoltaic Generating Facilities

Unitil plans a solar photovoltaic (PV) pilot program to test the costs and benefits of PV. The PV will be owned by the utility and applied in circuits where distributed energy resources could supply distribution system benefits. Under the pilot project, the utility will consider the potential benefits and costs and monetize them. The benefits may include distribution benefits such as upgrade deferrals, congestion relief, and load relief; the value of renewable energy credits; carbon benefits; independent system operator (ISO) capacity market values; Regional Greenhouse Gas Initiative credits; and reduced line losses.

Unitil will file a proposed plan in Massachusetts for utility-owned solar PV, including an approach to allocate the costs and benefits to the utility, customers, and society.

Massachusetts' Green Communities Act enables this business models because it allows utility ownership of solar PV facilities.

The benefits of the utility-owned solar PV facilities may include:

- For customers and society: Cost effective PV located where it brings value to the system that is contributing to the renewable energy goals, providing environmental benefits including carbon benefits, and providing distribution system benefits.
- For the utility: The ability to earn a rate of return on the investment of the solar facility, and the ability to contribute to renewable energy goals. Located where it brings value, the PV may contribute distribution system benefits, such as upgrade deferrals, congestion relief, and load relief; the value of renewable energy credits; carbon benefits; independent system operator (ISO) capacity market values; Regional Greenhouse Gas Initiative credits; and reduced line losses. These benefits may reduce overall system costs and increase system reliability.

While specific successes and challenges are still to be determined, some have already been considered:

- Successes: Unitil considers the utility to be in the best position to monetize benefits, thus the opportunity to proceed with the PV pilot program and quantify costs and benefits will provide valuable information for the utility, its customers, and the Commonwealth.
- Challenges: The Commonwealth of Massachusetts has no administrative structure to realize the value of renewable energy credits or carbon benefits. However, the utility will propose an approach.

Utility Enhancement of Distribution Infrastructure to Enable DER

Unitil has enhanced the distribution infrastructure by installing advanced metering infrastructure (AMI) for all Fitchburg Gas and Electric Light Company customers. Unitil is planning a pilot project for a subset of Fitchburg customers with time based-rates and in-home energy information systems that communicate with the advanced meters. The system is designed to empower consumers to reduce use of energy and peak demand.

Unitil considers energy efficiency and demand response as a "displacement resource," just as distributed generation displaces grid resources. Unitil's pilot project will produce price elasticity data which may be useful to improve the effectiveness of the system to empower customers to reduce usage during critical periods. The goal is to improve load factor as well as efficiency, plus provide capacity to generation markets.

The Green Communities Act in Massachusetts encourages use of advanced technologies to improve energy efficiency. In addition, the Department of Public Utilities' ratemaking order allows decoupling as a means of removing disincentives of encouraging energy efficiency, distributed generation, and other load reduction strategies.

The benefits of the enhanced distribution infrastructure may include:

- For customers and society: Customer empowerment to reduce the use of energy and demand which reduces the need for new power supply sources and infrastructure, thus potentially reducing system costs. Energy efficiency and peak demand reduction also have environmental and carbon benefits.
- For the utility: The ability to earn a rate of return on the investment of AMI. The AMI may also enable improvement of load factor by reducing peak demand, which may reduce the need for transmission and distribution investment. The AMI may contribute additional distribution system benefits, which will be better understood as a result of the pilot project.

While specific successes and challenges are still to be determined, some have already been considered:

- Successes: As for DER, Unitil considers the utility to be in the best position to monetize benefits of the AMI and time-based rates. Thus, the Unitil pilot will provide valuable information for the utility, its customers, and the Commonwealth.

- Challenges: The Commonwealth of Massachusetts does not allow similar treatment of comparable benefits provided by different means. The pilot project will provide the quantification needed for Unitil to propose how to address this.

Recommendations

Unitil notes that the National Association of Regulatory Utility Commissioners recently issued a resolution endorsing the joint statement by the Natural Resources Defense Council and the Edison Electric Institute on exploiting all cost effective energy efficiency. The NRDC-EEI statement establishes that sustained energy efficiency requires regulatory action to ensure:

1. Cost recover for prudent investment

2. An earnings opportunity, and

3. Being kept whole for fixed costs as power sales volumes decline.

Unitil recommends that Massachusetts expand its policy to include an earnings opportunity for energy efficiency, customer-owned distributed generation, and other displacement resources.

Unitil also recommends that the Commonwealth not limit the ownership of distributed generation to solar PV, but expand utility ownership to other distributed generation technologies.

Unitil recommends that non-traditional investments that result in the same benefits as traditional investments should receive the same treatment. For example, load reduction may have the same impact as an increase in supply capacity, therefore there should allow a comparable opportunity for earnings, such a return on capital investment. Load displacement resources, such as energy efficiency, fuel substitution, demand response, energy storage, and distributed generation should be valued by what benefits they bring to the system. The actual benefits should be determined from the actual distribution system.

Unitil considers net metering in Massachusetts a subsidy that enables wheeling for free. The underlying purpose of the goal is appropriate but the program has not been designed properly. For example, net metering uses grid resources at no cost. The electricity grid provides a storage device for loads and negative loads, but is not compensated for. The value of the grid should be incorporated into the program

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CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This report shows that successful policies and regulations are those that set critical societal goals and also enable utilities to recover prudent costs, be kept whole for fixed costs as power sales volumes decline, and have an earnings opportunity. Massachusetts has put these into place with legislation—The Green Communities Act and the Global Warming Solutions Act-- and a regulatory order on "decoupling". The result is that all investor-owned utilities serving Massachusetts are taking innovative approaches to distributed energy resources that embrace the Commonwealth's goals and are positive business models for the utilities. These win-win approaches include:

- **Customer-owned, utility-facilitated distributed energy resources**, involving utility incentives and rebates for energy efficiency, demand response, and distributed generation, including combined heating and power and solar photovoltaic systems.
- **Utility ownership of solar photovoltaic generating facilities** , involving utility purchase and implementation of PV on utility, customer, and government sites
- **Utility enhancement of distribution infrastructure to enable DER**, involving utility implementation of smart grid technologies to integrate distributed resources, communications capability to enable dispatch of distributed generators, and smart meters to empower customers to reduce energy use and peak demand.

Recommendations

While the utilities are early in their planning stages for their win-win DER approaches, the following recommendations were made by one or more of the utilities:

- The results of the pilots and initial programs should be used along with stakeholder inputs to make decisions for future programs.
- Massachusetts should continue its approach of using a framework rather than selecting technologies because this approach enables flexibility to address specific needs and issues, as well as varying technology risks.
- The Commonwealth should not limit the ownership of distributed generation to solar PV, but expand utility ownership to other distributed generation technologies.

- Non-traditional investments that result in the same benefits as traditional investments should receive the same treatment. For example, load reduction may have the same impact as an increase in supply capacity, therefore there should allow a comparable opportunity for earnings, such a return on capital investment. Load displacement resources, such as energy efficiency, fuel substitution, demand response, energy storage, and distributed generation should be valued by what benefits they bring to the system. The actual benefits should be determined from the actual distribution system.

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