April 23, 2018

Ms. Kavita Kale
Michigan Public Service Commission
7109 W. Saginaw Hwy.
P. O. Box 30221
Lansing, MI 48909

Via E-filing & E-Service

RE: MPSC Case No. U-18352

Dear Ms. Kale:

The following is attached for paperless electronic filing:

PUBLIC Direct Testimony of Douglas Jester on behalf of Michigan Environmental Council with Exhibits MEC-1 through MEC-13**

Proof of Service

** *CONFIDENTIAL Exhibit MEC-4C is subject to the Protective Order and will only be served on those parties with a signed NDC on file. A hard copy will be sent to Ms. Kale to file under seal.*

Sincerely,

Digitally signed by
Christopher M. Bzdok
Date: 2018.04.23
17:47:56 -04'00'

Christopher M. Bzdok
chris@envlaw.com

xc: Parties to Case No. U-18352
Administrative Law Judge, Martin D. Snider
James Clift, MEC (james@environmentalcouncil.org)

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter on the Commission's own motion, regarding the regulatory reviews, revisions, determinations and/or approvals necessary for **DTE ELECTRIC COMPANY** to comply with Section 61 of 2016 PA 342	Case Nº. U-18352 ALJ

DIRECT TESTIMONY OF

DOUGLAS JESTER

ON BEHALF OF MICHIGAN ENVIRONMENTAL COUNCIL

AND ON BEHALF OF

ENERGY INNOVATION BUSINESS COUNCIL, INSTITUTE FOR ENERGY INNOVATION, AND ADVANCED ENERGY ECONOMY

April 23, 2018

TABLE OF CONTENTS

I. INTRODUCTION & QUALIFICATIONS

Q. Please state for the record your name, position, and business address.

A. My name is Douglas B. Jester. I am a Partner of 5 Lakes Energy LLC, a Michigan limited liability corporation, located at Suite 710, 115 W Allegan Street, Lansing, Michigan 48933.

Q. On whose behalf is this testimony being offered?

A. I am testifying on behalf of Michigan Environmental Council ("MEC") regarding charges and credits for Voluntary Green Pricing programs; and for Energy Innovation Business Council ("EIBC"), the Institute for Energy Innovation ("IEI"), and Advanced Energy Economy ("AEE") regarding the quantities of renewable energy that should be planned for Voluntary Green Pricing programs.

Q. Please summarize your experience in the field of electric utility regulation.

A. I have worked for more than 20 years in electricity industry regulation and related fields. My work experience is summarized in my resume, provided as Exhibit MEC-1.

Q. Have you testified before this Commission or as an expert in any other proceeding?

A. I have previously testified before the Michigan Public Service Commission in the following cases:

- Case U-17473 (Consumers Energy Plant Retirement Securitization);
- Case U-17096-R (Indiana Michigan 2013 PSCR Reconciliation);
- Case U-17301 (Consumers Energy Renewable Energy Plan 2013 Biennial Review);
- Case U-17302 (DTE Energy Renewable Energy Plan 2013 Biennial Review);

- Case U-17317 (Consumers Energy 2014 PSCR Plan);
- Case U-17319 (DTE Electric 2014 PSCR Plan);
- Case U-17671-R (UPPCO 2015 PSCR Reconciliation);
- Case U-17674 (WEPCO 2015 PSCR Plan);
- Case U-17674-R (WEPCO 2015 PSCR Reconciliation);
- Case U-17679 (Indiana-Michigan 2015 PSCR Plan);
- Case U-17688 (Consumers Energy Cost of Service and Rate Design);
- Case U-17689 (DTE Electric Cost of Service and Rate Design);
- Case U-17698 (Indiana-Michigan Cost of Service and Rate Design);
- Case U-17735 (Consumers Energy General Rates);
- Case U-17752 (Consumers Energy Community Solar);
- Case U-17762 (DTE Electric Energy Optimization Plan);
- Case U-17767 (DTE General Rates);
- Case U-17792 (Consumers Energy Renewable Energy Plan Revision);
- Case U-17895 (UPPCO General Rates);
- Case U-17911 (UPPCO 2016 PSCR Plan);
- Case U-17911-R (UPPCO 2016 PSCR Reconciliation);
- Case U-17990 (Consumers Energy General Rates);
- Case U-18014 (DTE General Rates);
- Case U-18089 (Alpena Power PURPA Avoided Costs);
- Case U-18090 (Consumers Energy PURPA Avoided Costs);
- Case U-17911-R (UPPCO 2016 PSCR Reconciliation);
- Case U-18091 (DTE PURPA Avoided Costs);

- Case U-18092 (Indiana Michigan Power Company PURPA Avoided Costs);
- Case U-18093 (Northern States Power PURPA Avoided Costs);
- Case U-18094 (Upper Peninsula Power Company PURPA Avoided Costs);
- Case U-18095 (Wisconsin Public Service Company PURPA Avoided Costs);
- Case U-18096 (Wisconsin Electric Power Company PURPA Avoided Costs);
- Case U-18224 (UMERC Certificate of Necessity);
- Case U-18255 (DTE Electric General Rates);
- Case U-18322 (Consumers Energy General Rates);
- Case U-18406 (UPPCO 2018 PSCR Plan);
- Case U-18408 (UMERC 2018 PSCR Plan);
- Case U-18419 (DTE Certificate of Necessity); and
- Case U-20150 (UPPCO Revenue Deficiency Mechanism Complaint).

Additionally, I have testified as an expert witness before the Public Utilities Commission of Nevada in Case No. 16-07001 concerning the 2017-2036 integrated resource plan of NV Energy; before the Missouri Public Service Commission in Cases Nos. ER-2016-0179, ER-2016-0285, and ET-2016-0246 concerning residential rate design and electric vehicle ("EV") policy, revenue requirements, cost of service, and rate design; before the Kentucky Public Service Commission in Case No. 2016-00370 concerning municipal street lighting rates and technologies, before the Massachusetts Department of Public Utilities in Case Nos. DPU 17-05 and DPU 17-13 concerning EV charging infrastructure program design and cost recovery; and before the Rhode Island Public Utilities Commission in Case 4780 concerning advanced metering and EV charging infrastructure.

I have also testified as an expert witness on behalf of the State of Michigan before the Federal Energy Regulatory Commission in cases relating to the relicensing of hydro-electric generation and have participated in state and federal court cases on behalf of the State of Michigan, concerning electricity generation matters, which were settled before trial. My resume is attached as Exhibit MEC-1.

Q. What is the purpose of your testimony?

A. The primary purpose of my testimony is to evaluate the pricing proposed by DTE for its Voluntary Green Pricing program(s) and to recommend specific pricing methods that are consistent with requirements of law. Because adequate planning to supply renewable energy for Voluntary Green Pricing programs is essential to providing a fair price for program participants, I recommend that the Commission provide specific direction to DTE regarding such planning.

Q. Are you sponsoring any exhibits?

A. Yes. I have attached the following exhibits for review.

- Exhibit MEC-1: Resume of Douglas Jester
- Exhibit MEC-2: MECDE-1.2 Attachment 2014
- Exhibit MEC-3: MECDE-1.2 Attachment 2016
- Exhibit MEC-4C: MECDE-2.5 Attachment CONFIDENTIAL
- Exhibit MEC-5: MECDE-1.4 and Attachment
- Exhibit MEC-6: MECDE-2.1a-b
- Exhibit MEC-7: Net Costs to Customers Exhibit
- Exhibit MEC-8: Renewable Energy Plan-U-18232 Exhibit A-14

- Exhibit MEC-9: Comparative Credit Calculation
- Exhibit MEC-10: U-18232 Schroeder Testimony p 10
- Exhibit MEC-11: Corporate Renewable Energy Targets (DJ4)
- Exhibit MEC-12: MIEIBC IEI AEE DE 1-5 Discovery Responses to DJ Requests
- Exhibit MEC-13: Status and Trends in the US Voluntary Green Power Mkt (DJ6)

II. BACKGROUND

Q. What does Section 61 of 2016 PA 342 provide with regard to pricing in a Voluntary Green Pricing program?

A. Section 61 of 2016 PA 341 provides, in part, that

> An electric provider shall offer to its customers the opportunity to participate in a voluntary green pricing program under which the customer may specify, from the options made available by the electric provider, the amount of electricity attributable to the customer that will be renewable energy. If the electric provider's rates are regulated by the commission, the program, including the rates paid for renewable energy, must be approved by the commission. The customer is responsible for any additional costs incurred and shall accrue any additional savings realized by the electric provider as a result of the customer's participation in the program.

Q. What additional guidance has the Commission provided to utilities regarding pricing in a Voluntary Green Pricing program?

A. In its Order of July 12, 2017 in Case U-18349, the Commission provided important guidance on several issues related to the pricing of Voluntary Green Pricing programs. The Commission agreed with commenters that the subscription prices and bill credits must reflect actual renewable energy costs and benefits and be clearly articulated for customers to evaluate the opportunity. The Commission also agreed that Voluntary Green Pricing programs should be cost-of-service based and structured to avoid subsidization by non-

participants. The Commission further stated that "[w]ith respect to the valuation of program benefits, the Commission will make this assessment on a case-by-case basis as programs and tariffs are filed." In discussing factors that should be considered in evaluating the merits of proposed programs, the Commission also identified "(2) the reasonableness and transparency of the calculation of cost of the VGP products; (3) the extent to which program fees are used for marketing and administration versus the VGP product offered; and (4) whether the accounting for the program is clear and whether the program is based on cost-of-service principles." In discussing the process for updating Voluntary Green Pricing programs, the Commission also found that "utilities should structure programs to avoid the creation of stranded costs."

Q. Describe the Commission's actions to date concerning DTE's proposed Voluntary Green Pricing program.

A. DTE filed an application for *ex parte* approval of its Voluntary Green Pricing program in this docket on October 18, 2017. MEC and others objected to the request for *ex parte* approval for several reasons. The Commission rejected the request in an Order dated December 20, 2017, finding that a contested case was warranted to address concerns raised by the objecting parties. (Order, p 8). In that Order, the Commission stated:

> In the interests of providing additional guidance to all parties and addressing concerns with the filing requirements for the proposed programs as efficiently as possible, the Commission clarifies that it remains willing to provide the utilities with flexibility in designing and implementing the VGP programs. The Commission also remains dedicated to ensuring that transparency, being one of its chief concerns, is still enforced. Customers enrolled in the VGP programs have a right to know how funding for the program is spent, and how the savings incurred from the program are passed onto customers, as Section 61 requires. The Commission will reject any

> program proposal that does not sufficiently detail the breakdown of costs and savings to provide the customer with an accurate price signal. (Order, p 6).

The Commission also emphasized the importance of designing programs based upon customer feedback:

> The Commission also notes its encouragement for providers to assess customer interest and preferences for VGP programs. The Commission commends the providers who have made efforts to obtain customer feedback through surveys, and recommends that providers who have not done so follow suit with similar surveys, studies, or other means. Providers may tailor their method of gathering customer feedback for VGP programs to that which is best suited to the number of customers and/or the amount of megawatts used in their service area. Knowing customers' preferences and expectations for VGP programs will better enable the utility to design an effective and successful program. (Order, p 8).

DTE filed a revised application on January 16, 2018.

Q. Please summarize the Voluntary Green Pricing programs proposed by DTE in its revised application of January 16, 2918.

A. In its revised application, DTE proposes a single program, which it brands as MIGreenPower. It also proposes to terminate a former voluntary renewable energy program known as GreenCurrents.

The MIGreenPower program allows full-service customers to subscribe to receive a specific percentage of their electricity in 5% increments above the level of renewables DTE is required to provide to its full-service customers, up to 100%. Subscriptions to this program will only be available until December 31, 2019 and are limited to annual renewable generation of 150,000 MWh. A subscriber may withdraw at any time.

As proposed by DTE, a subscriber to the MIGreenPower program will remain in their normal tariff and will be subject to an additional charge of 7.2 cents per kWh and will receive a credit in an amount that will be adjusted annually according to a method that I discuss at length below.

The electricity for this program is to be produced from DTE-owned renewable energy resources, 50% from the Pinnebog Wind Park and the other 50% from a combination of several utility-scale solar systems. These resources are included in DTE's Renewable Energy Plan.

Q. Did DTE seek customer feedback in relation to its Voluntary Green Pricing program?

A. Yes. DTE produced the results of customer outreach efforts as attachments 2014 and 2016 to discovery response MECDE-1.2, which I am sponsoring as Exhibits MEC-2 and MEC-3; and also produced a study of corporate customer preferences as a Confidential attachment to discovery response MECDE-2.5, which I am sponsoring as Confidential Exhibit MEC-4C.

Q. What were some of the conclusions of the outreach efforts?

A. Generally, the 2014 and 2016 outreach showed strong interest in Voluntary Green Pricing programs from some customer segments, with the proviso that the programs "have to be simple to understand, require minimal commitment, and result in no more than a small and predictable impact on customers' bills in order to achieve any serious consideration." (Exhibit MEC-2, Attachment 2014, p 57). Feedback on potential programs along the lines proposed by DTE in this case was generally that the program structure was confusing.

Corporate customer feedback on the MIGreenPower program ultimately proposed in this case was also negative, per Confidential Exhibit MEC-4C.

Q. How should the programs proposed by DTE be revised to better serve customers?

A. I commend the Commission's attention to the testimony of EIBC-IEI-AEE witness Caitlin Marquis with regard to the design of programs that will interest large corporate customers. ELPC witness Rebecca Stanfield recommends programs that will interest residential and smaller commercial customers.

III. CHARGES AND CREDITS FOR VOLUNTARY GREEN PRICING PROGRAMS (on behalf of Michigan Environmental Council)

Q. How is DTE proposing to determine rates for its Voluntary Green Pricing programs?

A. DTE proposes a combination of charges and credits for its program. DTE's methods to establish charges and credits for the proposed MIGreenPower program are described by witness T. L. Schroeder in testimony filed with DTE's Revised Application in this case. Ms. Schroeder justifies a subscription charge of $0.072 per kWh, based on the Company's Renewable Energy Plan forecast of costs for the two facilities from which DTE will obtain renewable energy credits for the program. Revenue from the subscription charge would flow to DTE's Renewable Energy Plan.

Ms. Schroeder displays the calculation of credits in her Exhibit A-3.

Her calculation of the energy credit for the MIGreenPower program is shown in lines 1 through 11 of Exhibit A-3. The energy credit would be based on DTE's fuel and purchase power expense per kWh, including its PSCR charge, minus the cost of transmission in the

PSCR. The capacity credit would be equal to 75% of the MISO Cost of New Entry for Zone 7.

Q. Has DTE projected a net cost for its Voluntary Green Pricing program?

A. Yes, it has. Exhibit MEC-5, which is discovery response MECDE-1.4 and attachment, projects the energy credit, capacity credit, and net cost of the program from 2016 through 2041. However, this projection is apparently low. In Exhibit MEC-6, which contains discovery responses MECDE-2.1a and 2.1b, DTE states that the net cost to customers in 2018 is projected to be 3.5 cents per kWh, not 3 cents as shown in the spreadsheet, which is apparently an older projection.

Q. How does the net cost of DTE's program compare to other Voluntary Green Pricing programs in Michigan?

A. The net cost of DTE's program appears to be an outlier. Exhibit MEC-7 compiles the projected net costs of Voluntary Green Pricing programs proposed by other Michigan electric utilities for which information could be found. The projected net costs of the programs other than DTE's ranges from 0.755 cents per kWh to 3.02 cents per kWh. The only projected net costs that reach 3 cents per kWh are two Upper Peninsula utilities – UMERC and Wisconsin Electric – and only at the 100% renewable level. The most expensive program proposed by a Lower Peninsula utility (other than DTE) is Indiana Michigan at 2.47 cents per kWh.

Q. Do you find DTE's methodology for calculating the credit to be reasonable?

A. No. DTE's proposal significantly undervalues renewable resources and thereby mistreats customers participating in the MIGreenPower program.

DTE based its calculation of capacity credit on the cost of new entry of a combustion turbine and has implicitly used the greater fuel efficiency of more expensive power plants with a greater cost of capacity in calculating its energy credit; the Company has thereby significantly shortchanged the credits for the voluntary renewable energy program.

The starting point for Ms. Schroeder's calculation of avoided energy cost as shown in Exhibit A-3 is DTE's unit cost of power supply as filed by DTE in its 2018 PSCR Plan case, U-18403. Unit cost of power supply in the PSCR is an average for all power supplied by DTE, including plants at any given time that have operating costs that are less than the marginal cost of power. The addition of renewable resources to serve a Voluntary Green Pricing program does not displace generation at average cost; but displaces marginal generation which should be presumed to have variable costs equal to the location marginal price (LMP) of energy in the MISO market at the time of generation. Thus, PSCR base unit cost of power supply is not the appropriate avoided cost of energy for determining the credit for customers of the Voluntary Green Pricing program.

Witness Schroeder's calculation of the capacity credit for the MIGreenPower program is shown in lines 12 through 31 of Exhibit A-3. Her calculation (in lines 12 through 25) of the zonal resource credits that MISO attributes to the renewable resources proposed for this program appears correct given her assumptions. In her calculation, she bases capacity on the cost of new entry for a natural gas combustion turbine, but fails to convert the cost of new entry on a nameplate basis to a MISO zonal resource credit to reflect the forced outage rate of a combustion turbine. She then only credits 75% of the cost of new entry to the renewable energy resources used in DTE's program. The capacity value she calculates for

the wind and solar resources, on the other hand, are zonal resource credits. Adjustment of the cost of new entry to a zonal resource credit basis is accomplished by dividing the cost of new entry on a nameplate basis by the expected availability percentage of the combustion turbine. Average forced outage rate of a combustion turbine is 8.4%[1]. Thus Ms. Schroeder's cost of new entry value of $91 per kW, shown in line 28 of Exhibit A-3 should be $99.34.[2] Capacity value should be based on the full cost of new entry, not 75% of that value;[3] Witness Schroeder does not provide a justification for crediting only 75% of cost of new entry.

Q. How do you recommend that the Commission establish the appropriate charges and credits for a Voluntary Green Pricing program?

A. A variety of program designs are possible in a Voluntary Green Pricing program. In fact, the Commission has explicitly encouraged utilities to provide diverse programs to meet the needs and preferences of diverse customers and has invited innovation in the design of these programs. Nonetheless, the basic principles for pricing these programs can be understood by considering two program archetypes. In the first archetypal program, the customer is provided unbundled renewable energy credits. In the second archetypal

[1] North American Electric Reliability Corporation Generation Availability Data System, statistical summary available from https://www.nerc.com/pa/RAPA/gads/Reports/Generating%20Unit%20Statistical%20Brochure%202%202016%20-%20All%20Units%20Reporting.xlsx.

[2] This value is calculated as CONE per ZRC=CONE per Nameplate Capacity/(1-EFORd) which in this case is $99.34 = $91/(1-0.084).

[3] The Commission used the full cost of new entry in PURPA avoided cost cases U-18090 and U-18091. In establishing "transfer prices" for renewable energy plan purposes, the Commission has consistently used the full cost of a combined cycle natural gas plant so that, while the Commission has not separated capacity and energy in "transfer prices" it has in those cases implicitly used full cost of new entry plus the investment attributable to energy as determined in the PURPA avoided cost cases.

program, the customer is provided bundled energy and renewable energy credits. In either case, renewable energy credits can serve as the accounting device to ensure that renewable energy is generated on the customer's behalf and is not double-counted. The key differences between these two program archetypes are that unbundled renewable energy credits need not be produced in the same year as they are credited to the customer while bundled energy and renewable energy credits must generally be produced in the same year as they are credited to the customer. In either case, the renewable energy credits can be produced from specific renewable resources identified to the customer or from a portfolio of resources. In either case, the renewable energy credits can be produced from resources owned by the utility or through a power purchase agreement including renewable energy credits. In the case of a program based on the use of unbundled renewable energy credits, those could be purchased unbundled from other producers of renewable energy.

The GreenCurrents program discussed in DTE's application in this case, but scheduled for termination, is fundamentally a program based on unbundled renewable energy credits. The MIGreenPower program proposed by DTE in this case is a bundled energy and renewable energy credits program. In order to establish principles for future programs, I analyze both types of programs below.

Q. How should the Commission establish charges and credits in an unbundled renewable energy credits program?

A. In a Voluntary Green Pricing program based on unbundled credits, the utility can withdraw renewable energy credits from its renewable energy standard compliance inventory to satisfy the customer in the Voluntary Green Pricing program and then replace those renewable energy credits in its compliance inventory. When the utility has banked

renewable energy credits in its compliance inventory that are not needed in the current year, those renewable energy credits can be replaced in future years. Under current Michigan law, the renewable energy standard effectively requires retirement of renewable energy credits through April 2029, so if the utility delivers 10 renewable energy credits to a Voluntary Green Pricing customer in 2019, it likely could replace those credits at the rate of one renewable energy credit per year from 2019 through 2028. Since these replacement renewable energy credits can be produced after they are delivered to the customer, the utility need not fully anticipate Voluntary Green Pricing program requirements for unbundled renewable energy credits. The Commission should then establish an incremental charge above the customer's basic tariff in each year in such an unbundled renewable energy credits program by providing for the recovery of the incremental cost of the incremental renewable energy credits to replace in future those used in the Voluntary Green Pricing program plus the applicable administrative and marketing costs.

The Commission currently deals with the fundamentally similar task of determining the incremental cost of compliance with the renewable energy standard by determining the planned cost of a renewable energy resource, subtracting from that cost the "transfer price" that is recovered from all customers through power supply costs, and taking the net of this calculation to be the incremental cost of compliance. These same methods can and should be applied to a Voluntary Green Pricing program based on unbundled renewable energy credits. Since the "transfer price" is set as the lesser of the cost of the renewable resource and the cost of comparable power from a natural gas plant, this method will never result in a net credit to the Voluntary Green Pricing customer in an unbundled renewable energy credit program. If renewable generation costs are less than the costs to generate comparable

power from a non-renewable resource, the cost of participating in the Voluntary Green Pricing program will simply be the cost of administering and marketing the program.

For purposes of compliance with the renewable energy standard, the accumulated incremental cost of compliance net of previous cost recovery is recovered through per-meter surcharges and those surcharges reflect the average cost of the renewable resources used for compliance. In the Voluntary Green Pricing program, Section 61 of 2016 PA 342 provides that the "[t]he customer is responsible for any additional costs incurred and shall accrue any additional savings realized by the electric provider as a result of the customer's participation in the program." Thus, in determining the charges for participation in a Voluntary Green Pricing program based on unbundled renewable energy credits, the Commission should only consider the incremental cost of the incremental renewable energy credits required for the Voluntary Green Pricing program, not the average cost of all renewable energy credits needed for compliance with the renewable energy standard.

According to Company witness Schroeder, the cost of power supply for the proposed MIGreenPower program is approximately $0.07 per kWh. Meanwhile, in DTE's current Renewable Energy Plan case, U-18232, Exhibit A-14[4] shows DTE's proposed 2017 transfer price for 2018 to have been $0.07418. Thus, a Voluntary Green Pricing program using unbundled renewable energy credits should provide participating customers a net credit of $0.00418 per kWh before the application of administration and marketing expenses for the program.

[4] Submitted in this case as Exhibit MEC-8.

Q. How should the Commission establish charges and credits in a bundled energy and renewable energy credits program?

A. In a bundled energy and renewable energy credits program, the utility must produce renewable energy in the current year in the amounts of renewable energy required by the Voluntary Green Pricing program customers. Consequently, the utility must generally own or contract for the energy provided from specific renewable resources to meet the demand of the program's customers. It is therefore appropriate that the Commission establish the charges and credits in a bundled energy and renewable energy credits program by establishing charges that recover the cost of the renewable energy, including the renewable energy credits, and establishing credits equal to the costs the utility can avoid as a result of using the energy and capacity from those renewable resources to meet the power requirements of its customers.

The Commission has well-established methods to determine the revenue requirements associated with any utility asset or power purchase agreement, and those methods are appropriate for determining the costs of renewable energy resources to supply bundled energy and renewable energy credits to a Voluntary Green Pricing Program. Rate design for recovery of these costs should reflect the rate design practice used by the Commission for the recovery of power supply costs from customer's class.

The Commission already has a duty to determine the avoided costs for various types of renewable resources pursuant to the Public Utilities Regulatory Policy Act of 1978 ("PURPA"), reinforced by provisions of Section 6v of 2016 PA 341. Under PURPA, avoided costs are determined for the purpose of establishing prices to be paid to independent power producers for power from renewable resources pursuant to the utility's

obligation under PURPA to purchase from such producers. However, the logic of avoided costs is the same for utility-owned renewable energy resources as for renewable energy resources owned by an independent power producer.

The Commission has recently undertaken to review and update its practices regarding PURPA avoided costs in cases U-18089 through U-18096. PURPA avoided costs for DTE are being addressed in case U-18091, in which the Commission has not yet issued a final determination of avoided costs. The Commission did issue an order in case U-18091 on July 31, 2017, in which the Commission established the method by which it would establish PURPA avoided costs: "developing avoided capacity cost using a natural gas combustion turbine unit and avoided energy cost using a natural gas combined cycle unit as proxy plants and a calculation of investment cost attributable to energy." The Commission's method as ordered in U-18091 is particularly appropriate since DTE subsequently filed in U-18419 a request for a certificate of necessity to promptly build a combined cycle natural gas plant and indicated in the integrated resource plan filed in U-18419 that it plans to build an additional combined cycle natural gas plant in the late 2020s. The separation of plant costs into capacity cost based on a natural gas combustion turbine and investment cost attributable to energy reflects standard electricity production planning analytical methods and provides the correct basis for evaluating the avoided costs of various generation technologies. The Commission also determined that the capacity value of resource-dependent generation should be calculated using the effective load carrying capacity method and capacity accreditation as practiced by the Midcontinent Independent System Operator. The Commission further determined in U-18091 that there may be other avoided costs for particular PURPA qualifying facilities and that those could be determined through

negotiation between the parties and may be addressed in future reviews of PURPA avoided costs. These methods clearly can be applied to any renewable energy resource, whether owned by the Company, subject to a voluntary power purchase agreement by DTE, or subject to a PURPA power purchase agreement.

Q. How does DTE's methodology for calculating the credit compare to the Commission's method to determine avoided cost for PURPA contracts?

A. The Commission's PURPA avoided cost method and DTE's calculation both calculate separate values for energy and capacity. DTE then allocates the capacity value to kWh or energy and sums the energy and capacity values per kWh to obtain a customer credit per kWh. Allocation of capacity value to kWh of energy is an appropriate method to establish a kWh credit in a Voluntary Green Pricing program even though the Commission's practice in PURPA contracts is for capacity payments to be made on the basis of capacity per unit time.

As I explained earlier, Ms. Schroeder's calculation of avoided energy cost is based on DTE's unit cost of power supply in the PSCR, which is an average for all power supplied by DTE, including resources operating below the marginal cost of power. As I also explained, adding renewable resources to serve a Voluntary Green Pricing program does not displace generation at average cost, but instead displaces marginal generation which should be presumed to have variable costs equal to the LMP at the time of generation. For this reason, average base unit cost of power supply is not the appropriate avoided cost of energy for determining the credit for customers of the Voluntary Green Pricing program and should be replaced by an average of LMPs at the nodes of the renewable energy resources used in the program weighted by the production from those facilities at each time.

I cannot determine the value of this calculation based on the evidence available in this case, but by definition it will be larger than the PSCR unit cost of power used by Ms. Schroeder. In U-18091 the Commission determined that using the average variable cost per kWh of operating a combined cycle plant is an appropriate proxy for average locational marginal price. In U-18232, Company Exhibit A-14 shows variable costs of a combined cycle plant in 2018 forecast to be $0.0432 per kWh, compared to the $0.024 used by Ms. Schroeder in Exhibit A-3 of this case. The difference between these is $0.0192, which I use in my subsequent calculations of credits for the MIGreenPower program based on Ms. Schroeder's Exhibit A-3.

The Commission's PURPA avoided cost method allocates a portion of the capital carrying cost of a natural gas combined cycle plant to capacity and the balance, labeled as investment attributable to energy, is allocated to avoided energy cost. DTE's proposed energy credit clearly does not give credit for the investment attributable to energy. Since DTE based its calculation of capacity cost on the cost of new entry of a combustion turbine and has implicitly used the greater fuel efficiency of more expensive power plants with a greater cost of capacity, the Company has significantly shortchanged the credits for the voluntary renewable energy program. The Commission's method to calculate investment attributable to energy is the most appropriate correction to the Company's method. The Commission has not yet determined the value of investment attributable to energy for DTE in case U-18091, but in U-18090 the Commission determined that for Consumers Energy this value is $7.65 per MWh, or $0.00765 per kWh. Adjusting this amount by the line loss factor of 1.068 used by Ms. Schroeder in her calculations yields an addition to the energy credit of $0.00817 per kWh. The calculation of the value of investment attributable to

energy as done by the Commission in U-18090 requires subtraction of the value of capacity as measured by the cost of new entry of a combustion turbine from the carrying costs of the proxy combined cycle plant. Since DTE's calculation of the cost of new entry for a combustion turbine is significantly less than in U-18090, it is highly likely that when the Commission determines the value of investment attributable to energy for DTE in U-18091, the value will be higher.

Witness Schroeder's calculation of the capacity credit for the MIGreenPower program is shown in lines 12 through 31 of Exhibit A-3. Her calculation (in lines 12 through 25) of the zonal resource credits that MISO attributes to the renewable resources proposed for this program appears correct given her assumptions, but it is notable that her calculation of the wind capacity required to generate 75,000,000 kWh per year implies a net capacity factor of only about 37.6%. In her calculation, she bases avoided capacity cost on the cost of new entry for a natural gas combustion turbine, which is consistent with the Commission's method for the determination of PURPA avoided costs, but fails to convert the cost of new entry on a nameplate basis to a MISO zonal resource credit to reflect the forced outage rate of a combustion turbine. She then only credits 75% of the cost of new entry to the renewable energy resources used in DTE's program. The capacity value she calculates for the wind and solar resources, on the other hand, are zonal resource credits. Adjustment of the cost of new entry to a zonal resource credit basis is accomplished by dividing the cost of new entry on a nameplate basis by the expected availability percentage of the combustion turbine. Average forced outage rate of a combustion turbine is 8.4%[5]. Thus

[5] North American Electric Reliability Corporation Generation Availability Data System, statistical summary available from

Ms. Schroeder's cost of new entry value of $91 per kW, shown in line 28 of Exhibit A-3 should be $99.34. As the Commission has previously determined that capacity value should be based on cost of new entry, not 75% of the cost of new entry, that is the value that should be used to determine the capacity value of the renewable resources used in this program. Applying the capacity credit calculated by Ms. Schroeder to the cost of new entry on a zonal resource credit basis, yields a value of $0.019 per kWh. Summing this value, Ms. Schroeder's energy credit from line 11 of Exhibit A-3 and the cost of investment attributable to energy from U-18090 as adjusted for losses yields a credit of $0.0512 per kWh. Correction of Ms. Schroeder's energy value so that it is based on the average variable costs of a combined cycle gas plant yields a credit of $0.0704 per kWh. This is slightly larger than the $0.07 per kWh cost of power from the renewable resources for the MIGreenPower program calculated by Ms. Schroeder and implies that program participants should receive a net credit of $0.0004 per kWh prior to the application of administration and marketing costs. These calculations are presented in Exhibit MEC-9.

It is noteworthy that using the same method but calculating the capacity value per kWh separately for the solar and wind portions of this portfolio yields values of $0.0348 per kWh and $0.0034 per kWh, respectively. Applying Ms. Schroeder's value for energy plus the value of investment attributable to energy yields total credits per kWh of $0.067 per kWh avoided cost for the solar resource and $0.03557 per kWh avoided cost for the wind resource. Correction of Ms. Schroeder's energy value so that it is based on variable costs

https://www.nerc.com/pa/RAPA/gads/Reports/Generating%20Unit%20Statistical%20Brochure%202%202016%20-%20All%20Units%20Reporting.xlsx.

of a combustion turbine yields total credits per kWh of $0.0862 per kWh avoided cost for the solar resource and $0.05447 per kWh avoided cost for the wind resource.

Q. Do you recommend basing the credits in the MIGreenPower program on the calculations you presented above?

A. No. I recommend that the Commission conclude U-18091 and base the credits on the PURPA avoided costs determined in that case. My calculations above are intended to show the defects in the method used by Ms. Schroeder on behalf of the Company.

Q. How often should charges and credits for Voluntary Green Pricing programs be changed?

A. Participants in the MIGreenPower program are able to leave the program at any time, so it is reasonable to adjust the charges and credits from time-to-time, as long as participants are given ample notice of any detrimental changes and given adequate time to withdraw from participation. In the MIGreenPower program, charges are based on specific renewable resources with known costs, so adjustments to the charges for the program should not be necessary until additional resources are added to the program. Avoided costs will vary with time but should not change so often as to be confusing to customers, so I recommend that credits not change more often than annually.

If DTE offers a Voluntary Green Pricing program to which a customer must commit for an extended period, then the customer should have the option to lock-in pricing for the entire enrollment period at the time of program entry.

Q. Are the administrative and marketing expenses proposed for this program appropriate?

A. Administrative and marketing expenses proposed for this program are not supported by any budgetary detail or any testimonial justification. According to Exhibit A-2, they were mostly incurred in 2017 and are dominated by administrative costs. I recommend a Staff audit of these expenses.

Marketing expenses for a program like this one are not well-defined and can be used more for the purpose of improving perceptions of the Company than for actually recruiting subscribers to the program. The Commission should carefully audit those expenditures to ensure that they are appropriate to be charged to the customers of this program.

IV. PLANNING SUPPLY FOR VOLUNTARY GREEN PRICING PROGRAMS (on behalf of Energy Innovation Business Council, Institute for Energy Innovation, and Advanced Energy Economy)

Q. DTE has proposed to supply up to 150,000 MWh per year for the MIGreenPower program and to cap participation at that level. Is this an appropriate plan?

A. The Commission has already determined that a program cap is inappropriate:

> In addition, the Commission finds that, for now, there is no need to set any limit on the amount of renewable energy to be obtained under the Act 61 programs and tariffs. In the future, if a provider encounters difficulties with a VGP program that is expanding too quickly, or that may become too large, the provider may file a request to amend the program and tariff to cap participation or otherwise modify the program offering.[6]

[6] U-18349 Commission Order of July 12, 2017, page 8.

DTE has not provided any justification in this case for a limit on enrollment in the MIGreenPower program. The Commission should therefore require DTE not to limit the program at this time.

DTE has also proposed to limit enrollment in the MIGreenPower program to the period before December 31, 2019. Section 61 of 2016 PA 342 does not provide for a utility to comply only for a short period, but DTE has not indicated in this case that it will propose a program extension or a different program to be available for customer enrollment in 2020 and thereafter. I therefore recommend that the Commission require that this program be open for enrollment at least until such time as the Commission approves a replacement program or programs by which DTE will comply with Section 61 of 2016 PA 342.

Under the program charges and credits proposed by DTE in this case, 150,000 MWh per year is may be enough to meet demand for enrollment prior to December 31, 2019. However, with a fairly priced program and looking to 2020 and beyond, 150,000 MWh will likely not be enough to satisfy customer demand.

DTE appears to have recognized after filing its application and testimony in this case that it needs to supply more than 150,000 MWh per year for Voluntary Green Pricing programs. In U-18232, DTE filed a Renewable Energy Plan in which it indicates that it plans to provide 893,520 MWh per year for Voluntary Green Pricing programs beginning in 2020.[7] In U-18232, DTE witness Schroeder explains that "[a]dditionally, the Company has received interest in a new large customer VGP program, and the Company is currently

[7] U-18232 Exhibit A-1 (row 41).

examining the potential for such a program."[8] Albeit that DTE plans these additional renewable resources for an unspecified program targeted to large customers, it clearly isn't necessary to cap the MIGreenPower program at this time.

Q. Why is it important that Voluntary Green Pricing programs be unlimited?

A. First, it would appear that, at a minimum, the Commission expects a good-faith effort to plan for and supply customer-requested renewable energy consistent with demand.

Second, Michigan public policy favors the incremental development of renewable energy both by establishing a minimum share of all sales through the renewable energy standard and by requiring that each utility offer Voluntary Green Pricing programs. It would therefore be inappropriate for the Commission to allow DTE to plan to fail in offering such a program.

Finally, and most importantly, access to renewable energy is increasingly important to some of DTE's large commercial and industrial customers, and the Company should plan to satisfy its customers' needs given that they can only purchase renewable energy from or through DTE, per Michigan policy. As a corollary, it is also important to some of DTE's prospective customers and may affect their decisions to locate or remain in DTE's service territory, thereby providing sales and profits to DTE and economic activity in Michigan.

[8] Ex MEC-10 - U-18232 Testimony of Terri L. Schroeder (excerpt).

Q. Why is using renewable energy important to some of DTE's customers and to Michigan?

A. Many businesses have recognized that the sustainability of our economy is crucial to their own long-term success and that continued dependence on fossil fuels is a major business risk. As a result, they have established targets for either greenhouse gas emission reductions, including in their supply chains, and/or explicit targets for use of renewable energy.[9] General Motors has committed to 100% renewables for its global electricity supply by 2050 and is steadily executing a program to reach that goal, including sourcing 20% of its global electricity usage of about 9 TWh from renewable resources in 2018 and 100% of its electricity usage in Ohio and Indiana from renewable resources by the end of 2018.[10] General Motors is an important customer of DTE and likely consumes a material portion of DTE's total sales. Although many of these corporate purchasers have a preference to locate their renewable energy sources near their load centers, so as to provide a cost hedge for their electricity supply, some have been willing to source offsetting renewables in other locations where renewables market access is more open.[11] If DTE fails to provide an attractive program for customer-requested renewable energy purchases, this will frustrate some of their important customers and will lead either to transfer of operations or to sourcing renewables, with the attendant economic activity, in other locales. Some of them may be able to self-generate renewables on-site, thereby reducing DTE's load below DTE's forecast.

[9] See Exhibit MEC-11, a summary by Advanced Energy Economy of such corporate commitments.

[10] See General Motors press announcement at http://www.gm.com/mol/GM-renewable-energy-by-2018.html.

[11] Such investment has been one of the drivers of renewables growth in Texas, for example.

Availability of 100% renewably-generated electricity has also become a key criterion for business location. Switch, a globally important data center operator, is committed to 100% renewable electricity supply for its data centers and made availability of renewable power a condition for its recent investment of $5 billion in Michigan, projected to create 1,000 jobs for Michiganders.[12] Amazon recently solicited proposals from North American cities to become its second headquarters, which will employ as many as 50,000 people, and included amongst its selection criteria the following:

> Sustainability: Amazon is committed to sustainability efforts. … We also invest in large solar and wind operations and were the largest corporate purchaser of renewable energy in the U.S. in 2016. Amazon will develop HQ2 with a dedication to sustainability.

It is therefore essential to Michigan's business environment that these corporate purchasers have access in DTE's service territory to a supply of renewable energy congruent with their corporate goals. Tightly capping DTE's supply of customer-requested renewable energy due to a failure to plan for adequate renewable generation would not be in the public interest. Failure to plan for adequate renewable generation therefore cannot be considered reasonable and prudent.

Q. If the Commission adopts your recommendations and establishes charges and credits for Voluntary Green Pricing that net to approximately zero or even a net credit to the

[12] See Switch press release at https://www.switch.com/switch-announces-plans-make-supernap-michigan-data-centers-100-percent-green-joins-wwfwri-renewable-buyers-energy-principles/ and news coverage at: http://www.mlive.com/business/west-michigan/index.ssf/2015/12/business_leaders_celebrate_tax.html, and https://mibiz.com/news/energy/item/23332-switch%E2%80%99s-love-affair-with-michigan-started-with-reliable,-renewable-energy

participating customers, will that create a risk of rapid program growth and stranded costs?

A. Potentially, but since in case U-18419 DTE has recently submitted a request to build an 1100 MW combined cycle plant and has shown in that case that it expects to build another large combined cycle natural gas plant in the late 2020s, there should be room for considerable growth in the Voluntary Green Pricing program before significant stranded costs develop.

In U-18419, in which DTE sought a certificate or necessity for a new 1100 MW natural gas combined cycle plant, I testified that the Commission should reject the integrated resource plan submitted by the Company in that case because it failed to adequately forecast the growth of Voluntary Green Pricing programs. As of this testimony, the Commission has not decided that case. However, if the Commission does grant that certificate of necessity and demand for the Voluntary Green Pricing program is then sufficient to strand fossil resources, that stranded cost will not be attributable to the participants in the Voluntary Green Pricing program so much as it will be a cost of inadequate planning by DTE.

Q. If the Voluntary Green Pricing program grows at a pace that threatens to leave stranded assets, how should the Commission deal with that circumstance?

A. First, I urge the Commission not to artificially restrict the growth of the Voluntary Green Pricing programs in anticipation of such a circumstance; rather the Commission should direct the utility to monitor the Voluntary Green Pricing program and return to the Commission if it reasonably forecasts such circumstance.

If growth of the Voluntary Green Pricing program does grow to a scale that threatens to strand fossil generation assets, then the Commission should direct the retirement of the excess fossil generation assets and either determine that such stranded costs are unrecoverable because they result from inadequate planning by DTE or allocate the stranded costs to all customers.

Q. How can DTE prudently plan renewable energy supply for Voluntary Green Pricing programs?

A. In order to prudently plan renewable energy supply for Voluntary Green Pricing, DTE must undertake deliberate and systematic forecasts of demand for these programs. It is important that these forecasts be used in the development of DTE's renewable energy plans and Voluntary Green Pricing programs, but also in DTE's overall system planning. I therefore recommend that the Commission order to DTE to include forecasts of participation in Voluntary Green Pricing programs in its rate cases and in any integrated resource plan filed by the Company pursuant to either Section 6t or 6s of 2016 PA 341.

When preparing such forecasts, DTE must perform quantitative econometric forecasts or market analyses. During early years of these programs, such forecasts must be based on analogies to other utilities or on market surveys, but as the programs develop track records, the forecasts can increasingly be made by the same econometric methods that DTE uses to make other demand and sales forecasts in its rate cases and integrated resource planning.

Q. How do you recommend that DTE perform market analyses in the near term?

A. DTE should segment the market by its traditional customer classes and should then perform market surveys within class.

DTE should also give particular attention to those customers who have made public commitments to either renewable energy sourcing or significant greenhouse gas reductions. After DTE filed its application in this case, I compiled a list of corporations with a presence in the United States, Michigan cities, and Michigan universities that have made such public commitments to using renewable energy in their operations or made strong commitments to greenhouse gas reduction that will require them to voluntarily use renewably-generated electricity.[13] Through discovery request MIEIBC IEI AEE DE 1-5, I asked DTE several questions about this compiled list, responses to which are in Exhibit MEC-12. In these responses, DTE affirms that approximately 38 of the listed organizations are customers of DTE but otherwise demonstrates that it has not systematically surveyed these organizations to determine their needs from DTE in order to fulfill their public pledges. It is apparent from a perusal of the listed organizations that they include major customers of DTE who collectively represent a material share of DTE's load, but DTE did not provide a sum of their electricity purchases from DTE.

Q. Is there experience in other places that can be used to inform a forecast of Voluntary Green Pricing program participation?

A. Yes. Perhaps the most convenient summary of that experience is a recent report by the National Renewable Energy Laboratory, provided as Exhibit MEC-13.[14] This report shows that total voluntary US green power purchases in 2016 were about 95.45 TWh (95.45 million MWh), up from about 37 TWh in 2010 with an annual compound growth rate of

[13] Available to interested parties as a workpaper.

[14] Exhibit MEC-13 O'Shaughnessy, E, et al. 2017. Status and Trends in the U.S. Voluntary Green Power Market (2016 Data). National Renewable Energy Laboratory Technical Report TP-6A20-70174. Available from: https://www.nrel.gov/docs/fy18osti/70174.pdf.

more than 17%. 95.45 TWh represents about 2.5% of total US electricity sales in 2016. Unfortunately, attractive voluntary energy purchase mechanisms are not available throughout the United States. The report shows that voluntary green power generation is heavily located in a few states that are characterized by retail competition or by state incentives for renewable energy generation. Texas (20.3 TWh), California (10.6 TWh), Illinois (6.1 TWh), New York (5.7 TWh), and Iowa (4.8 TWh) account for half of all renewable energy generation for voluntary purchases. Generation for voluntary renewable energy purchases in these states constitutes about 4.7% of electricity sales in these states. Thus, a forecast that voluntary renewable purchases in DTE's service territory will constitute 5% of its sales in 2024 is likely about the level of national participation in voluntary renewable energy purchases and consistent with levels already achieved in states that have provided appropriate market conditions.

V. RECOMMENDATIONS AND CONCLUSION

Q. Please summarize your recommendations to the Commission.

A. I recommend that the Commission establish charges in DTE's Voluntary Green Pricing program based on the costs of the renewable resources used in the program, using the Commission's normal methods. These practices are reasonably represented in the testimony of Company witness Schroeder as to the power supply costs in the MiGreenPower program.

I recommend that the Commission base credits in a Voluntary Green Pricing program using bundled energy and renewable energy credits, as in the proposed MIGreenPower program, on the avoided cost of non-renewable energy as determined in the Company's PURPA

avoided cost proceeding. In the alternative, it would also be reasonable for the Commission to based these credits on the "transfer price" used in the Company's Renewable Energy Plan.

I recommend that the Commission require DTE to include forecasts of demand for Voluntary Green Pricing programs in each of its rate cases and integrated resource plans as well as in future filings regarding Voluntary Green Pricing programs. These forecasts should be based on systematic econometric forecasts or market surveys, including specific outreach to all of its large customers that have made public commitments to use renewable energy in their operations or to significantly reduce greenhouse gas emissions.

Q. Does that complete your testimony?

A. Yes.

Douglas B. Jester

Personal Information

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Professional experience

January 2011 – present 5 Lakes Energy
Partner

Co-owner of a consulting firm working to advance the clean energy economy in Michigan and beyond. Consulting engagements with foundations, startups, and large mature businesses have included work on public policy, business strategy, market development, technology collaboration, project finance, and export development concerning energy efficiency, smart grid, renewable generation, electric vehicle infrastructure, and utility regulation and rate design. Policy director for renewable energy ballot initiative and Michigan energy legislation advocacy. Supported startup of the Energy Innovation Business Council, a trade association of clean energy businesses. Expert witness in utility regulation cases. Developed integrated resource planning models for use in ten states' compliance with the Clean Power Plan.

February 2010 - December 2010 Michigan Department of Energy, Labor and Economic Growth
Senior Energy Policy Advisor

Advisor to the Chief Energy Officer of the State of Michigan with primary focus on institutionalizing energy efficiency and renewable energy strategies and policies and developing clean energy businesses in Michigan. Provided several policy analyses concerning utility regulation, grid-integrated storage, performance contracting, feed-in tariffs, and low-income energy efficiency and assistance. Participated in Pluggable Electric Vehicle Task Force, Smart Grid Collaborative, Michigan Prosperity Initiative, and Green Partnership Team. Managed development of social-media-based community for energy practitioners. Organized conference on Biomass Waste to Energy.

August 2008 - February 2010 Rose International
Business Development Consultant - Smart Grid

- Employed by Verizon Business' exclusive external staffing agency for the purpose of providing business and solution development consultation services to Verizon Business in the areas of Smart Grid services and transportation management services.

December 2007 - March 2010 Efficient Printers Inc

President/Co-Owner

- Co-founder and co-owner with Keith Carlson of a corporation formed for the purpose of acquiring J A Thomas Company, a sole proprietorship owned by Keith Carlson. Recognized as Sacramento County (California) 2008 Supplier of the Year and Washoe County (Nevada) Association for Retarded Citizens 2008 Employer of the Year. Business operations discontinued by asset sale to focus on associated printing software services of IT Services Corporation.

August 2007 - present IT Services Corporation

President/Owner

- Founder, co-owner, and President of a startup business intended to provide advanced IT consulting services and to acquire or develop managed services in selected niches, currently focused on developing e-commerce solutions for commercial printing with software-as-a-service.

2004 – August 2007 Automated License Systems

Chief Technology Officer

- Member of four-person executive team and member of board of directors of a privately-held corporation specializing in automated systems for the sale of hunting and fishing licenses, park campground reservations, and in automated background check systems. Executive responsible for project management, network and data center operations, software and product development. Brought company through mezzanine financing and sold it to Active Networks.

2000 - 2004 WorldCom/MCI

Director, Government Application Solutions

- Executive responsible in various combinations for line of business sales, state and local government product marketing, project management, network and data center operations, software and product development, and contact center operations for specialized government process outsourcing business. Principal lines of business were vehicle emissions testing, firearm background checks, automated hunting and fishing license systems, automated appointment scheduling, and managed application hosting services. Also responsible for managing order entry, tracking, and service support systems for numerous large federal telecommunications contracts such as the US Post Office, Federal Aviation Administration, and Navy-Marine Corps Intranet.
- Increased annual line-of-business revenue from $64 million to $93 million, improved EBITDA from approximately 2% to 27%, and retained all customers, in context of corporate scandal and bankruptcy.
- Repeatedly evaluated in top 10% of company executive management on annual performance evaluations.

1999-2000 Compuware Corporation

Senior Project Manager

- Senior project manager, on customer site with five project managers and team of approximately 80, to migrate a major dental insurer from a mainframe environment to internet-enabled client-server environment.

1995 - 1999 City of East Lansing, Michigan

Mayor and Councilmember

- Elected chief executive of the City of East Lansing, a sophisticated city of 52,000 residents with a council-manager government employing about 350 staff and with an annual budget of about $47 million. Major accomplishments included incorporation of public asset depreciation into budgets with consequent improvements in public facilities and services, complete rewrite and modernization of city charter, greatly intensified cooperation between the City of East Lansing and the East Lansing Public Schools, significant increases in recreational facilities and services, major revisions to housing code, initiation of revision of the City Master Plan, facilitation of the merger of the Capital Area Transportation Authority and Michigan State University bus systems, initiation of a major downtown redevelopment project, City government efficiency improvements, and numerous other policy initiatives. Member of Michigan Municipal League policy committee on Transportation and Environment and principal writer of league policy on these subjects (still substantially unchanged as of 2009).

1995-1999 Michigan Department of Natural Resources

Chief Information Officer

- Executive responsibility for end-user computing, data center operations, wide area network, local area network, telephony, public safety radio, videoconferencing, application development and support, Y2K readiness for Departments of Natural Resources and Environmental Quality. Directed staff of about 110. Member of MERIT Affiliates Board and of the Great Lakes Commission's Great Lakes Information Network (GLIN) Board.

1990-1995 Michigan Department of Natural Resources

Senior Fisheries Manager

- Responsible for coordinating management of Michigan's Great Lakes fisheries worth about $4 billion per year including fish stocking and sport and commercial fishing regulation decisions, fishery monitoring and research programs, information systems development, market and economic analyses, litigation, legislative analysis and negotiation. University relations. Extensive involvement in regulation of steam electric and hydroelectric power plants.
- Served as agency expert on natural resource damage assessment, for all resources and causes.
- Considerable involvement with Great Lakes Fishery Commission, including:
  - Co-chair of Strategic Great Lakes Fishery Management Plan working group

- Member of Lake Erie and Lake St. Clair Committees
- Chair, Council of Lake Committees
- Member, Sea Lamprey Control Advisory Committee
- St Clair and Detroit River Areas of Concern Planning Committees

1989-1990 American Fisheries Society

Editor, North American Journal of Fisheries Management

- Full responsibility for publication of one of the premier academic journals in natural resource management.

1984 - 1989 Michigan Department of Natural Resources

Fisheries Administrator

- Assistant to Chief of Fisheries, responsible for strategic planning, budgets, personnel management, public relations, market and economic analysis, and information systems. Department of Natural Resources representative to Governor's Cabinet Council on Economic Development. Extensive involvement in regulation of steam electric and hydroelectric power plants.

1983-present Michigan State University

Adjunct Instructor

- Irregular lecturer in various undergraduate and graduate fisheries and wildlife courses and informal graduate student research advisor in fisheries and wildlife and in parks and recreation marketing.

1977 – 1984 Michigan Department of Natural Resources

Fisheries Research Biologist

- Simulation modeling & policy analysis of Great Lakes ecosystems. Development of problem-oriented management records system and "epidemiological" approaches to managing inland fisheries.
- Modeling and valuation of impacts power plants on natural resources and recreation.

Education

1991-1995 Michigan State University
PhD Candidate, Environmental Economics
Coursework completed, dissertation not pursued due to decision to pursue different career direction.

1980-1981 University of British Columbia
Non-degree Program, Institute of Animal Resource Ecology

1974-1977 Virginia Polytechnic Institute & State University
MS Fisheries and Wildlife Sciences
MS Statistics and Operations Research

1971-1974 New Mexico State University
BIS Mathematics, Biology, and Fine Arts

Citizenship and Community Involvement

Youth Soccer Coach, East Lansing Soccer League, 1987-89

Co-organizer, East Lansing Community Unity, 1992-1993

Bailey Community Association Board, 1993-1995

East Lansing Commission on the Environment, 1993-1995

East Lansing Street Lighting Advisory Committee, 1994

Councilmember, City of East Lansing, 1995-1999

Mayor, City of East Lansing, 1995-1997

East Lansing Downtown Development Authority Board Member, 1995-1999

East Lansing Transportation Commission, 1999-2004

East Lansing Non-Profit Housing and Neighborhood Services Corporation Board Member, 2001-2004

Lansing – East Lansing Smart Zone Board of Directors, 2007-present

Council on Labor and Economic Growth, State of Michigan, by appointment of the Governor, May 2009 – May 2012

East Lansing Downtown Development Authority Board Member and Vice-Chair, 2010 – present.

East Lansing Brownfield Authority Board Member and Vice-Chair, 2010 – present.

East Lansing Downtown Management Board and Chair, 2010 – 2016

East Lansing City Center Condominium Association Board Member, 2015 – present.

Douglas Jester
Specific Energy-Related Accomplishments

Unrelated to Employment

- Member of Michigan SAVES initial Advisory Board. Michigan SAVES is a financing program for building energy efficiency measures initiated by the State of Michigan Public Service Commission and administered under contract by Public Sector Consultants. Program launched in 2010.
- Member of Michigan Green Jobs Initiative, representing the Council for Labor and Economic Growth.
- Participated in Lansing Board of Water and Light Integrated Resource Planning, leading to their recent completion of a combined cycle natural gas power plant that also provides district heating to downtown Lansing.
- In graduate school, participated in development of database and algorithms for optimal routing of major transmission lines for Virginia Electric Power Company (now part of Dominion Resources).
- Commissioner of the Lansing Board of Water and Light, representing East Lansing. December 2017 – present.

For 5 Lakes Energy

- Participant by invitation in the Michigan Public Service Commission Smart Grid Collaborative, authoring recommendations on data access, application priorities, and electric vehicle integration to the grid.
- Participant by invitation in the Michigan Public Service Commission Energy Optimization Collaborative, a regular meeting and action collaborative of parties involved in the Energy Optimization programs required of utilities by Michigan law enacted in 2008.
- Participant by invitation in Michigan Public Service Commission Solar Work Group, including presentations and written comments on value of solar, including energy, capacity, avoided health and environmental damages, hedge value, and ancillary services.
- Participant by invitation in Michigan Senate Energy and Technology Committee stakeholder work group preliminary to introduction of a comprehensive legislative package.
- Participant by invitation in Michigan Public Service Commission PURPA Avoided Cost Technical Advisory Committee.
- Participant by invitation in Michigan Public Service Commission Standby Rate Working Group.
- Participant by invitation in Michigan Public Service Commission Street Lighting Collaborative.
- Participant by invitation in State of Michigan Agency for Energy Technical Advisory Committee on Clean Power Plan implementation.
- Conceived, obtained funding, and developed open access integrated resource planning tools (State Tool for Electricity Emissions Reduction aka STEER) for State compliance with the Clean Power Plan:
    - For Energy Foundation - Michigan and Iowa
    - For Advanced Energy Economy Institute – Arkansas, Florida, Illinois, Ohio, Pennsylvania, Virginia
    - For The Solar Foundation - Georgia and North Carolina
- Presentations to Michigan Agency for Energy and the Institute for Public Utilities Michigan Forum on Strategies for Michigan to Comply with the Clean Power Plan.
- Participant in Midcontinent Independent Systems Operator stakeholder processes on behalf of Michigan Citizens Against Rate Excess and the MISO Consumer Representatives Sector, including Resource Adequacy Committee, Loss of Load Expectation Working Group, Transmission Expansion Working Group, Demand Response Working Group, Independent Load Forecasting Working Group, and Clean Power Plan Working Group.
- Expert witness before the Michigan Public Service Commission in various cases, including:

  - Case U-17473 (Consumers Energy Plant Retirement Securitization)
  - Case U-17096-R (Indiana Michigan 2013 PSCR Reconciliation)
  - Case U-17301 (Consumers Energy Renewable Energy Plan 2013 Biennial Review);
  - Case U-17302 (DTE Energy Renewable Energy Plan 2013 Biennial Review);
  - Case U-17317 (Consumers Energy 2014 PSCR Plan);
  - Case U-17319 (DTE Electric 2014 PSCR Plan);
  - Case U-17674 (WEPCO 2015 PSCR Plan);
  - Case U-17679 (Indiana-Michigan 2015 PSCR Plan);
  - Case U-17689 (DTE Electric Cost of Service and Rate Design);
  - Case U-17688 (Consumers Energy Cost of Service and Rate Design);
  - Case U-17698 (Indiana-Michigan Cost of Service and Rate Design);
  - Case U-17762 (DTE Electric Energy Optimization Plan);
  - Case U-17752 (Consumers Energy Community Solar);
  - Case U-17735 (Consumers Energy General Rates);
  - Case U-17767 (DTE General Rates);
  - Case U-17792 (Consumers Energy Renewable Energy Plan Revision);
  - Case U-17895 (UPPCO General Rates);
  - Case U-17911 (UPPCO 2016 PSCR Plan);
  - Case U-17990 (Consumers Energy General Rates); and
  - Case U-18014 (DTE General Rates);
  - Case U-17611-R (UPPCO 2015 PSCR Reconciliation);
  - Case U-18089 (Alpena Power PURPA Avoided Costs);
  - Case U-18090 (Consumers Energy PURPA Avoided Costs);
  - Case U-18091 (DTE PURPA Avoided Costs);
  - Case U-18092 (Indiana Michigan Electric Power PURPA Avoided Costs);
  - Case U-18093 (Northern States Power PURPA Avoided Costs);
  - Case U-18094 (Upper Peninsula Power Company PURPA Avoided Costs);
  - Case U-18095 (UMERC PURPA Avoided Costs);
  - Case U-18224 (UMERC Certificate of Necessity);
  - Case U-18255 (DTE General Rate Case);
  - Case U-18322 (Consumers Energy General Rate Case).
- Expert witness before the Public Utilities Commission of Nevada in
  - Case 16-07001 (NV Energy 2017-2036 Sierra Pacific Integrated Resource Plan)
- Expert witness before the Missouri Public Service Commission in
  - Case ER-2016-0179 (Ameren Missouri General Rate Case)
  - Case ER-2016-0285 (KCP&L General Rate Case)
  - Case ET-2016-0246 (Ameren Missouri EV Policy)
- Expert witness before the Kentucky Public Service Commission
  - Case 2016-00370 (Kentucky Utilities General Rate Case)
- Expert witness before the Massachusetts Department of Public Utilities in
  - Case 17-05 (Eversource General Rate Case)
  - Case 17-13 (National Grid General Rate Case)
- Coauthored “Charge without a Cause: Assessing Utility Demand Charges on Small Customers”
- Currently under contract to the Michigan Agency for Energy to develop a Roadmap for CHP Market Development in Michigan, including evaluation of various CHP technologies and applications using STEER Michigan as an integrated resource planning tool.
- Under contract to NextEnergy, authored “Alternative Energy and Distributed Generation” chapter of Smart Grid Economic Development Opportunities report to Michigan Economic Development Corporation and assisted authors of chapters on “Demand Response” and “Automated Energy Management Systems”.
- Developed presentation on “Whole System Perspective on Energy Optimization Strategy” for Michigan Energy Optimization Collaborative.
- Under contract to NextEnergy, assisted in development of industrial energy efficiency technology development strategy.

- Under contract to a multinational solar photovoltaics company, developed market strategy recommendations.
- For an automobile OEM, developed analyses of economic benefits of demand response in vehicle charging and vehicle-to-grid electricity storage solutions.
- Under contract to Pew Charitable Trusts, assisted in development of a report of best practices for electric vehicle charging infrastructure.
- Under contract to a national foundation, developed renewable energy business case for Michigan including estimates of rate impacts, employment and income effects, health effects, and greenhouse gas emissions effects.
- Assisted in Michigan market development for a solar panel manufacturer, clean energy finance company, and industrial energy management systems company.
- Under contract to Institute for Energy Innovation, organized legislative learning sessions covering a synopsis of Michigan's energy uses and supply, energy efficiency, and economic impacts of clean energy.

For Department of Energy Labor and Economic Growth

- Participant in the Michigan Public Service Commission Energy Optimization Collaborative, a regular meeting and action collaborative of parties involved in the Energy Optimization programs required of utilities by Michigan law enacted in 2008.
- Lead development of a social-media-based community for energy practitioners in Michigan at www.MichEEN.org.
- Drafted analysis and policy paper concerning customer and third-party access to utility meter data.
- Analyzed hourly electric utility load demonstrating relationship amongst time of day, daylight, and temperature on loads of residential, commercial, industrial, and public lighting customers. Analysis demonstrated the importance of heating for residential electrical loads and the effects of various energy efficiency measures on load-duration curves.
- Analyzed relationship of marginal locational prices to load, demonstrating that traditional assumptions of Integrated Resource Planning are invalid and that there are substantial current opportunities for cost-effective grid-integrated storage for the purpose of price arbitrage as opposed to traditionally considered load arbitrage.
- Developed analyses and recommendations concerning the use of feed-in tariffs in Michigan.
- Participated in Pluggable Electric Vehicle Task Force and initiated changes in State building code to accommodate installation of vehicle charging equipment.
- Organized December 2010 conference on Biomass Waste to Energy technologies and market opportunities.
- Participated in and provided support for teams working on developing Michigan businesses involved in renewable energy, storage, and smart grid supply chains.
- Developed analyses and recommendations concerning low-income energy assistance coordination with low-income energy efficiency programs and utility payment collection programs.
- Drafted State of Michigan response to a US Department of Energy request for information on offshore wind energy technology development opportunities.
- Assisted in development of draft performance contracting enabling legislation, since adopted by the State of Michigan.

For Verizon Business

- Analyzed several potential new lines of business for potential entry by Verizon's Global Services Systems Integration business unit and recommended entry to the "Smart Grid" market. This recommendation was adopted and became a major corporate initiative.
- Provided market analysis and participation in various conferences to aid in positioning Verizon in the "Smart Grid" market. Recommendations are proprietary to Verizon.

- Led a task force to identify potential converged solutions for the "Smart Grid" market by integrating Verizon's current products and selected partners. Established five key partnerships that are the basis for Verizon's current "Smart Grid" product offerings.
- Participated in the "Smart Grid" architecture team sponsored by the corporate Chief Technology Officer with sub-team lead responsibilities in the areas of Software and System Integration and Network and Systems Management. This team established a reference architecture for the company's "Smart Grid" offerings, identified necessary changes in networks and product offerings, and recommended public policy positions concerning spectrum allocation by the FCC, security standards being developed by the North American Reliability Council, and interoperability standards being developed by the National Institute of Standards and Technology.
- Developed product proposals and requirements in the areas of residential energy management, commercial building energy management, advanced metering infrastructure, power distribution monitoring and control, power outage detection and restoration, energy market integration and trading platforms, utility customer portals and notification services, utility contact center voice application enablement, and critical infrastructure physical security.
- Lead solution architecture and proposal development for six utilities with solutions encompassing customer portal, advanced metering, outage management, security assessment, distribution automation, and comprehensive "Smart Grid" implementation.
- Presented Verizon's "Smart Grid" capabilities to seventeen utilities.
- Presented "Role of Telecommunications Carriers in Smart Grid Implementation" to 2009 Mid-America Regulatory Conference.
- Presented "Smart Grid: Transforming the Electricity Supply Chain" to the 2009 World Energy Engineering Conference.
- Participant in NASPInet work groups of the North American Energy Reliability Corporation (NERC), developing specifications for a wide-area situational awareness network to facilitate the sharing and analysis of synchrophasor data amongst utilities in order to increase transmission reliability.
- Provided technical advice to account team concerning successful proposal to provide network services and information systems support for the California ISO, which coordinates power dispatch and intercompany power sales transactions for the California market.

For Michigan Department of Natural Resources

- Determined permit requirements under Section 316 of the Clean Water Act for all steam electric plants currently operating in the State of Michigan.
- Case manager and key witness for the State of Michigan in FERC, State court, and Federal court cases concerning economics and environmental impacts of the Ludington Pumped Storage Plant, which is the world's largest pumped storage plant. A lead negotiator for the State in the ultimate settlement of this issue. The settlement was valued at $127 million in 1995 and included considerations of environmental mitigation, changes in power system dispatch rules, and damages compensation.
- Managed FERC license application reviews for the State of Michigan for all hydroelectric projects in Michigan as these came up for reissuance in 1970s and 1980s.
- Testified on behalf of the State of Michigan in contested cases before the Federal Energy Regulatory Commission concerning benefit-cost analyses and regulatory issues for four different hydroelectric dams in Michigan.
- Reviewed (as regulator) the environmental impacts and benefit-cost analyses of all major steam electric and most hydroelectric plants in the State of Michigan.
- Executive responsibility for development, maintenance, and operations of the State of Michigan's information system for mineral (includes oil and gas) rights leasing, unitization and apportionment, and royalty collection.
- In cooperative project with Ontario Ministry of Natural Resources, participated in development of a simulation model of oil field development logistics and environmental impact on Canada's Arctic slope for Tesoro Oil.

MPSC Case No.: U-18352
Respondent: T. L. Schroeder
Requestor: MEC-1
Question No.: MECDE-1.2
Page: 1 of 1

Question: Produce any and all documents reporting results of or otherwise memorializing activities described in the previous response.

Answer: See attachments MECDE 1.2 2014 and MECDE 1.2 2016.

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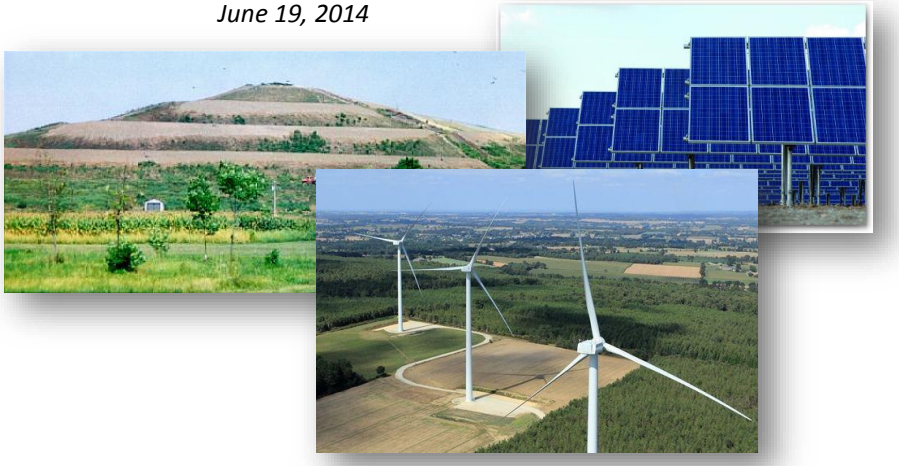
DTE Energy®

Renewable Energy Programs Exploration

Final Report

June 19, 2014



CONSUMER insights inc.

5455 Corporate Drive, Suite 120
Troy, MI 48098
(248) 952-1600
www.consumerinsightsinc.com

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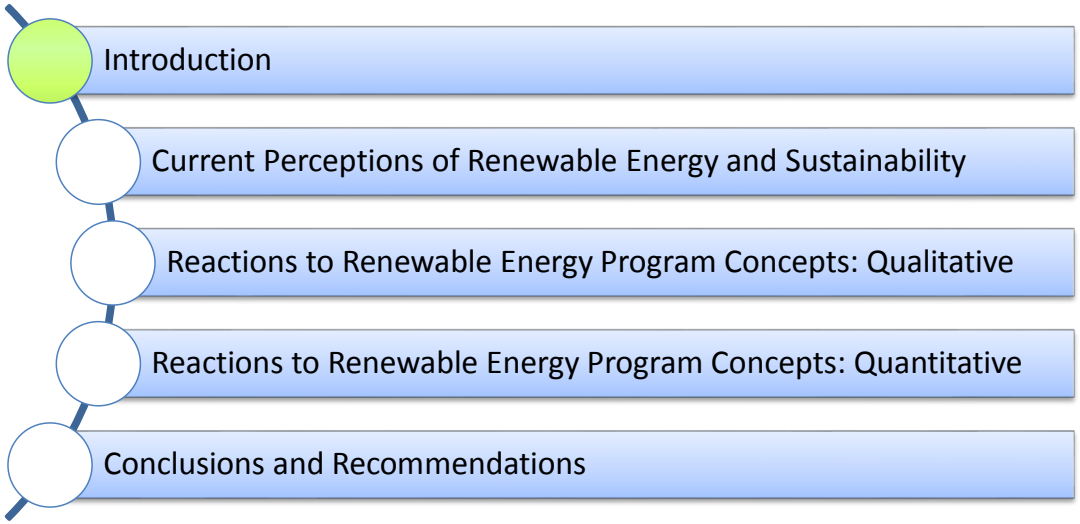
Presentation Organization



DTE Energy

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Background and Study Objectives

- DTE Energy currently offers its Green Currents program as a voluntary option for residential electric customers who want to encourage the development of renewable energy sources within DTE Energy's power grid.
- With the expansion of wind and solar installations within the state, DTE Energy wants to see if there is increased appetite from both residential and business customers for additional voluntary programs that more specifically target the way renewable energy is generated.
- This research was requested to explore current perceptions of renewable energy among both residential and business customers as well as their interest in additional programs that may be structured differently than the current Green Currents program.
- This report encompasses two complementary phases of research - a qualitative phase of research conducted in May and a quantitative phase conducted in early June. Throughout this report, qualitative findings will generally be presented before their corresponding quantitative results.

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Qualitative Sample and Methodology

- This phase of the research consisted of 6 focus groups among DTE Energy residential and small business electric customers in Southeast Michigan.
- All respondents were screened on the following:
  - Primary decision maker and bill payer relating to utility bills and programs
  - Mix of DTE Energy satisfaction levels
  - Residential: mix of education/ages/gender
  - Residential: household Income of $55k+
  - Business: mix of business types who own their location
- All groups were conducted at the Consumer Insights, Inc. focus group facility in Troy.
- Groups were conducted on April 24 and May 8, 2014 and lasted two hours.
- Residential participants received a $100 incentive; business participants received $150.

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Quantitative Sample and Methodology

- The quantitative portion of the study consisted of fifteen-minute-long online surveys completed by n=304 residential customers and n=304 business customers.
- All respondents were screened on the following:
  - Primary decision maker and bill payer relating to utility bills and programs
  - Mix of DTE Energy satisfaction levels
  - Residential: Evenly split between target geographic areas (AA, Detroit, Ypsilanti, Canton, & Dexter) and non-target areas. Household income of $55K+.
  - Business: Evenly split between small and medium businesses. Mix of geographic areas.
- The residential survey was fielded May 28th to June 3rd, 2014, and the business survey was fielded May 28th to June 7th, 2014.
- All participants who completed the survey were entered into a cash drawing ($25 for residential, $100 for business).
- All quantitative conclusions are drawn from differences observed in the data that are statistically significant at the 95% confidence level.

DTE Energy

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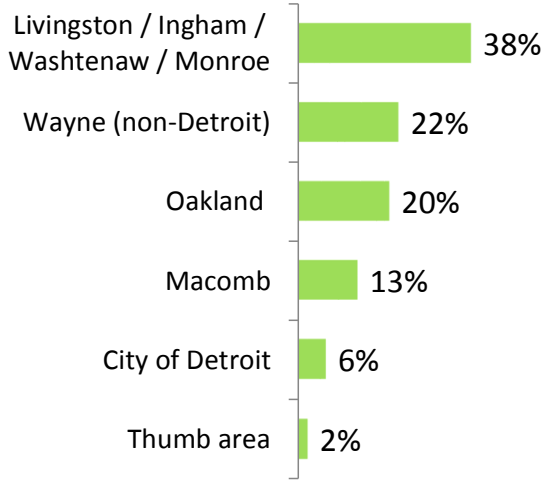
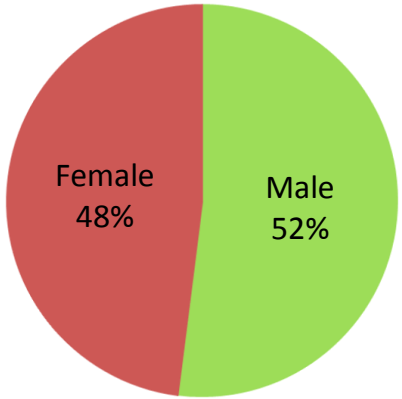
Quantitative Sample and Methodology: Residential

Geography



Gender



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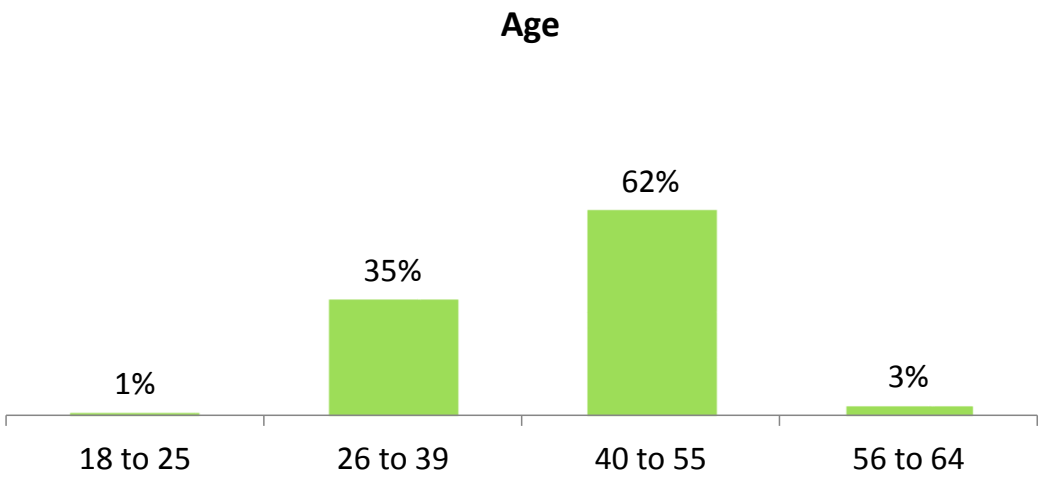
Quantitative Sample and Methodology: Residential



DTE Energy

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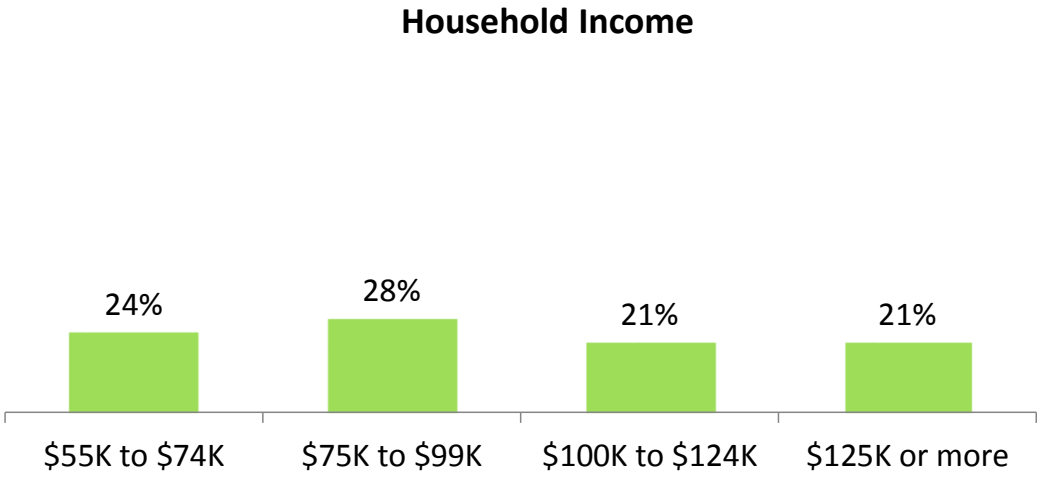
Quantitative Sample and Methodology: Residential



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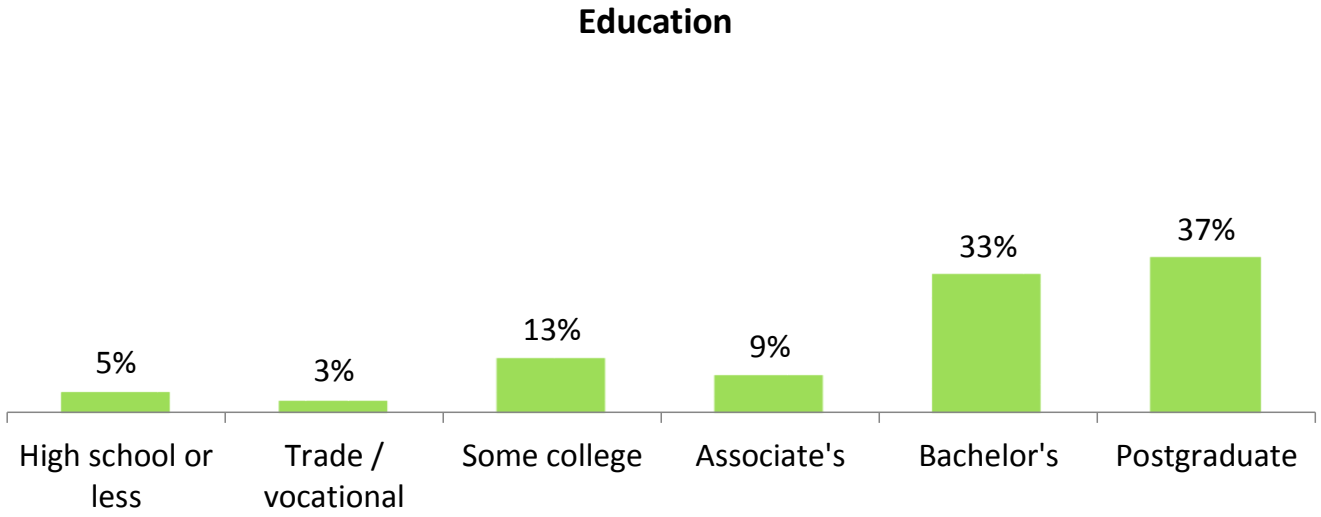
Quantitative Sample and Methodology: Residential



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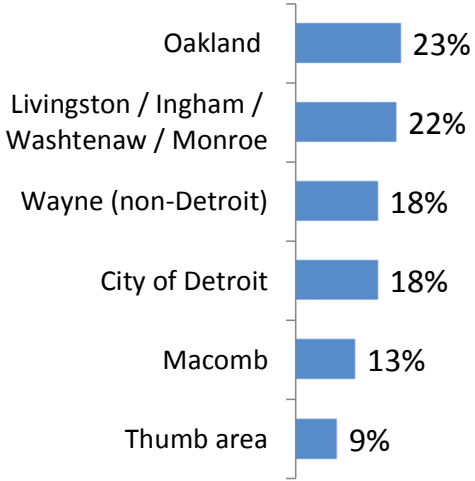
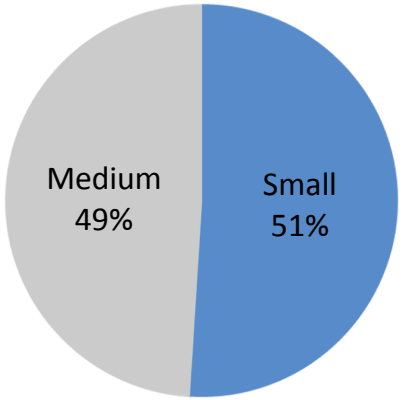
Quantitative Sample and Methodology: Business

Geography



Business Size



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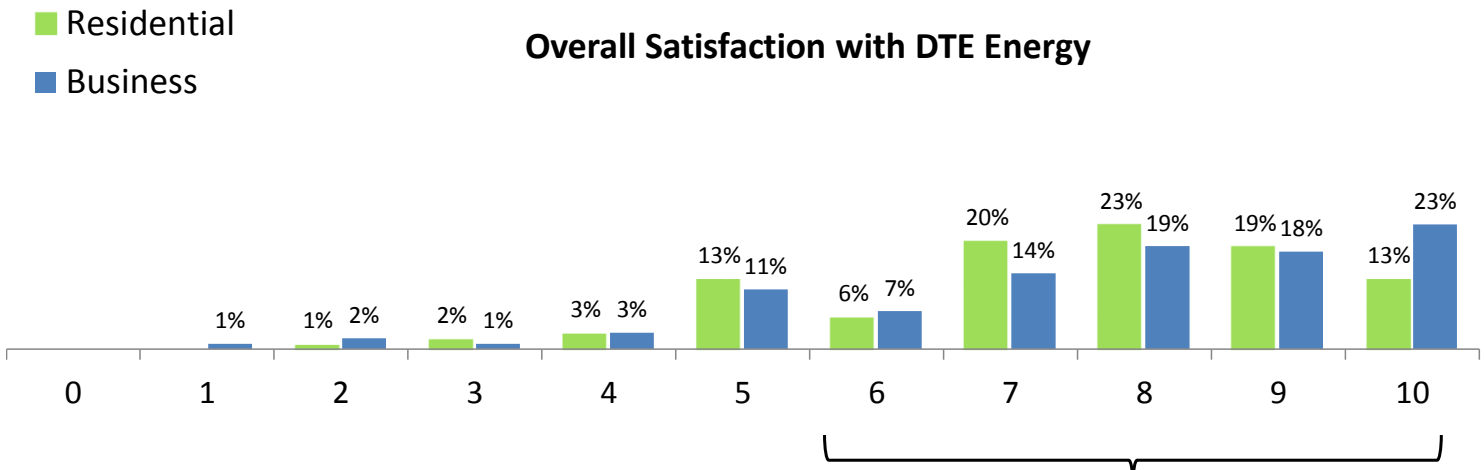
Quantitative Sample and Methodology



DTE Energy

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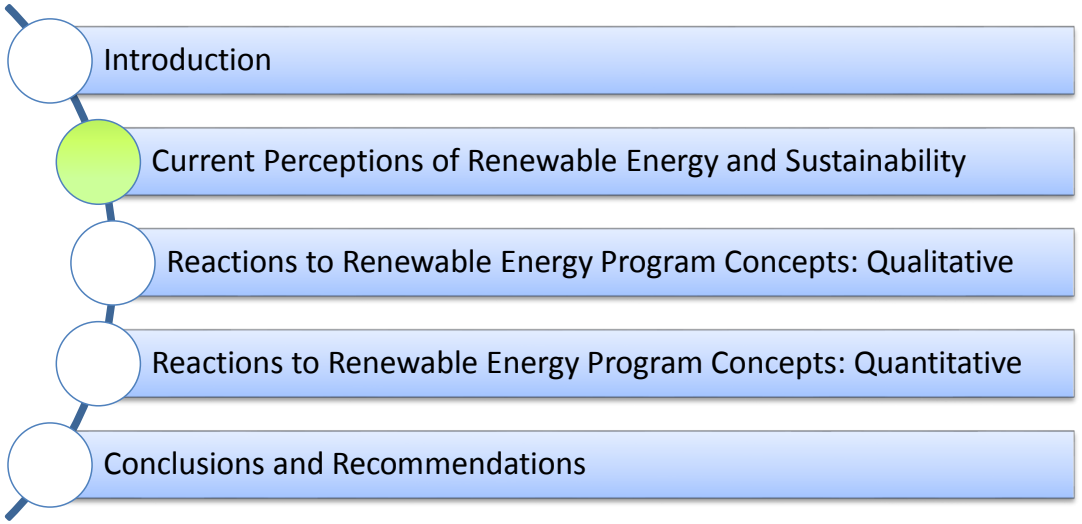
MPSC Case No. U-18352
Attachment: MECDE-1.2 2014
Respondent: T. L. Schroeder
Page: 12 of 59

Presentation Organization



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Personal or business goals relating to sustainability were extremely rare among customers—most decisions continue to be driven by economics.

- Both business and residential customers have often taken steps to reduce energy consumption over the past few years—swapping out light bulbs, replacing appliances and HVAC with new units, etc.
- However, almost universally, the motivation behind these actions is cost savings—in all but a few cases, customers could not identify any moves relating to environmental stewardship or conservation that were undertaken unless there was at least the hope for a cost benefit.
- Options that were cost neutral or that would increase costs were virtually never attempted, regardless of whether a customer considered him/herself an environmentally-conscious consumer.
- Particularly in the case of businesses in a still recovering economy, any move that increases the cost of goods/services sold without a clear, tangible benefit for the business owner will be quickly rejected.

DTE Energy

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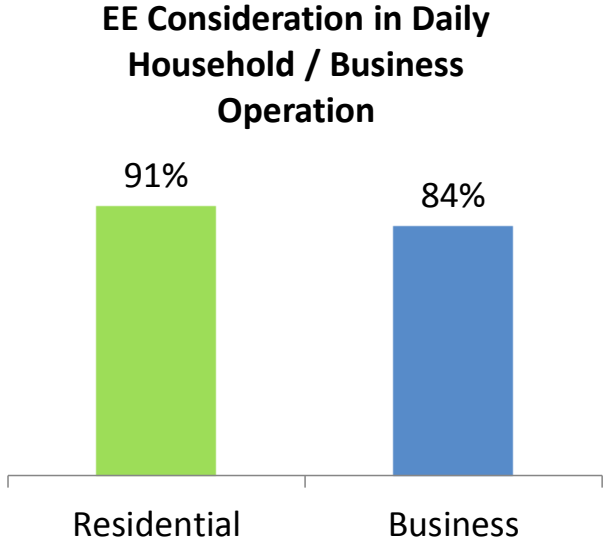
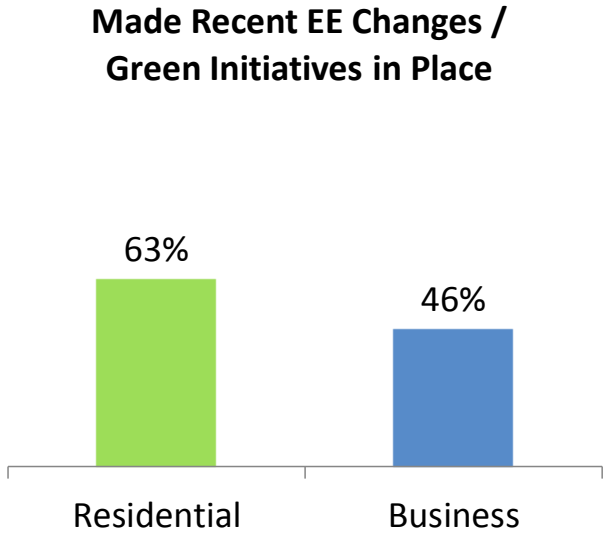
MPSC Case No. U-18352
Attachment: MECDE-1.2 2014
Respondent: Schneider
Page: 14 of 59

Although the vast majority of respondents claim to be taking energy conservation into consideration in the day to day management of both their households and businesses, significantly fewer have actually made recent changes in their homes or businesses.





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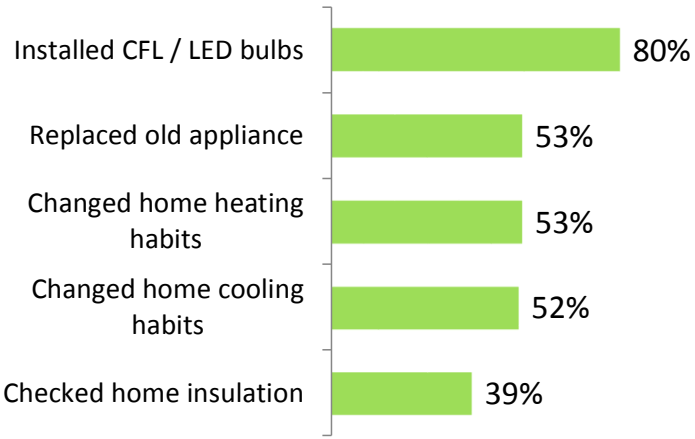
MPSC Case No. U-18352
Attachment: MECDE-1.2 2014
Respondent: J. Schneider
Page: 15 of 59

Most of those customers who have made recent EE changes focused on the low-cost, easy-to-do updates such as swapping in more efficient lighting and changing their HVAC settings. It is worthwhile to note that less than one in ten businesses are currently participating in an REC program.

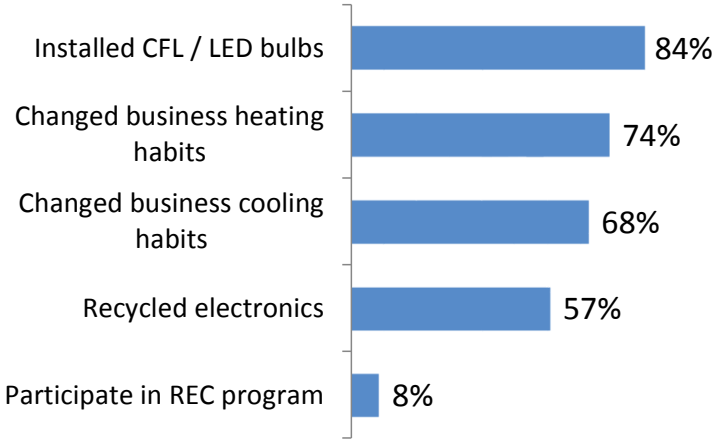
Residential
n=192

EE Changes Made Residential



EE Changes Made Business

Business
n=140



DTE Energy

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Perceptions of renewable energy were often wildly inaccurate and rarely top of mind.

- There was almost no recognition of the Green Currents program.
- Most respondents were largely unaware of the recent expansion of wind energy generation capacity within Michigan—in fact, in spite of the huge media coverage surrounding the “25 by 25” campaign last year, there was virtually no awareness of any state legislative initiatives relating to renewable energy or recall of the “10 by 15” law.
- Not surprisingly, then, there was also no sense that DTE Energy has been expanding its renewable footprint in the state; there was some recall of the DTE spot with Ben Bailey featuring a windmill, but the recall didn’t translate into an understanding of what DTE is actually doing.
- Compounding this lack of knowledge, customers consistently believe that renewable energy is **less expensive** to produce (both in the short and especially in the long run) than conventionally generated electricity, leading them to assume that any renewable energy program will **lower** their bill.
- This misperception led many customers to assume that any new programs from DTE that are tied to renewable electricity generation would (at least eventually) reduce their bill—in fact, a few business customers have toyed with the idea of adding solar panels as a way of reducing their operating cost by eliminating or reducing their DTE Energy bill.

DTE Energy

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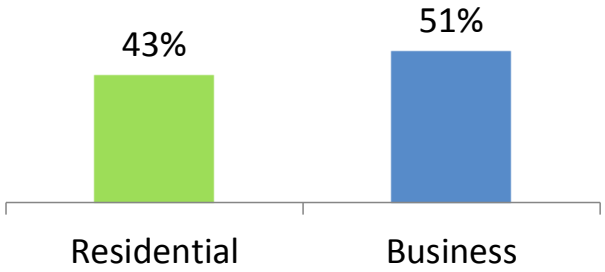
Michigan Case No. U-18352
Attachment: MECDE-1.2 2014
Respondent: T.L. Schneider
Page: 17 of 59

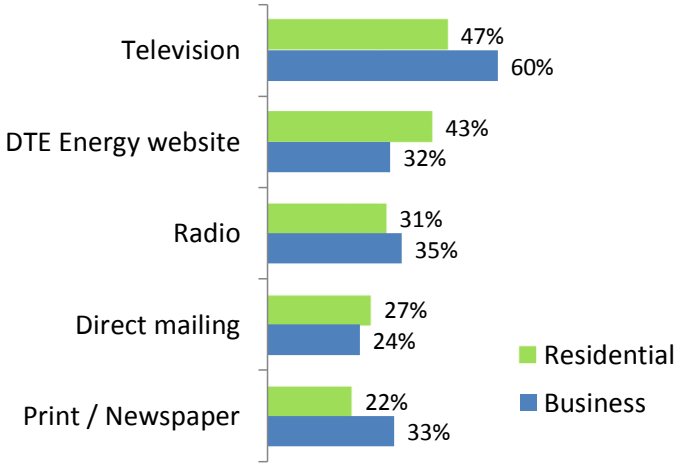
Supporting the qualitative results, awareness of DTE Energy's renewable energy efforts was low among both residential and business customers. Most of those who were aware found out about DTE Energy's efforts through TV ads or the company website.

Aware of DTE Energy Renewable Energy Development Efforts



Sources of Awareness

Res. n=131
Bus. n=156



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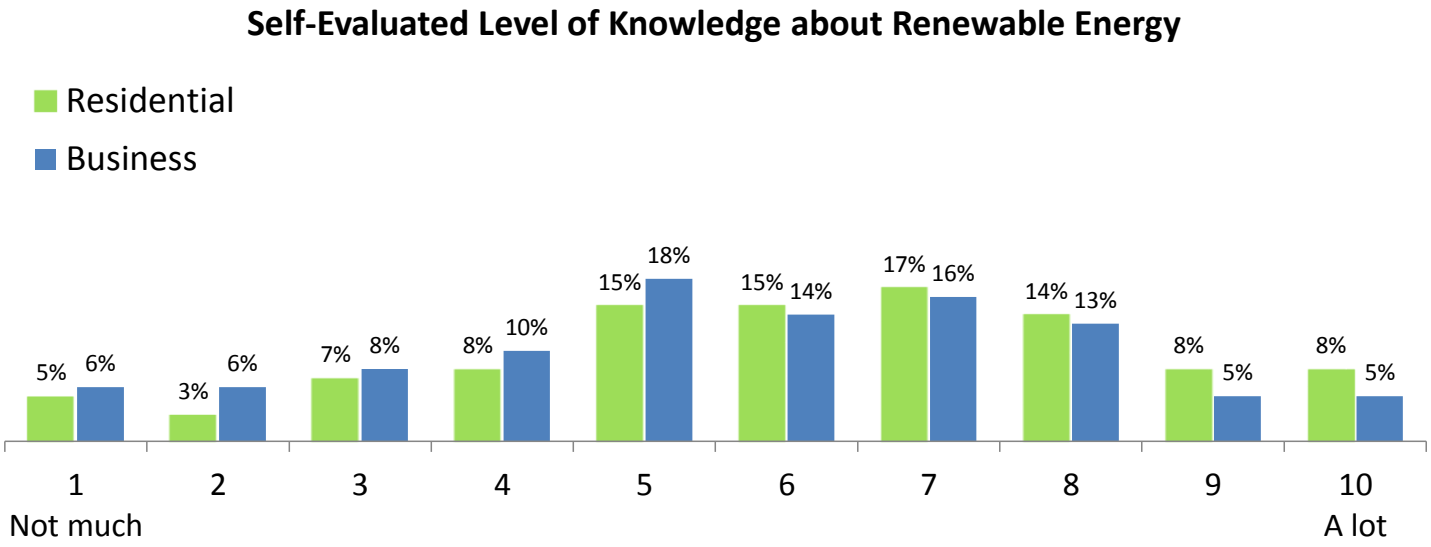
MPSC Case No. U-18352
Attachment: MECDE-1.2 2014
Respondent: T. L. Schroder
Page: 18 of 59

Even on a self-professed basis, knowledge and understanding of renewable energy is relatively low. Only about a quarter of customers feel like they know a lot about renewable energy, such as wind or solar energy.



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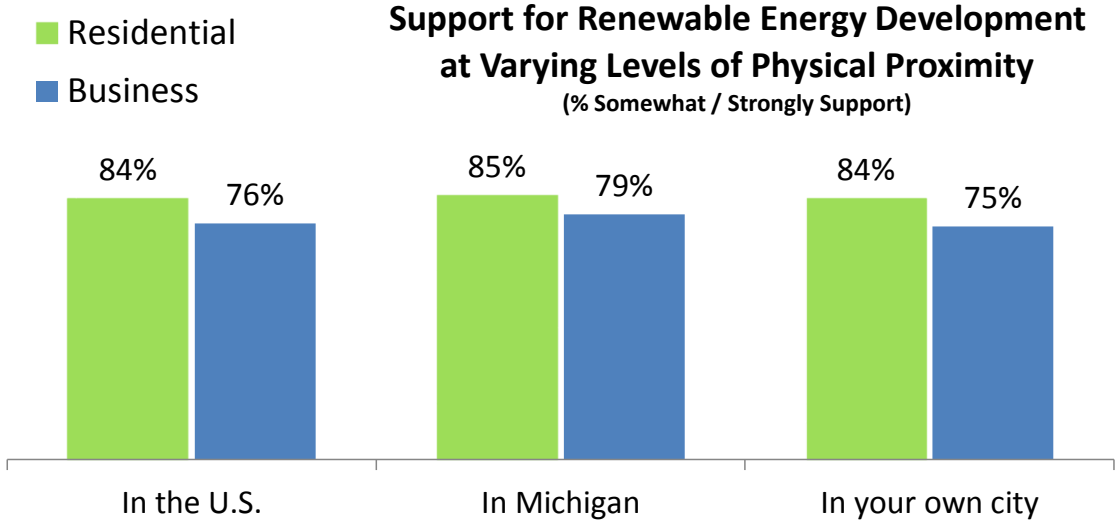
Filed Case No. U-18370
Attachment: MECDE-1.2 2014
Respondent: Thomas Schneider
Page: 19 of 59

Perhaps not surprisingly, given the misperceptions about the cost of renewable energy, support for renewable energy development was extremely strong. Even at the hyper-local level, the vast majority of residential and business customers support such development.



These support figures are in line with support from Huron County residents prior to the existence of local wind farms (82% in 2009). After the installation of those wind farms, support dropped sharply (61% in late 2013), indicating that the existence of local renewable energy sources may negatively impact support for local renewable energy development (a "not in my backyard" sentiment).

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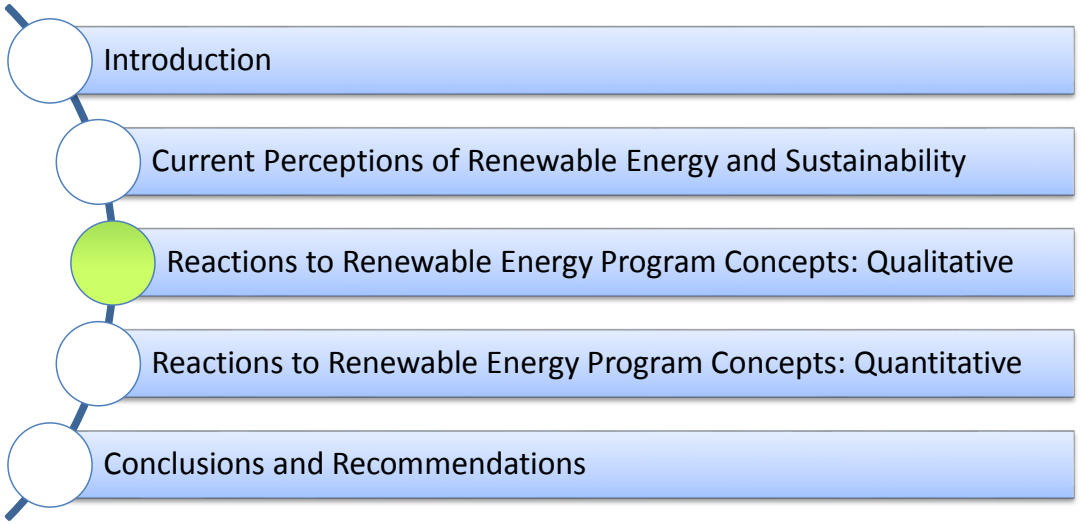
MPSC Case No. U-18352
Attachment: MECDE-1.2 2014
Respondent: T. L. Schroeder
Page: 20 of 59

Presentation Organization



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MPSC Case No. U-18352
Attachment MECDE-1.2(2014)
Respondent: T. L. Schroeder
Page: 21 of 59

Six concepts were presented to all respondents—some structurally similar concepts were adjusted to be appropriate for differences between residential and business.

- All respondents were provided a page of "definitions and clarifications" that would apply to all concepts (shown on the next two pages).
- All concepts were presented within a common structure of 4-5 common sections:
  - Program overview
  - Generation source
  - Associated costs
  - Lock-in commitment requirements
  - (Business only) Energy and REC category rating
- For this initial phase, several different commitment and cancellation requirements were tested to see how those elements could impact overall appeal of a concept, but the primary conversations focused on the merits and appeal of each concept itself.

DTE Energy

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Some Definitions and Clarifications: Residential Customers

- All of the programs we will be exploring would be voluntary, with different terms and conditions as explained in their descriptions.
- Assume that 650kWh per month will result in about $100 bill once you factor in energy costs and distribution charges.
- At this time there are no applicable tax breaks for any of these scenarios, so assume the cost listed is the actual net cost to your household.

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MPSC Case No. U-18352
Attachment: MECDE-1.2 2014
Respondent: T. L. Schroeder
Page: 23 of 59

Some Definitions and Clarifications: Business Customers

- All of the programs we will be exploring would be voluntary, with different terms and conditions as explained in their descriptions.
- Business customers have different rate structures depending on their size so I don't have a good rule of thumb for the whole group when it comes to cost per kWh right now.
- At this time there are no applicable tax breaks for any of these scenarios, so assume the cost listed is the actual net cost to your business.
- The term REC refers to a Renewable Energy Credit. A REC is a non-tangible energy commodity in the United States that represents proof that 1 megawatt-hour (MWh) of electricity was generated from an eligible renewable energy resource. We show this term in applicable programs because businesses that set energy sustainability goals often dictate the retirement of RECs. The RECs generated by the programs we will be discussing would be managed by DTE and retired on behalf of the participating business.
- Finally, some of these programs show an "energy + REC offering" versus a "REC only offering". Here's the difference:
  - A REC only offering allows the customer to purchase the Renewable Energy Credit—which will always be at a premium since it is an incremental cost to the energy you are buying. The purpose of the REC is to ensure that additional renewable energy is being generated somewhere upon your behalf.
  - In contrast, an energy + REC offering will provide the customer a flat rate that may not always be at a significant premium to market. The value of the energy allows you to "sell" the energy in to market, so as market prices increase the cost of the program stays the same.

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MPSC Case No. U-18352
Attachment: MECDE-1.2 2014
Respondent: T. L. Schroeder
Page: 24 of 59

Regardless of which concept was being addressed, there were some common themes that arose in the conversations.

- Customers don't want to feel like participation in the program is replacing investments DTE Energy should already be making—communications will need to clearly explain why the company can't develop these resources (as quickly? efficiently?) without these dedicated renewable energy programs.
- Customers don't want to feel like they are subsidizing customers who are not making the investment in renewable energy generation—this may be trickier, as that is exactly what these programs do.
- Even after extensive explanation, some customers erroneously think that participating in the program means changing the source (and potential reliability) of the electrons coming into their home or business.
- Customers want a way to verify that participation in the program is real:
  - How can DTE Energy verify it is doing what it promises to do?
  - On a "net" basis (after manufacturing, refining, disposal, maintenance, equipment lifespan, local damage, etc.) does the alternative electricity generation source actually have a smaller environmental impact?
- Because of their aversion to increasing their bills for what they perceive to be less expensive energy, customers are only interested if the investment cost is minimal and (in the case of businesses) there is a way for them to identify a potential benefit to offset the cost (such as a participant decal for their door).

"You have to have a way to let people know what you're doing."

DTE Energy

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MPSC Case No. U-18352
Attachment: MECDE-1.2 2014
Respondent: T. L. Schroeder
Page: 25 of 59

In the general discussion and context of the tested concepts, the location of energy generation did have some impact on its appeal.

- Although a few customers—particularly business customers—were open to renewable energy generation wherever it made economic/environmental sense, most only gave DTE Energy "credit" for efforts within the state of Michigan because they wanted to economic and energy generation benefit to be felt locally.
- Within the concepts, we evaluated three possible locational variables:
  - **"Within Michigan / Within DTE Energy service territory"**
    This distinction didn't matter to customers—the economic value of the proposition was perceived as positive and equivalent.
  - **"Within your county"**
    This was interesting to customers, in part because they have such low awareness of DTE Energy green generation efforts to date. Having a facility within their county means they see physical evidence that DTE is fulfilling its promise made under its renewable energy program—yet the installations may not be so close to the customers' homes that they become an "eye sore."
  - **"Within your city"**
    This has both positive and potentially negative connotations—the installation (confirmation of new energy solutions) becomes very visible, but depending on the location and size of the installation, its (ugly?) presence may not be welcome and could actually decrease customer satisfaction as a result.

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Idea W1: Michigan-based Wind Energy

MPSC Case No. U-18352
Attachment: MECDE-1.2 2014
Respondent: T. L. Schroeder
Page: 26 of 59

Residential Version

- **Overview –** This is a Michigan-based wind energy generation program. The program could be purchased in 100 kWh blocks. Customers would be charged for the number of blocks they sign up for monthly and would not be allowed to sign up for more than 50% of their usage.
- **Generation Resource –** Michigan-based wind generation within DTE service territory
- **Associated Costs –** Cost for each 100 kWh block would be $3 – This is a flat rate fee incremental to your current bill, so if you committed to purchasing 300 kWh of wind energy every month, you would be billed an extra $9 on your electric bill each month in addition to your normal usage cost.
- **Lock-in Commitment Requirements –** Requirement for 2 years upon initial sign up, then can drop with 90 days notice.

Business Version

- **Overview –** This is a Michigan-based wind energy generation program. The program could be purchased in 100 kWh blocks. Customers would be charged for the number of blocks they sign up for monthly and business would be allowed to sign up for a maximum of 10 blocks per month.
- **Generation Resource –** Michigan-based wind generation within DTE service territory
- **Associated Costs –** Cost for each 100 kWh block would be $3 – This is a flat rate fee incremental to your current bill, so if you committed to purchasing 300 kWh of wind energy every month, you would be billed an extra $9 on your electric bill each month in addition to your normal usage cost.
- **Lock-in Commitment Requirements –** Requirement for 2 years upon initial sign up, then can drop with 90 days notice.
- **Category –** This is considered an energy and REC offering.

DTE Energy

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W1 provided a cost-effective way of demonstrating an environmental commitment.

- This was one of the most popular concepts across both business and residential customers.
- The terms were easy to understand, and the incremental cost is laid out clearly.
- Even though W1 incrementally raises the customer's bill every month, it provides stability (and predictability) in the increase, which is particularly important for the business customers.
- As presented, the 2-year commitment was seen as a significant detractor—most were more comfortable with a 1-year commitment to allow a quick exist if household or business finances changed.
- Most would sign up for 1-2 blocks—which represented a minimal investment/increase for the benefit of engaging in green energy (or convincing your customers you are).

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Idea W2: Michigan-based Wind Energy

MPSC Case No. U-18352
Attachment: MECDE-1.2 2014
Respondent: T. L. Schroeder
Page: 28 of 59

Residential Version

- **Overview –** This is a Michigan-based wind generation program. The program would allow DTE Energy customers to purchase 100% of their monthly usage from wind energy sources. Customers could not purchase more than they will use. They would be charged monthly.
- **Generation Resource –** Michigan-based wind generation (although not necessarily in DTE service territory).
- **Associated Costs –** The program would charge a rate of $0.055 per kWh. This rate would be incremental to the current bill but would be netted against market energy (not including distribution) price (currently about $0.025 kWh). As the market price increases or decreases the rate would stay the same but the overall "premium" to the bill would increase or decrease. In the initial situation shown above, a $100 conventional bill would increase by $20 to $120 total.
- **Lock-in Commitment Requirements –** Requirement for 2 years upon initial sign up, then can drop the program with 90 days notice. Ability to lock in rate for up to a 20 year commitment.

Business Version

- **Overview –** This is a Michigan-based wind generation program. The program would allow DTE Energy customers to purchase up to 4 MWs of capacity; actual generation would be based on the output of the wind park. Customers could not purchase more than they will use. They would be charged monthly.
- **Generation Resource –** Michigan-based wind generation (although not necessarily in DTE service territory).
- **Associated Costs –** The program would charge a rate of $0.055 per kWh. This rate would be incremental to the current bill but would be netted against market price (currently about $0.025 kWh). As the market price increases or decreases the rate would stay the same but the overall "premium" to the bill would increase or decrease. With the example rates above, customers in this program would pay an extra $30 for every 1,000 kWh used per month (1,000 kWh x ($0.055-$0.025) = $30).
- **Lock-in Commitment Requirements –** Requirement for 2 years upon initial sign up, then can drop the program with 90 days notice. Ability to lock in rate for up to a 20 year commitment.
- **Category –** This is considered an energy and REC offering.

DTE Energy

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In contrast, W2 seemed complex and lacked a clear customer benefit

MPSC Case No. U-18352
Attachment: MECDE-1.2 2014
Respondent: T. L. Schroeder
Page: 29 of 59

- This concept was extremely hard for customers to grasp—it would require a very detailed, graphic explanation from DTE Energy, and even then, telegraphing it in a way that becomes clear to customers would require a time and attention investment atypical for most customers.

  "I have no idea what they're trying to do here."

- Once the moderator was able to convey the details effectively, some customers were intrigued by the ability to lock into a set rate for multiple years but wanted some sense for whether conventionally generated electric rates would climb above the wind rate eventually.
- When the moderator conveyed the answer that the wind price would probably always be a premium over conventional for the foreseeable future, even mild interest in the concept disappeared.

  "If you'll never exceed market price, then what's the advantage?"

- In general, this was seen as a big gamble for a future financial benefit but would guarantee a significantly higher rate every month for the customer in the near term.
- In this context, the environmental benefit of the program was largely lost on the customers because they were so concerned about how participation would drive up their energy costs now.

  "I'm not opposed to a long term commitment, but I probably wouldn't pick this one because we're pushing 20% in an increase with no promise of offsetting future costs."

  "There are too many variables."

  "It's a poor business decision."

  "The difference from market price makes me leery."

DTE Energy

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Idea R: Michigan-based Renewable Energy

MPSC Case No. U-18352
Attachment: MECDE-1.2 2014
Respondent: T. L. Schroeder
Page: 30 of 59

Residential Version

- **Overview –** This is a Michigan-based renewable generation program. The program could be purchased in 100 kWh blocks. Customers could not purchase more than they will use. They would be charged for the number of blocks they sign up for monthly, and would not be allowed to sign up for more than 100% of their usage.
- **Generation Resource –** Michigan-based renewable energy generation from two sources (90% biomass, 10% wind).
- **Associated Costs –** Cost for each 100 kWh block would be $2.50 – This is a flat rate fee incremental to your current bill, so if you committed to purchasing 300 kWh of renewable energy every month, you would be billed an extra $7.50 on your electric bill each month in addition to your normal usage cost.
- **Lock-in Commitment Requirements –** Requirement for 1 year upon initial sign up, then can drop from the program at any time.

Business Version

- **Overview –** This is a Michigan-based renewable generation program. The program could be purchased in 1,000 kWh blocks. Customers could not purchase more than they will use. They would be charged for the number of blocks they sign up for monthly, and would not be allowed to sign up for more than 100% of their usage.
- **Generation Resource –** Michigan-based renewable energy generation from two sources (90% biomass, 10% wind).
- **Associated Costs –** Cost for each 1,000 kWh block would be $2 – This is a flat rate fee incremental to your current bill, so if you committed to purchasing 3,000 kWh of renewable energy every month, you would be billed an extra $6 on your electric bill each month in addition to your normal usage cost.
- **Lock-in Commitment Requirements –** Requirement for 1 year upon initial sign up, then can drop from the program at any time.
- **Category –** This is considered an REC ONLY offering.

DTE Energy

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Idea R is essentially Green Currents—and ironically, was one of the most popular concepts tested.

- This concept had two key points of appeal:
  - It provided the cheapest way of all six concepts to incorporate a "green" element into a customer's bill in a completely predictable manner.
  - It takes an existing environmental problem (methane being directly released or burned without benefit) and turns it into something useful and less damaging.

    "It makes the most sense to me, using something that's already there, catching it and using it for something instead of just burning it or letting it escape. "

- There were two consistent concerns raised about this program:
  - Because it relies heavily on biomass and burning methane (or even direct trash), some questioned its environmental credentials: is this really a better, safer, cleaner way to produce electricity?
  - Who benefits from the program—in particular, are DTE Energy customers simply subsidizing landfill owners' profits and even potentially encouraging the importing of garbage into MI from other states and Canada?

DTE Energy

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MPSC Case No. U-18352
Attachment: MECDE-1.2 2014
Respondent: T. L. Schroeder
Page: 32 of 59

Idea S1: Michigan-based Solar Energy

Residential Version

- **Overview –** This is a Michigan-based solar energy generation program. The program could be purchased in 50 kWh blocks. Customers would be charged for the number of blocks they sign up for monthly and would not be allowed to sign up for more than 50% of their usage.
- **Generation Resource –** Michigan based solar generation within DTE Energy service territory.
- **Associated Costs –** Cost for 50 kWh block would be $17.50 – This is a flat rate fee incremental to your current bill, so if you committed to purchasing 150 kWh of solar energy every month, you would be billed an extra $52.50 on your electric bill each month in addition to your normal usage cost.
- **Lock-in Commitment Requirements –** Requirement for 2 years upon initial sign up, then can drop the program with a 90 day notice.

Business Version

- **Overview –** This is a Michigan-based solar energy generation program. The program could be purchased in 100 kWh blocks. Customers would be charged for the number of blocks they sign up for monthly and would be allowed to sign up for as much as the their minimum month's usage out of a rolling calendar year up to a maximum of 10 blocks. They can't purchase more than they will use.
- **Generation Resource –** Michigan-based solar generation within DTE Energy service territory.
- **Associated Costs –** Cost for 100 kWh block would be $34 – This is a flat rate fee incremental to your current bill, so if you committed to purchasing 300 kWh of solar energy every month, you would be billed an extra $102 on your electric bill each month in addition to your normal usage cost.
- **Lock-in Commitment Requirements –** Requirement for 2 years upon initial sign up, then can drop the program with a 90 day notice.
- **Category –** This is considered an energy and REC offering.

DTE Energy

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MPSC Case No. U-18352
Attachment: MECDE-1.2 2014
Presentation to Customer
Page: 33 of 59

Like W1, S1 was easy to understand but customers balked at the associated cost.

- There didn't appear to be any intrinsic value associated with generating electricity from solar panels versus other types of renewable energy.
- As such, customers looked at S1 and saw a more expensive version of R and W1—which, for some customers, was enough to consider the program.

  "$34 per month means I can advertise I'm part of the green community."
- However, most reactions suggest a program structured in this way would not be viable.

  "This is very expensive. For me, it's over the level I'd commit to."

  "Comparatively, it's pretty high."

  "That's more than $500 a year—it's not justifiable. Why not just put them on your own house?"

  "I'm not sold on this one because of the additional costs. It doesn't add up, and our customers wouldn't care [whether we were using green energy]."

  "No—this is a 25% increase in my electric bill. It's not affordable."

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Idea S2: Community Solar Energy

Residential Version

- **Overview –** This is a Michigan-based community solar generation program. This program would be a lease of a solar panel to a customer. DTE would retain ownership of the panels but lease to customer for a one-time fee.
- **Generation Resource –** Michigan-based solar generation within the customer's county.
- **Associated Costs –** One-time $475 initial charge to purchase a "share" in the solar project (1 panel). Customer would use the energy generated by that panel for a 20 year life span. The customer would receive a bill credit of approximately $2 each month (actual amount would be based on the customer's share of the total monthly output of the solar array).
- **Lock-in Commitment Requirements –** Commitment up front, good for 20 year life cycle of the array.

Business Version

- **Overview –** This is a Michigan-based community solar generation program. This program would be a lease of a solar panel to a customer. DTE would retain ownership of the panels but lease to customer for a onetime fee.
- **Generation Resource –** Michigan-based solar generation within the customer's county.
- **Associated Costs –** One-time $475 initial charge to purchase a "share" in the solar project (1 panel). Customer would use the energy generated by that panel for a 20 year life span. The customer would receive a bill credit of approximately $2 each month (actual amount would be based the customer's share of the total monthly output of the solar array).
- **Lock-in Commitment Requirements –** Commitment up front, good for 20 year life cycle of the array.
- **Category –** This is NOT considered an energy or REC offering.

DTE Energy

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Even with a higher initial investment, Idea S2 was intriguing to many respondents.

- For customers who were highly opposed to an ongoing premium paid to DTE Energy for adding renewable energy sources, S2 provided a way to recover an initial investment in green energy over time.
- Customers were surprisingly open to forgoing a more profitable return via other investments in order to capture the environmental benefit of the solar energy.
- There was also an element of “bragging rights” associated with S2:
  - An installation within the county means there would be a physical reminder of the customer’s investment.
  - Several customers talked about either showing off “their” panel to grandkids or purchasing a panel as an interesting gift for someone else.
- The primary concern with this concept was the actual size of the initial investment; several customers suggested that if they could spread the $475 over several months, they would be more likely to sign up.
- Multiple customers were also concerned about the impact of moving, and wanted to make sure they would remain in the program even if they moved to a different county within the DTE service area.

DTE Energy

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Idea S3: Local Solar Energy

Residential Version

- **Overview –** This is a Michigan-based solar energy generation program. This program could be purchased as one of three percentages of the customer's bill.
- **Generation Resource –** Michigan-based solar generation within customer's city limits.
- **Associated Costs –** Customers would be charged an incremental rate in addition to the conventional energy rate. 25% of the customer's monthly usage would incur a $0.38 per kWh incremental cost on that portion of the bill; 50% of the customer's monthly usage would incur a $0.35 per kWh incremental cost on that portion; 100% of the customer's monthly usage would incur a $0.30 per kWh incremental cost on all electricity consumed.

  For example, a $100 conventional bill (650 kWh) would look like the following under each scenario:
  25% - Total Bill $161
  50% - Total Bill $213
  100% - Total Bill $295
- **Lock-in Commitment Requirements –** Requirement for 1 year upon initial sign up, then can drop the program with 90 days notice.

Business Version

- **Overview –** This is a Michigan-based solar energy generation program. This program could be purchased as one of three percentages of the customer's bill.
- **Generation Resource –** Michigan-based solar generation within customer's city limits.
- **Associated Costs –** Customers would be charged an incremental rate in addition to the conventional energy rate. 25% of the customer's monthly usage would incur a $0.38 per kWh incremental cost on that portion of the bill; 50% of the customer's monthly usage would incur a $0.35 per kWh incremental cost on that portion; 100% of the customer's monthly usage would incur a $0.30 per kWh incremental cost on all electricity consumed.

  For example—for every 1,000 kWh a business uses in a given month, the additional charge associated with the program would look like the following under each scenario:
  25% = $95 extra
  50% = $190 extra
  100% = $380 extra
- **Lock-in Commitment Requirements –** Requirement for 1 year upon initial sign up, then can drop the program with 90 days notice.
- **Category –** This is considered an energy and REC offering.

DTE Energy

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Idea S3 was not economically feasible for customers.

- Like S1, respondents didn't see any intrinsic value associated with generating electricity from solar panels versus other types of renewable energy.
- More so than with S1, S3 had the potential to dramatically raise a customer's bill.
- As a result, reactions to this concept were universally negative.

  "Wow! It's a lot of money."

  "We're too small (as a business)—we can't take the punch."

  "I don't know—I'd rather keep my bill low."

  "Who would do this?"

  "It's the cost. I would love local solar energy, but…"

  "$95 extra on a $500 bill? No."

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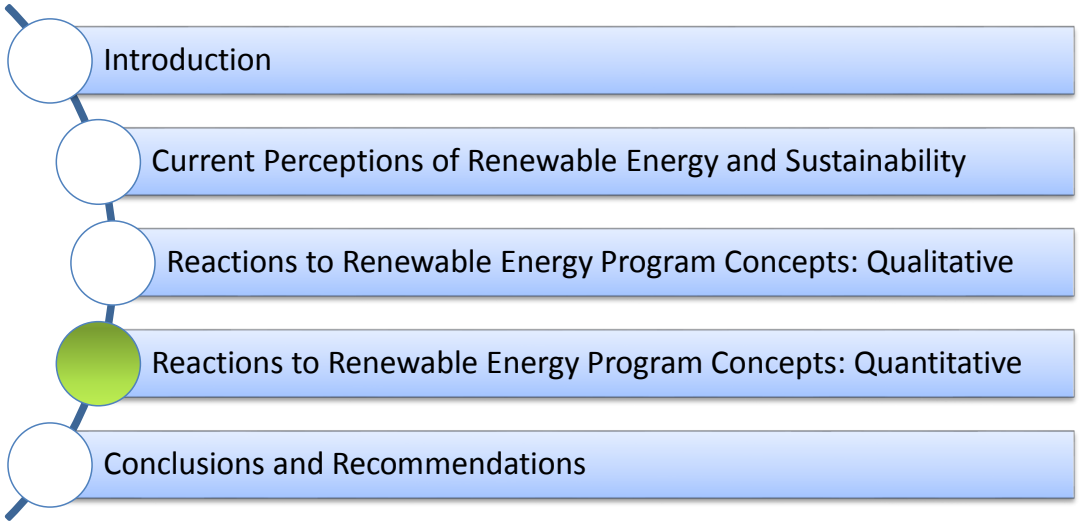
Presentation Organization



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Based off the feedback from the qualitative phase, two of the concepts (Idea S3 and Idea W2) were removed from the subsequent quantitative survey due to not meeting the minimum criteria necessary to gain subscribers.

The remaining four concepts were edited to require only a single-year commitment with an easy exit after that. The descriptions of each concept were also updated to provide better clarity, addressing the questions that arose in the qualitative discussions.

In the quantitative survey, all respondents reviewed each of the four remaining concepts in a randomized order. The concepts were presented to respondents in the same manner as in the qualitative phase – a short summary of the program, its generation source, associated costs, lock-in commitment requirements, and for business customers, the program's energy/REC category rating.

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Quantitative Idea W1: Michigan-based Wind Energy Purchased in Blocks

Residential Version

- **Overview –** This would be a Michigan-based wind energy generation program available to DTE Energy electric customers on a voluntary basis. Customers in the program could choose to purchase up to half of their average monthly electricity usage in the form of "wind energy blocks" of 100 kWh each. For every block purchased, DTE Energy would generate 100 kWh of wind energy within the general power grid.
- **Generation Resource –** Energy produced under this program would come from wind parks built within DTE Energy's Michigan service territory.
- **Program Costs –** Customers who join this program would be charged an additional $3 for each 100 kWh block they choose to purchase every month. This would be an extra flat rate fee on your current bill. For example, if you committed to purchasing 200 kWh of your electricity every month via this program, DTE Energy would bill you an extra $6 on your electric bill in addition to your normal usage cost ($3 x 2 blocks = $6).
- **Lock-in Commitment Requirements –** This program would require a 1-year commitment when you sign up for it. After that first year, you could drop the program at any time.
- **Reminder –** A $100 electric bill means you've used about 650 kWh of electricity for the month.

Business Version

- **Overview –** This would be a Michigan-based wind energy generation program available to DTE Energy electric business customers on a voluntary basis. Customers in the program could choose to purchase up to half of their average monthly electricity usage in the form of "wind energy blocks" of 100 kWh each. For every block purchased, DTE Energy would generate 100 kWh of wind energy within the general power grid.
- **Generation Resource –** Energy produced under this program would come from wind parks built within DTE Energy's Michigan service territory.
- **Program Costs –** Businesses who join this program would be charged an additional $3 for each 100 kWh block they choose to purchase every month. This would be an extra flat rate fee on your current bill. For example, if you committed to purchasing 200 kWh of your electricity every month via this program, DTE Energy would bill you an extra $6 on your electric bill in addition to your normal usage cost ($3 x 2 blocks = $6).
- **Lock-in Commitment Requirements –** This program would require a 1-year commitment when you sign up for it. After that first year, you could drop the program at any time.
- **Category –** This is considered a REC offering.

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Case No. U-18322
Attachment: MECDE-1.2 2014
Respondent: T. L. Schroeder
Page: 41 of 59

Quantitative Idea R: Michigan-based Renewable Energy Purchased in Blocks

Residential Version

- **Overview –** This would be a Michigan-based renewable generation program available to DTE Energy electric customers on a voluntary basis. Customers in the program could choose to purchase up to 100% of their average monthly electricity usage in the form of "renewable energy blocks" of 100 kWh each. For every block purchased, DTE Energy would generate 100 kWh of renewable energy within the general power grid.
- **Generation Resource –** 90% of the energy generated within this program would come from biomass, which is energy produced by harnessing and burning the methane produced from landfills to drive steam-powered generators (when not used to generate electricity, this methane is typically "torched" off or released directly into the atmosphere); 10% of the energy generated within this program would come from wind parks. Both forms would come from Michigan sites.
- **Associated Costs –** Customers who join this program would be charged an additional $2.50 for each 100 kWh block they choose to purchase every month. This would be an extra flat rate fee on your current bill. For example, if you committed to purchasing 200 kWh of your electricity every month via this program, DTE Energy would bill you an extra $5 on your electric bill in addition to your normal usage cost ($2.50 x 2 blocks = $5).
- **Lock-in Commitment Requirements –** This program would require a 1-year commitment when you sign up for it. After that first year, you could drop the program at any time.
- **Reminder –** A $100 electric bill means you've used about 650 kWh of electricity for the month.

Business Version

- **Overview –** This would be a Michigan-based renewable generation program available to DTE Energy electric business customers on a voluntary basis. Customers in the program could choose to purchase up to 100% of their average monthly electricity usage in the form of "renewable energy blocks" of 1,000 kWh each. For every block purchased, DTE Energy would generate 1,000 kWh of renewable energy within the general power grid.
- **Generation Resource –** 90% of the energy generated within this program would come from biomass, which is energy produced by harnessing and burning the methane produced from landfills to drive steam-powered generators (when not used to generate electricity, this methane is typically "torched" off or released directly into the atmosphere); 10% of the energy generated within this program would come from wind parks. Both forms would come from Michigan sites.
- **Associated Costs –** Businesses who join this program would be charged an additional $20 for each 1,000 kWh block they choose to purchase every month. This would be an extra flat rate fee on your current bill. For example, if you committed to purchasing 2,000 kWh of your electricity every month via this program, DTE Energy would bill you an extra $40 on your electric bill in addition to your normal usage cost ($20 x 2 blocks = $40).
- **Lock-in Commitment Requirements –** This program would require a 1-year commitment when you sign up for it. After that first year, you could drop the program at any time.
- **Category –** This is considered a REC offering.

DTE Energy

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Quantitative Idea S1: Michigan-based Solar Energy Purchased in Blocks

Residential Version

- **Overview –** This would be a Michigan-based solar energy generation program available to DTE Energy electric customers on a voluntary basis. Customers in the program could choose to purchase up to half of their average monthly electricity usage in the form of "solar energy blocks" of 50 kWh each. For every block purchased, DTE Energy would generate 50 kWh of solar energy within the general power grid.
- **Generation Resource –** Energy produced under this program would come from solar panel generation installations built within DTE Energy's Michigan service territory.
- **Associated Costs –** Customers who join this program would be charged an additional $17.50 for each 50 kWh block they choose to purchase every month. This would be an extra flat rate fee on your current bill. For example, if you committed to purchasing 100 kWh of your electricity every month via this program, DTE Energy would bill you an extra $35 on your electric bill in addition to your normal usage cost ($17.50 x 2 blocks = $35).
- **Lock-in Commitment Requirements – Lock-in Commitment Requirements –** This program would require a 1-year commitment when you sign up for it. After that first year, you could drop the program at any time.
- **Reminder –** A $100 electric bill means you've used about 650 kWh of electricity for the month.

Business Version

- **Overview –** This is a Michigan-based solar energy generation program available to DTE Energy electric customers on a voluntary basis. Customers in the program could choose to purchase up to 100% of their average monthly electricity usage in the form of "solar energy blocks" of 100 kWh each—or 10 blocks, whichever is smaller. For every block purchased, DTE Energy would generate 100 kWh of solar energy within the general power grid.
- **Generation Resource –** Energy produced under this program would come from solar panel generation installations built within DTE Energy's Michigan service territory.
- **Associated Costs –** Businesses who join this program would be charged an additional $34 for each 100 kWh block they choose to purchase every month. This would be an extra flat rate fee on your current bill. For example, if you committed to purchasing 200 kWh of your electricity every month via this program, DTE Energy would bill you an extra $68 on your electric bill in addition to your normal usage cost ($34 x 2 blocks = $68).
- **Lock-in Commitment Requirements –** This program would require a 1-year commitment when you sign up for it. After that first year, you could drop the program at any time.
- **Category –** This is considered a REC offering.

DTE Energy

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Quantitative Idea S2: Community Solar Energy 20-Year Panel Lease

MPSC Case No. U-18352
Attachment: MECDE-1.2 2014
Respondent: T. L. Schroeder
Page: 43 of 59

Residential Version

- **Overview –** This would be a Michigan-based solar energy generation program available to DTE Energy electric customers on a voluntary basis. Customers in the program could choose to lease a solar panel located within a larger DTE Energy solar generation installation. DTE would retain ownership of the panels but lease to customer for a one-time fee.
- **Generation Resource –** Energy produced under this program would come from solar panel generation installations built within the customer's county.
- **Associated Costs –** Customers who join this program would be charged a one-time $475 fee. This fee would provide them a "lease" on a single solar panel within the larger installation. Customers would be credited on their bill every month for the energy generated by that panel over the course of its 20-year functional life span. DTE Energy estimates that the monthly credit customers would receive over the course of the lease would average about $2 (so about $480 total over the life span of the solar panel).
- **Lock-in Commitment Requirements –** This is a single lease payment with no withdrawal/prorated withdrawal option. Customers retain lease ownership as long as they live within the DTE Energy service area (even if they move locations).
- **Reminder –** A $100 electric bill means you've used about 650 kWh of electricity for the month.

Business Version

- **Overview –** This is a Michigan-based solar energy generation program available to DTE Energy electric business customers on a voluntary basis. Customers in the program could choose to lease a solar panel located within a larger DTE Energy solar generation installation. DTE would retain ownership of the panels but lease to customer for a one-time fee.
- **Generation Resource –** Energy produced under this program would come from solar panel generation installations built within the customer's county.
- **Associated Costs –** Businesses who join this program would be charged a one-time $475 fee. This fee would provide them a "lease" on a single solar panel within the larger installation. Customers would be credited on their bill every month for the energy generated by that panel over the course of its 20-year functional life span. DTE Energy estimates that the monthly credit customers would receive over the course of the lease would average about $2 (so about $480 total over the life span of the solar panel).
- **Lock-in Commitment Requirements –** This is a single lease payment with no withdrawal/prorated withdrawal option. Businesses would retain lease ownership as long as they remained within the DTE Energy service area (even if they move locations).
- **Category –** This is NOT considered a REC offering.

DTE Energy

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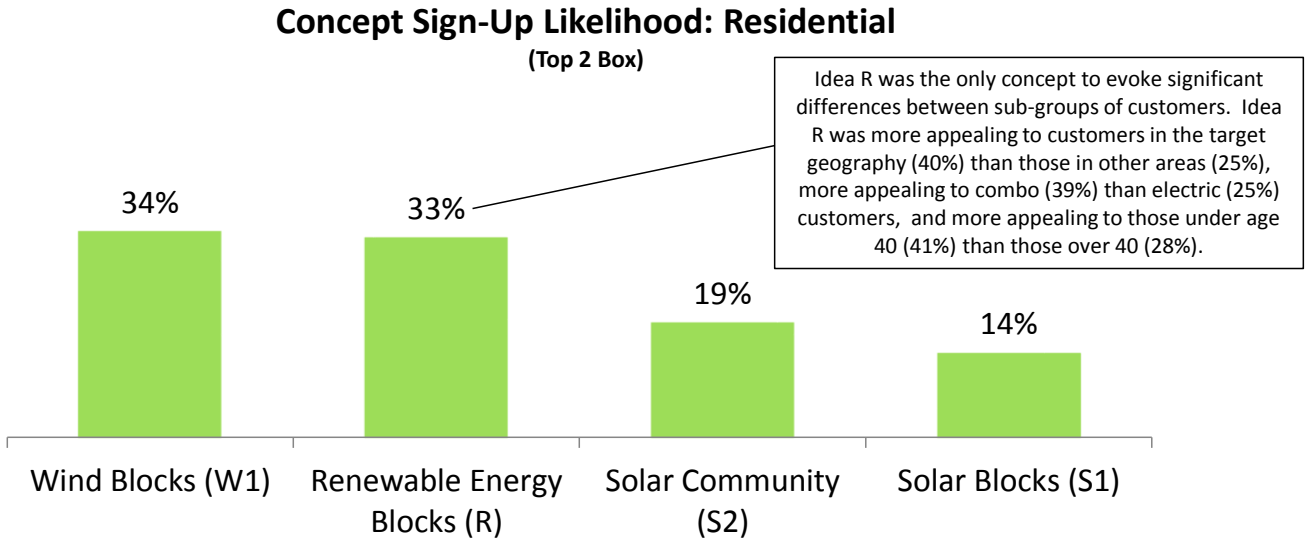
MPSC Case No: U-18352
Attachment: MECDE-1.2 2014
Respondent: T. L. Schneeder
Page: 44 of 59

Among residential customers, the wind and renewable energy block concepts were the most appealing, although only about a third of all respondents voiced interest. Interest in both of the solar concepts trailed significantly.



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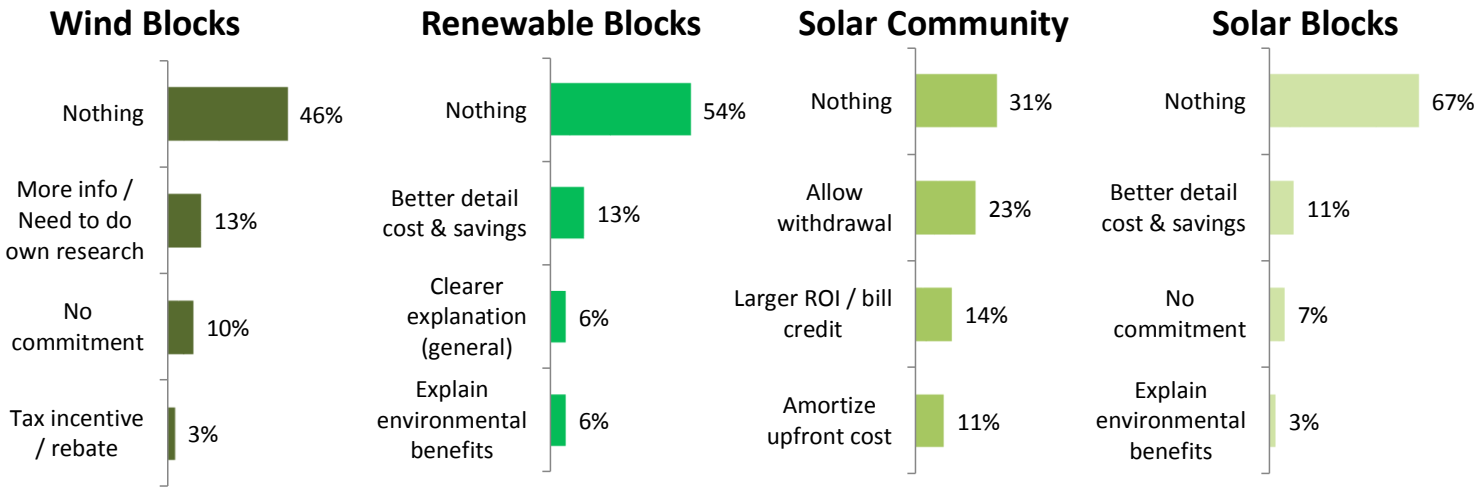
MPSC Case No. U-18352
Attachment: MECDE-1.2 2014
Respondent: T. J. Schneider
Page: 45 of 59

Cost was the primary deterrent among most of those who stated they would not buy into the various concepts. Beyond cost, some conversions may be possible with shorter commitments and better explanations of financial and environmental benefits.

Besides Cost, What Changes Would Increase Your Purchase Likelihood?

(Among those unlikely to purchase)



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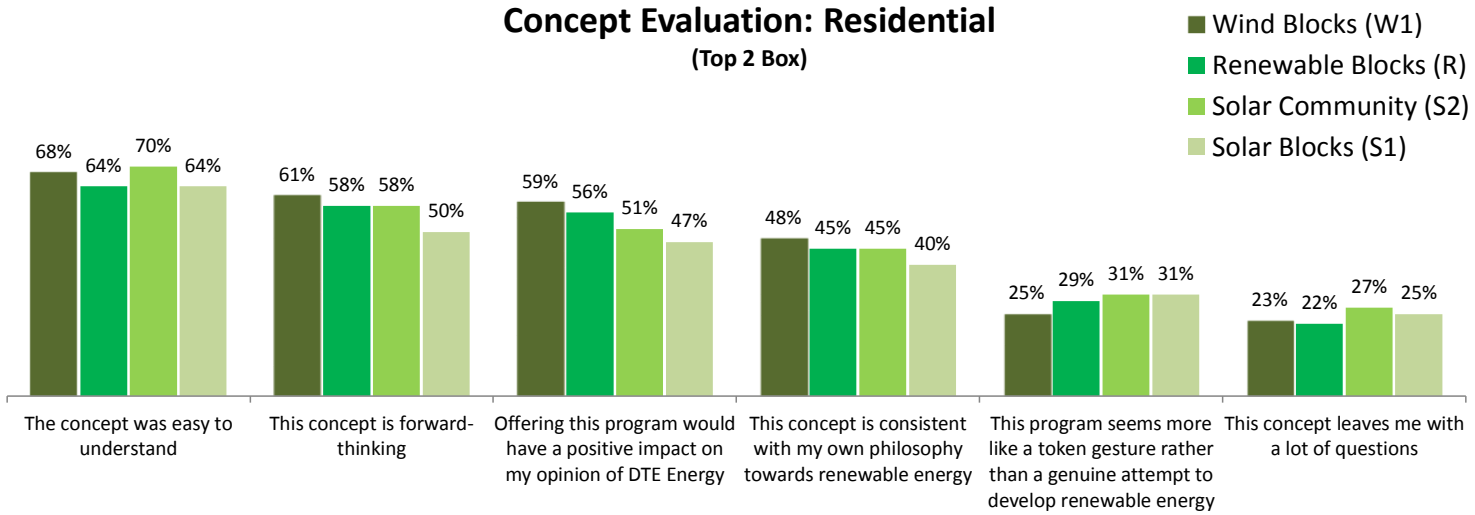
MPSC Case No. U-18352
Attachment: MECDE-1.2 2014
Respondent: T. Schneider
Page: 46 of 59

After the fine-tuning from the qualitative phase, all four of the concepts received comparable reviews for clarity. Although most customers recognized these concepts as something more than a token environmental effort, overall reactions to the concepts were viewed in relatively lukewarm terms.



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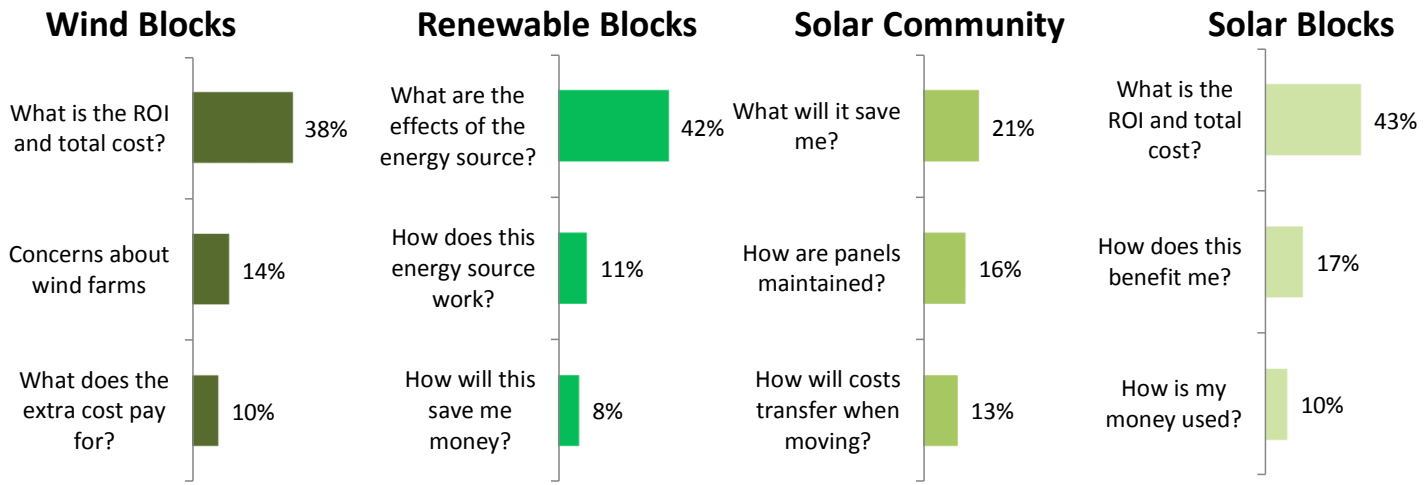
MPSC Case No: U-18352
Attachment: MECDE-1.2 2014
Respondent: T. L. Schroeder
Page 47 of 59

About a quarter of residential customers were left with questions after reading each of the concept overviews. Among this group, the most common questions appear to come from a tacit misunderstanding of the goals of the concepts – customers felt that they should save money from using renewable energy, rather than the reality of paying a bit extra to help the environment.

Remaining Questions about the Concepts

(Among those who stated concepts left them with questions)



DTE Energy

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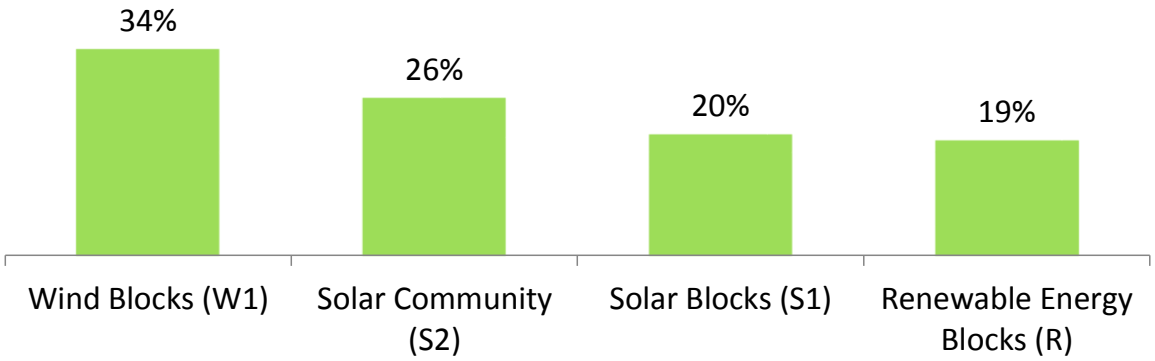
MPSC Case No. U-18352
Attachment MECDE-1.2(2014
Respondent: T. L. Schroeder
Page: 48 of 59

When faced with the option of only a single offering, a clear favorite failed to emerge, though the wind blocks concept remained the most popular among residential customers.

If DTE Energy Could Only Offer One of These Concepts, I Would Want…

(Among those who voiced interest in at least one concept)



n=250

DTE Energy

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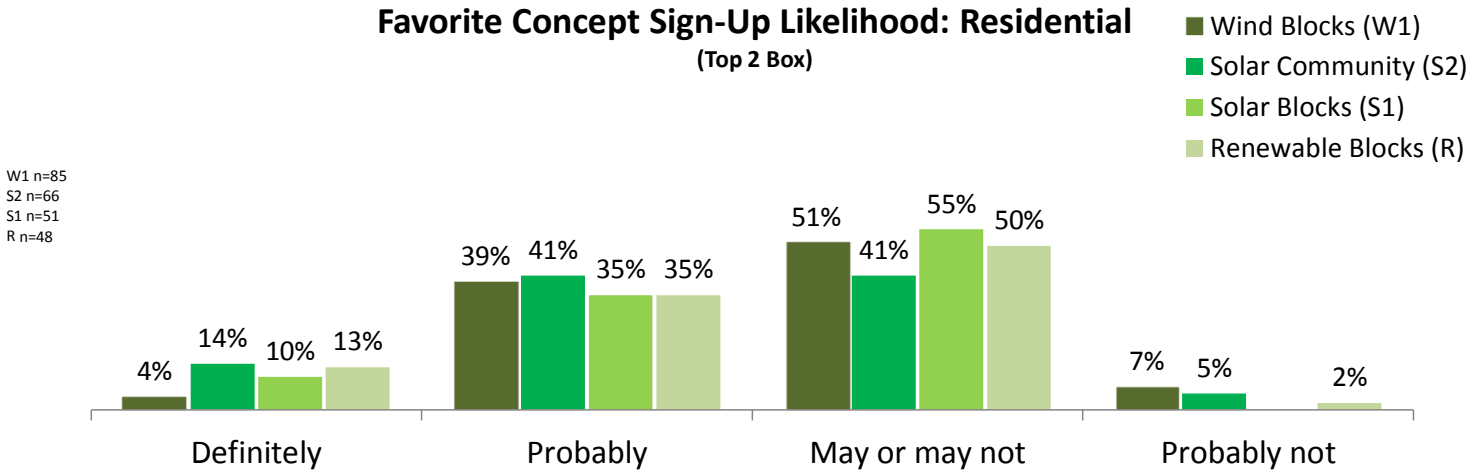
MPSC Case No: U-18352
Attachment: MECDE-1.2 2014
Respondent: T. C. Schroeder
Page: 49 of 59

After choosing their favorite concept, respondents were asked what the likelihood is that they would buy into that favorite concept if it were the only option available. Only a fraction stated that they would definitely sign up for their favorite concept; most remained on the fence regarding even the most personally appealing concept offered.



DTE Energy

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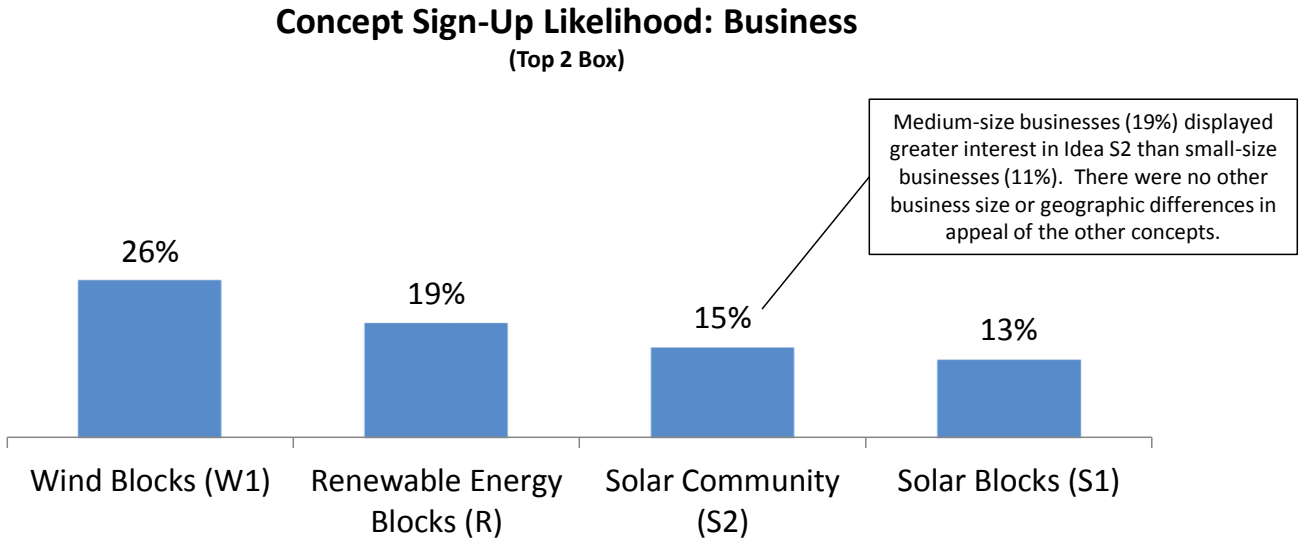
MPSC Case No: U-18352
Attachment: MECDE-1.2 2014
Respondent: T. J. Schneider
Page: 50 of 59

Across the board, business customers were less interested in investing in renewable energy through DTE Energy programs. As on the residential side, the wind block concept was the most popular, while the solar concepts drew little interest.



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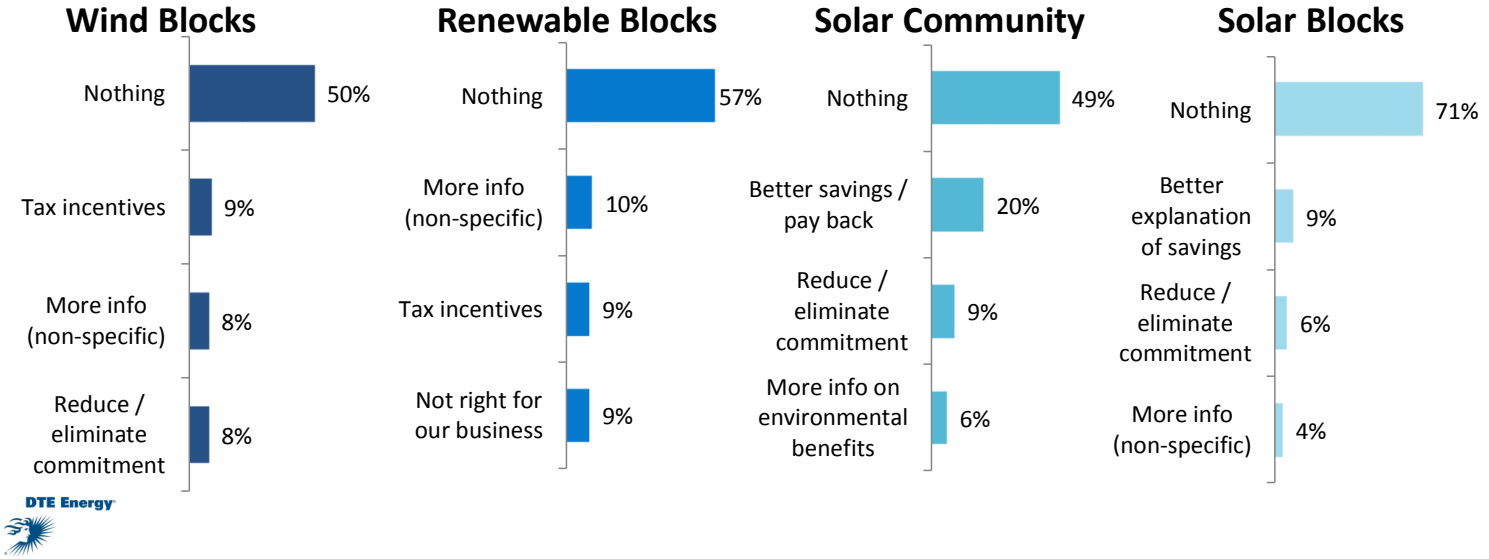
MPSC Case No. U-18352
Attachment: MECDE-1.2 2014
Respondent: T. Schroeder
Page: 51 of 59

As with residential customers, cost is the primary deterrent for business customers as well. A reduced commitment period may sway a handful of customers into purchasing a given program, but most are fixated on the associated costs more than anything else.

Besides Cost, What Changes Would Increase Your Purchase Likelihood?

(Among those unlikely to purchase)



DTE Energy

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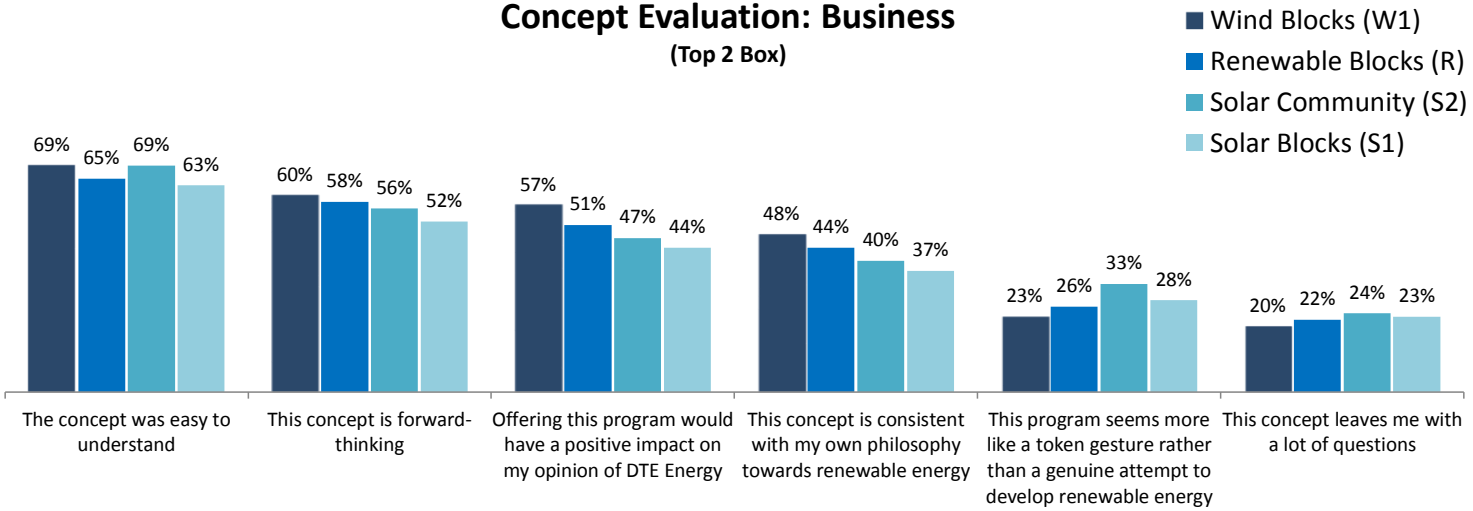
MPSC Case No. U-18352
Attachment MECDE-1.2 2014
Respondent: T. L. Schroeder
Page 1 of 60

Business customers were slightly less likely than their residential counterparts to view the concepts as mere token gestures, but otherwise evaluated all four ideas in much the same pattern.



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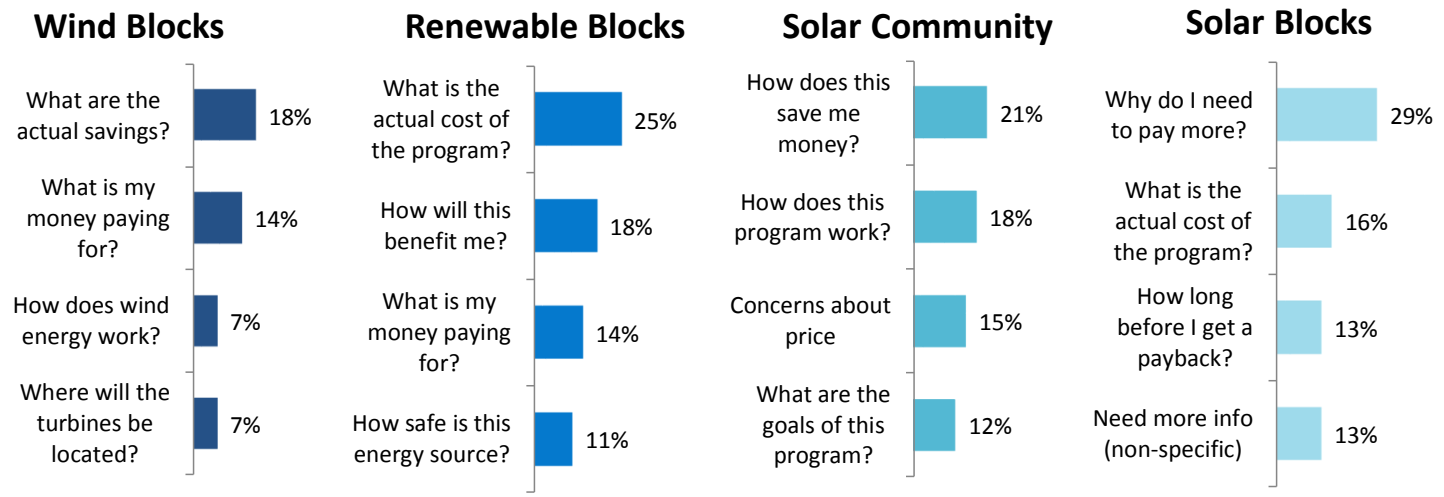
Cost remains the recurring theme for business owners, with the majority of lingering questions centering around the additional costs required by each concept.

Remaining Questions about the Concepts

(Among those who stated concepts left them with questions)



DTE Energy

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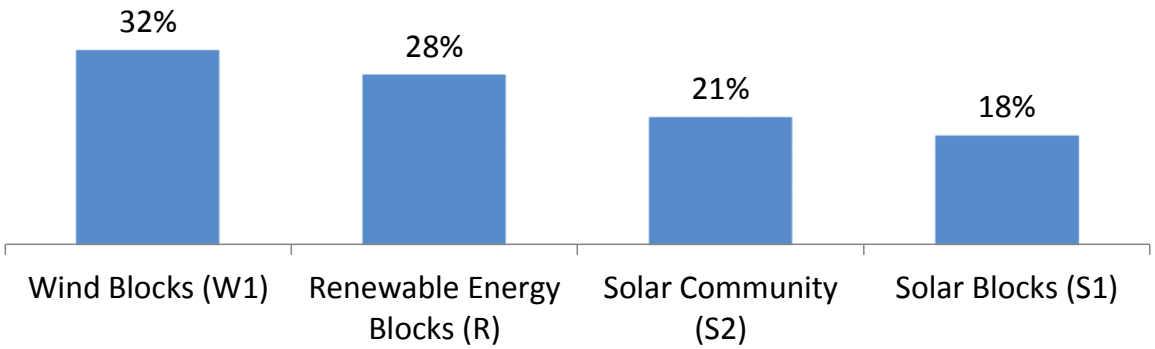
MPSC Case No. U-18352
Attachment: MECDE-1.2 2014
Respondent: T. L. Schroeder
Page: 54 of 59

When given the option of only a single concept to choose, the wind blocks concept was most popular among business customers. The renewable energy blocks concept was a close second, displaying more appeal to business customers than to residential customers.

If DTE Energy Could Only Offer One of These Concepts, I Would Want…

(Among those who voiced interest in at least one concept)



n=239

DTE Energy

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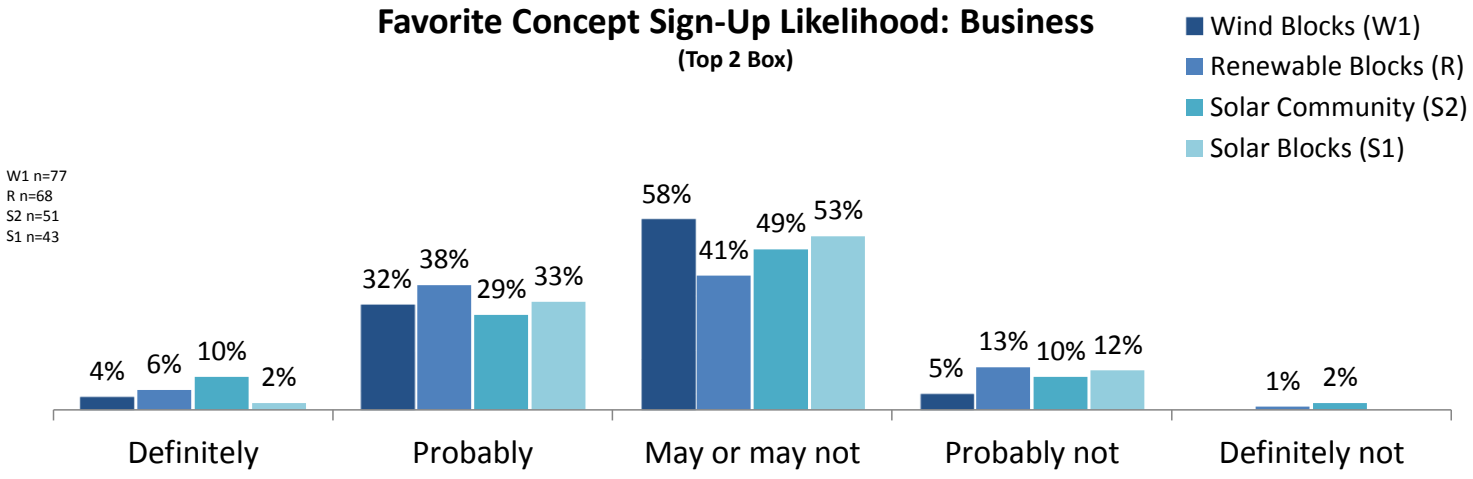
MPSC Case No. U-18352
Attachment: MEGDE-1.2 2014
Respondent: T. L. Schroeder
Page: 55 of 59

After choosing their favorite concept, business respondents were asked what the likelihood is that they would buy into that favorite concept if it were the only option available. As was seen on the residential side, most business customers remain on the fence about paying into a renewable energy program. Notably, although only the third most popular concept, the solar community concept was the most likely to receive a 'definitely' join selection from those who preferred it over the other concept offerings.



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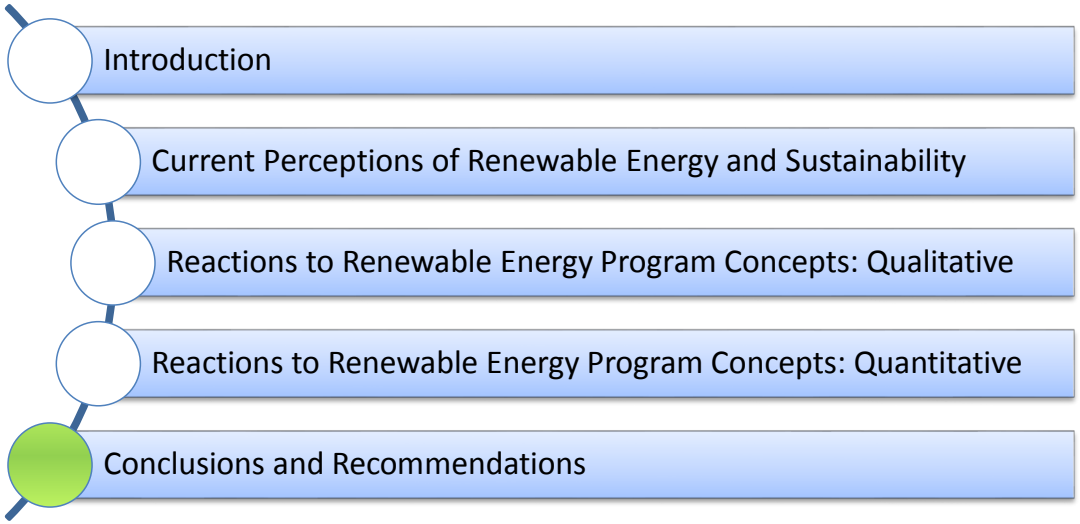
MPSC Case No. U-18352
Attachment: MECDE-1.2 2014
Respondent: T. L. Schroeder
Page: 56 of 59

Presentation Organization



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Qualitative

- In spite of Green Currents, any new renewable energy programs would enter the market as something new, relatively confusing, and potentially uninteresting to most residential and business customers.
  - Customer awareness and engagement with renewable energy remains surprisingly low—they had virtually no recognition of legislative pressure and increasing generation capacity in Michigan, and no excitement or demand for greener energy sources unless these sources result in lower electric bills.
  - As a result, new renewable energy programs offered by DTE Energy have to be simple to understand, require minimal commitment, and result in no more than a small and predictable impact on customers' bills in order to achieve any serious consideration.
  - Customers will be more engaged in a program that provides validation of positive environmental impact AND confirmation on an annual basis that DTE Energy fulfilled its promise associated with the program.

- Any program targeting business customers needs to provide some kind of visible ROI such as an annual participant decal so that the owner at least has the opportunity to convert participation into positive customer goodwill. We recommend adding a decal element to all of the business concepts to provide a visual ROI for the potential subscribers

DTE Energy

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Quantitative

- The wind blocks (W1) concept was the most popular among both residential and business customers, but there was no clear winning concept for either type of customer. As such, implementation of these concepts will likely result in only minimal engagement from most customers.
  - About a third of both residential and business respondents claimed wind blocks as the best option offered, but at best, only one in ten would definitely sign up for the program if it were offered by DTE Energy.
  - Evaluations of the concepts were lukewarm. Although relatively easy to understand, the concepts left a quarter of respondents with additional questions. Further, less than half of all respondents felt that the concepts lined up with their personal views of renewable energy and energy conservation.
  - The majority of respondents were ambivalent at best about joining such a program, with cost being the primary deterrent for joining. Given the misperceptions about the expense of renewable energy seen in the qualitative phase, programs that add additional cost may be prohibitive for most customers who are expecting to save money with renewable energy.

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Quantitative

- Supporting the qualitative results, both awareness of DTE Energy's renewable energy efforts and overall knowledge about renewable energy were low among both residential and business customers. Despite this lack of awareness and knowledge, the vast majority of customers support renewable energy development, even at the local (city) level.
  - The development of wind farms in Huron County, however, suggests that the physical installation of local renewable energy sources (at least those that are highly visible) has a negative impact on support for local renewable energy development. If the Huron County results generalize to the rest of Michigan, then support numbers will likely drop as more renewable energy sites are developed across the state.
  - Combined with the misperceptions about renewable energy costs, these results indicate that the public may not be adequately prepared for renewable energy programs that entail additional cost. Until the majority of customers understand that renewable energy development will cost more (at least in the short term), most will be unlikely to pay into any programs that do no provide them with any meaningful financial benefit.

DTE Energy

MPSC Case No.: U-18352
Respondent: T. L. Schroeder
Requestor: MEC-1
Question No.: MECDE-1.2
Page: 1 of 1

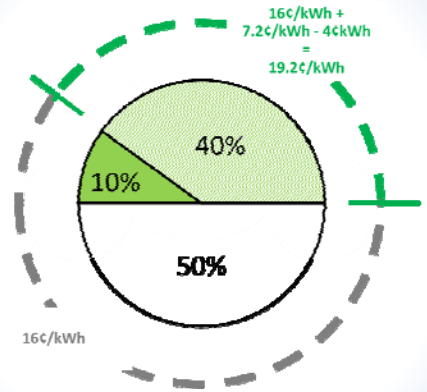
Question: Produce any and all documents reporting results of or otherwise memorializing activities described in the previous response.

Answer: See attachments MECDE 1.2 2014 and MECDE 1.2 2016.

DTE Energy

Renewables Program Focus Groups

Report (9.8.2016)



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Introduction

Background and Objectives

- Since 2007, DTE Energy has offered the GreenCurrents program to its 2.1 million electric customers.
  - GreenCurrents provided the option of "greening up" customers' power with renewable energy created from wind, biomass, and other environmentally friendly sources.
  - Since the program's inception, more than 22,000 customers have signed up for GreenCurrents.
  - DTE Energy will soon eliminate the GreenCurrents program and provide customers another program option in its place.
- The objectives of this research were to:
  - Understand customers' familiarity with renewable energy and willingness to participate in the program.
  - Assess the clarity of the program description and refine where necessary.
  - Prioritize the most motivational aspects and best names for the program.
  - Identify the most appropriate targets for the program.
  - Use the findings to create an efficient survey for quantitative validation.
- The objectives were met via a two-phased approach - a Phase II quantitative survey that helped validate the findings from the Phase I focus groups.

Qualitative – Methodology and Sample

- This Phase I study consisted of six, two-hour focus groups among 48 DTE Energy customers, with four groups in Troy on July 26-27th (servicing Detroit and northern suburbs) and two groups in Ann Arbor on August 3rd (servicing Ann Arbor).
  - The groups included electric-only and combo residential customers, small business customers, and GreenCurrents customers.
- Respondents were recruited to meet the following specifications:
  - Could not work for a utility, market research, or property management company
  - Must be primary or shared decision maker regarding utility costs and usage
  - Must be Electric Only or Combo Customers
  - Mix of business sizes and types
    - No more than one church per group
  - Mix of satisfaction levels with DTE Energy/no completely unsatisfied customers
  - Most must be in DTE "Affluent Green" or "Green" segments – note that additional "green" / philanthropic behavior qualified respondents in the Ann Arbor groups.

Quantitative – Methodology and Sample

- A total of 571 DTE Energy customers completed Phase II - a 10-minute, online survey, fielded August 22-31st.

97 Business customers

- Recruited from metro-Detroit areas, not including businesses within Detroit.
- Included any business that was defined by a segment (did not include undefined segment businesses that were undefined in DTE Energy's segmentation).
- No utility, market research, or landlords
- No more than 10 church respondents; each church must have congregation over 100
- Must be primary or shared decision maker regarding utility costs and usage for the company
- No Completely Unsatisfied Customers

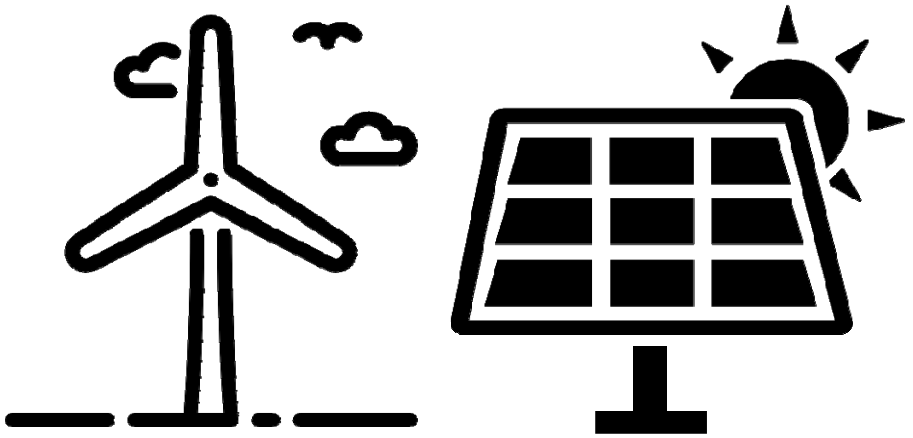
318 Residential customers

- Included both electric-only (n=143) and combo (n=175) customers.
- Must be in DTE "Affluent Green" or "Green" segments.
- Skewed toward higher income HHs.
- No one can be in the following industries: utility, market research, or landlord
- Must be primary or shared decision maker regarding utility costs and usage in the household
- No Completely Unsatisfied Customers
- No one under age 18

156 GreenCurrents customers

- Must have self-identified as GreenCurrents customers.

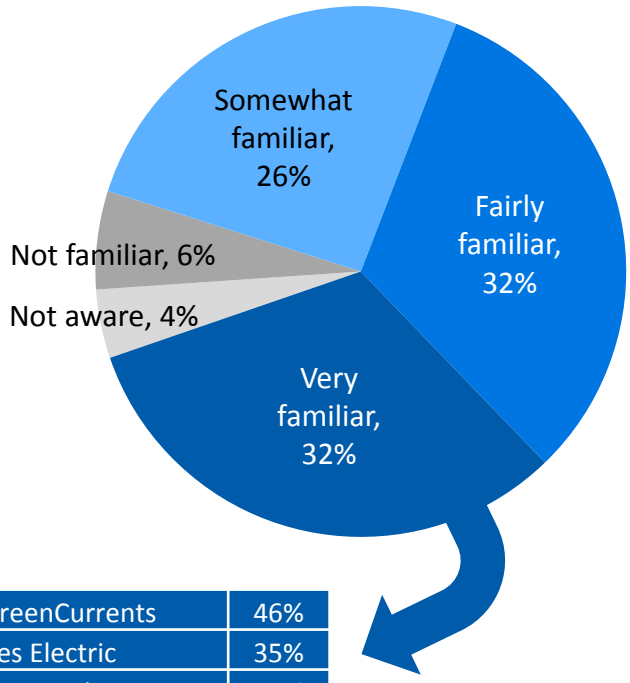
Renewable Energy Familiarity/ Opinion



Respondents have a solid familiarity of renewable energy.

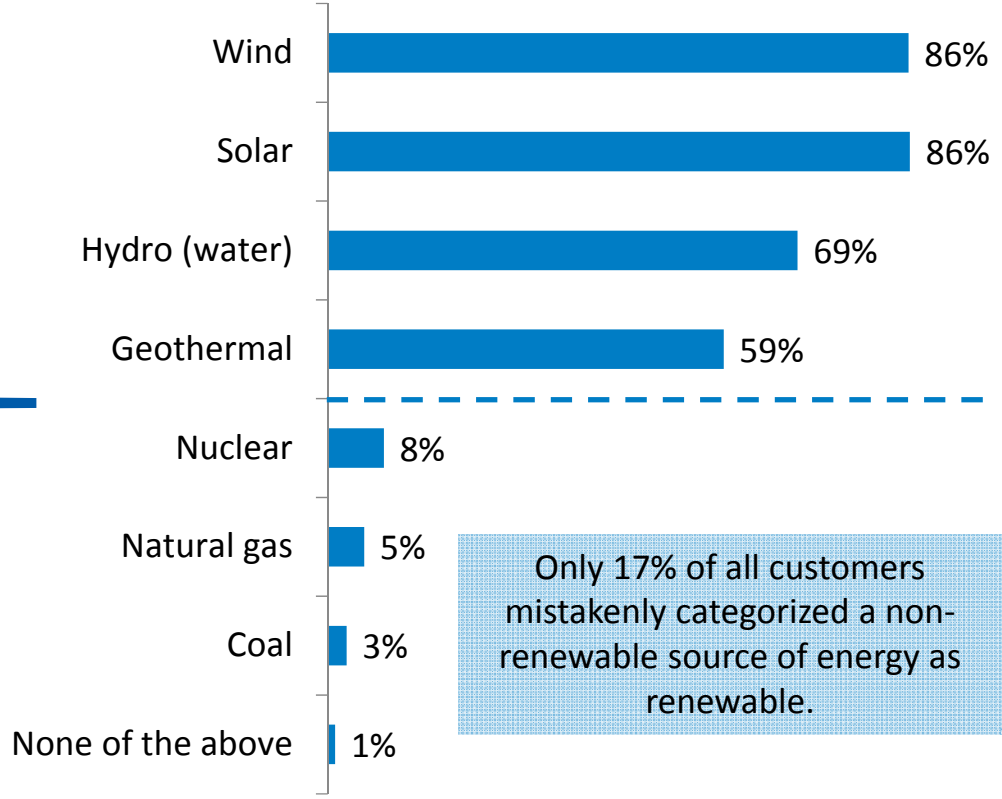
- Awareness of “renewable energy” among DTE Energy’s “green” segments is high, as the vast majority of customers are at least somewhat familiar with the term.
  - Approximately one third of all customers state that they are very familiar with renewable energy.
  - GreenCurrents customers are the most familiar with renewable energy, followed by both residential combo and electric-only customers, and then business customers.
- Wind and solar energy were more often cited as renewable energy sources than any other source.
  - This is good news for the DTE Energy Renewables Program, which obviously features a wind farm and solar array.
  - Fewer than one in five customers mistakenly categorized a non-renewable source of energy as renewable, strengthening the thought that DTE Energy’s “green” segments have a solid understanding of renewables.

Awareness of "Renewables"



GreenCurrents	46%
Res Electric	35%
Res Combo	32%
Business	27%

Types of Renewables



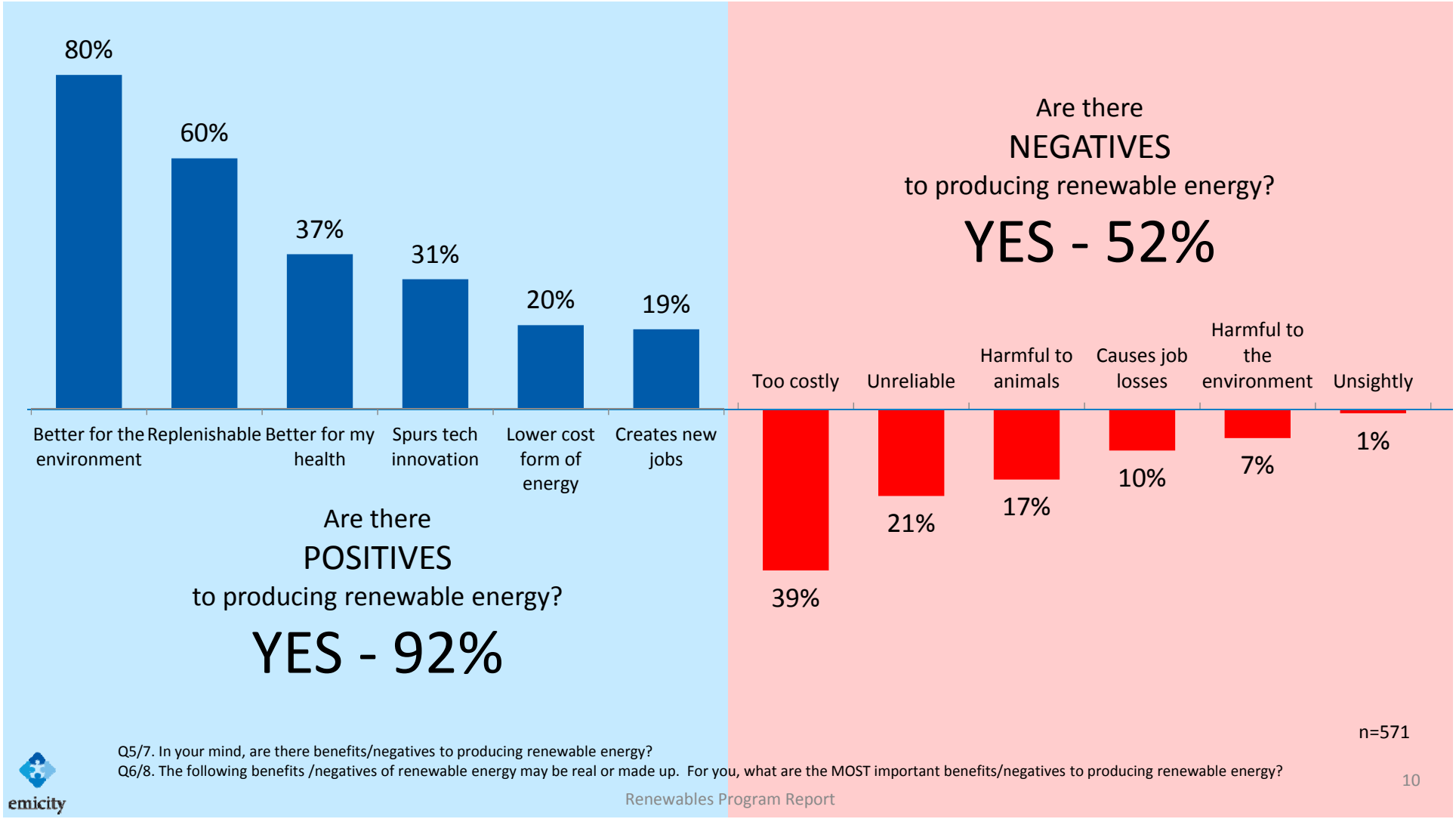
Only 17% of all customers mistakenly categorized a non-renewable source of energy as renewable.

Q1. Have you ever heard of the term "renewable energy"?
Q2. How familiar are you with the term "renewable energy"?
Q3. To the best of your ability, which of the following do you believe are sources of renewable energy? (Select all that apply)

n=571

Nearly every customer felt that there are positives to producing renewable energy, outweighing the negatives.

- Significantly more customers mentioned the positive benefits of producing renewable energy, including:
  - Environment - the most often mentioned benefit, renewable energy would be significantly better for the environment and climate.
  - Perpetual - respondents liked that renewable energy was forever replenishable.
  - Health - renewable energy does not adversely impact human health like fossil fuel energy.
  - Tech innovation – the production of renewable energy requires high-tech know how, which also might spur further advancement in producing higher efficiency renewable sources.
  - Lower cost - some felt that while the upfront cost of producing renewable energy would be expensive, in the long run, the cost would be less as technological efficiencies take hold.
  - Job creation - creating renewable energy facilitates new job growth.
- Among the negative mentions of producing renewable energy:
  - Higher cost - there is a perceived higher cost to building and maintaining renewable energy production facilities.
  - Not dependable - a couple of respondents worried that interruptions in wind or cloudy days could interrupt their electric service.



Q5/7. In your mind, are there benefits/negatives to producing renewable energy?
Q6/8. The following benefits /negatives of renewable energy may be real or made up. For you, what are the MOST important benefits/negatives to producing renewable energy?

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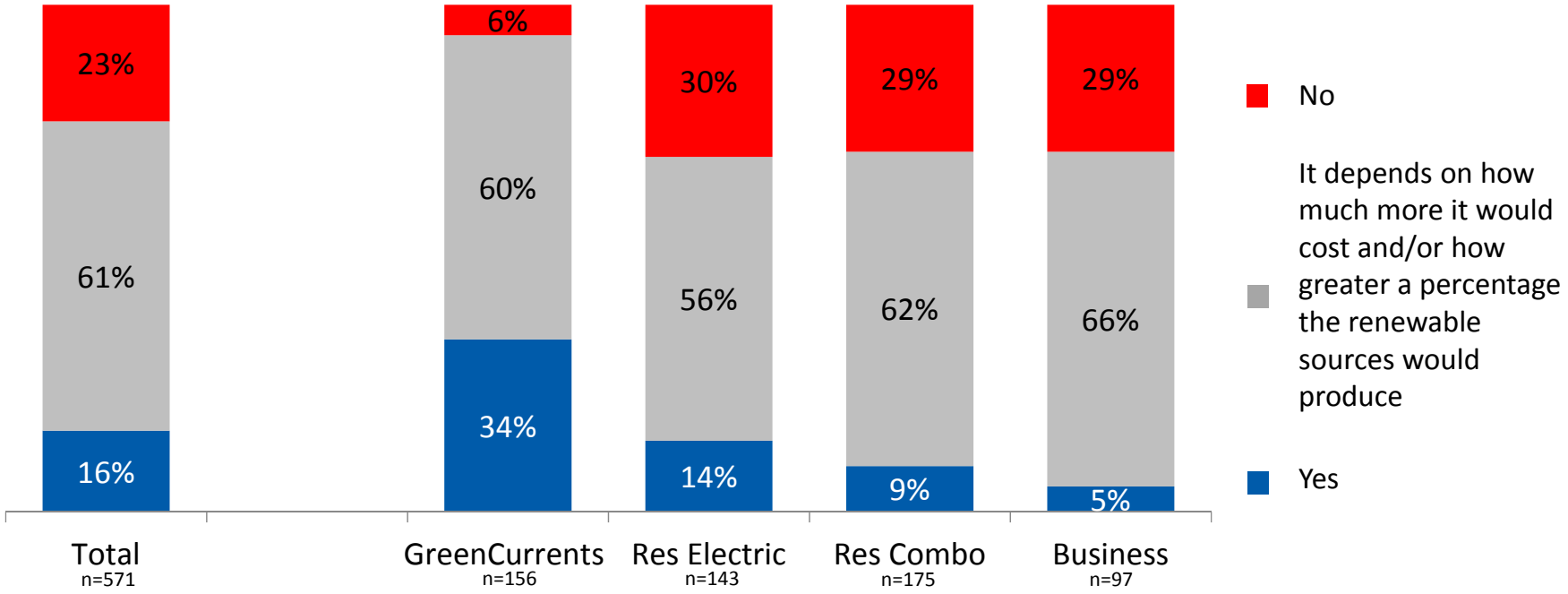
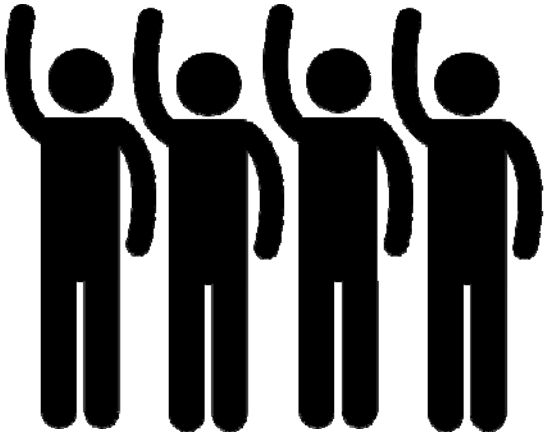
While few customers are outwardly willing to spend more for renewable energy, the majority would consider paying more depending on the cost and the amount of renewable energy they would pay for.

Willing to Spend More for Renewable Energy?



Q4. Be honest, are you the type of person that would be willing to pay more on your electric bill to help generate a greater percentage of electricity from renewable sources?

Interest in the Program



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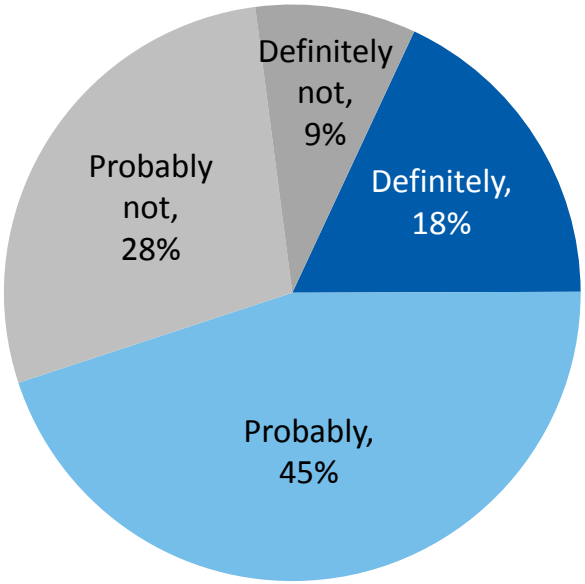
Based on consideration and estimates in sign-up rates, DTE Energy can expect between 1-2% of its target market will join the program.

- Based on the description they read in the survey, nearly one in five respondents would definitely consider the program, with nearly another five in ten probably considering the program. This demonstrates that the sample used in the survey effectively targeted the right customers and that DTE Energy should use that as a baseline for marketing the right people to the program.
- Applying a conservative estimate that 5% of those definitely considering and 1% of those probably considering would actually sign up, it is estimated that roughly 1-2 out of every 100 targeted DTE Energy customers will sign up for the program.
  - It is important to note, however, that this sample is weighted toward GreenCurrents customers, "green" segments, those with a higher income, and those more satisfied with DTE Energy. Based on results from Phase I, the sample also did NOT include businesses located in Detroit.
- Other demographic/behavioral data suggests that some populations are more propensed to consider the program.
  - Residential – younger, female, Caucasian, higher income, college graduate, electric-only customers and those who have a tendency to recycle, use only energy efficient light bulbs and green cleaners are more likely to consider the program.
  - Business – smaller businesses and those businesses that tend to belong to a recycling and/or donate to charities are more likely to consider the program.

Just under two thirds of DTE Energy's target market will consider this program, which may translate to 1-2% of that market signing up to join.

Consider This Program?



If we assume that 5% who "definitely" consider and 1% who "probably" consider the program actually sign up, then DTE Energy can **expect between 1-2% of its target market will join the program.**

Q9. Based on what you read, how likely would you be to consider signing up for this program once it's available to you?

n=571

There are notable differences in consideration based on different customer characteristics.

Residential

Differences in consideration	Index
GreenCurrents (vs other customers)	148
Caucasian (vs AA)	134
Only install energy saving bulbs (vs not)	131
Female (vs male)	128
HHI $50k+ (vs <$50k)	125
Recycle old batteries (vs not)	125
Own hybrid vehicle (vs not)	120
Very satisfied w/ DTE (vs less satisfied)	119
Under 56 years old (vs older)	118
Graduated college (vs not)	118
Recycle bottles/paper (vs not)	114
Use only green cleaners (vs not)	114
Res Electric only (vs combo)	113

Business

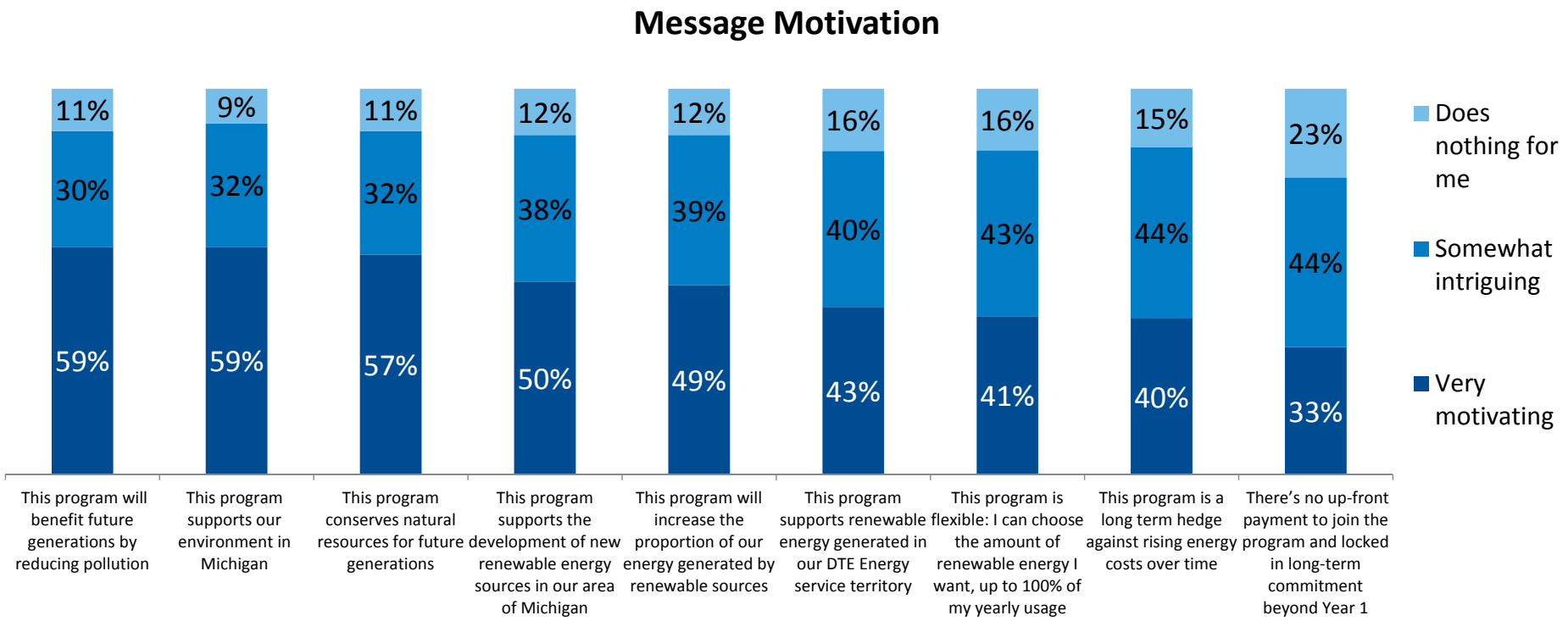
Differences in consideration	Index
Participate in recycling programs (vs not)	130
Very satisfied w/ DTE (vs less satisfied)	128
Donate to charities (vs not)	118
Under 6 employees (vs 6+ employees)	113
No differences in consideration	Index
Rent (vs own)	102
Under $1M revenue (vs $1M+)	101

Messaging

This research revealed that those customers most interested in signing up did so based solely on the altruistic benefits of the program.

- Focus group respondents who were more likely to consider the program did so primarily for beneficent reasons.
  - Very few customers were motivated through perceived financial benefits, as the vast majority of respondents felt that the program would require them to pay more on their energy bill versus someone not on the program.
  - Those more likely to consider the program mostly did so altruistically, primarily for two reasons:
    - The program would be beneficial to future generations by reducing climate change and pollution.
    - It would position Michigan as an energy innovator, potentially moving more jobs to the state.
- These motivators were validated in the quantitative phase, as the top three most motivating "reasons to believe" included reducing pollution and conserving natural resources for future generations, as well as communicating the "local" component to the program.
    - "I have a grandchild and think about what's coming for him."
    - "I'm more concerned about our area – where we live. If we're paying extra, I think it should benefit the state we live in."
    - "I think we should live selflessly."

The top three most motivating benefits to consider signing up for the program included helping future generations and supporting the environment in Michigan.



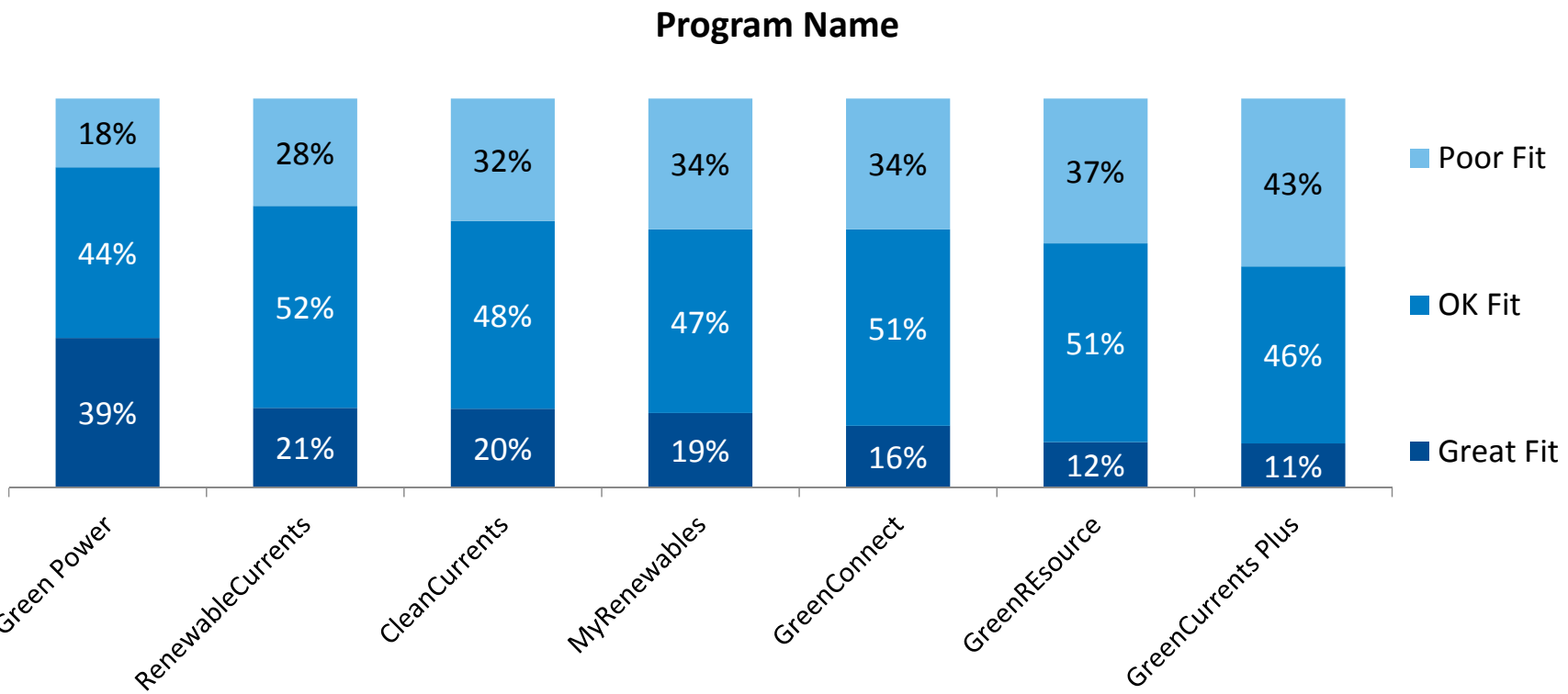
Q16. How motivating are the following aspects of the program? For each aspect, you can select "very motivating," "somewhat intriguing," or "does nothing for me."

n=571

Customers felt that those names that were more direct and descriptive are the best fit for the program.

- Customers overwhelmingly favored the name "MI Green Power."
  - The majority of customers understood, and liked, that the "MI" described the state of Michigan, giving the name an important local component.
  - Most respondents felt that substituting the term "My" with "MI" would strengthen any other names with "My" in them.
  - "Green" and "Power" efficiently conveyed the environmental and energy aspects of the program.
    - *"I like 'power' as opposed to the others. It just sounds more true and tells what the program is about."*
    - *"It calls the state out."*
    - *"It's the only one that had Michigan."*
- Other names that respondents felt could be a good fit for the program included, "RenewableCurrents," MyRenewables," and "CleanCurrents."

Four in ten customers felt that "MI Green Power" was a great fit with the program.



n=571

Q17. Now, let's have you name this program based on how well you feel the following names fit with the program. For each name you can select "great fit," "OK fit," or "poor fit."

Those customers who felt motivated by certain aspects of the program felt that the description communicated the need for a better environment, without breaking the bank.

- The up front paragraphs that communicated the general state of renewables in Michigan, along with details about the sources of renewable energy coming from the program, were felt to be motivating by many customers who liked the environmental message.
  - *"There is no future in non-renewable sources - no future for the earth, no future for human health. We must begin now. I have 5 grandsons. I want the solution to energy to begin now."*
  - *"Energy is coming from Michigan and providing jobs/income to Michigan."*
  - *"It is good to understand how the electricity will be generated (solar array, wind field)."*
  - *"The extra cost is helping to fund the creation of more renewable sources of energy. Something must be done to reduce use of polluting sources of energy that contribute to the warming of our climate."*
- Additionally, the detailed-cost paragraphs that mentioned the credit made it appear that the program wasn't going to be as costly as some customers expected.
  - *"The cost seems to be an acceptable price for investing in the future of renewable energy for some customers the cost ."*
  - *"It described the net cost to me for participating. I think this is a positive step forward for Michigan and I would be something I will like to be part of."*

Q11. OK, we'd like to ask you what information in the program description, if any, was motivating to you to consider joining the program. Please scan the description again and click on the paragraphs and/or graph that included the most motivating information.

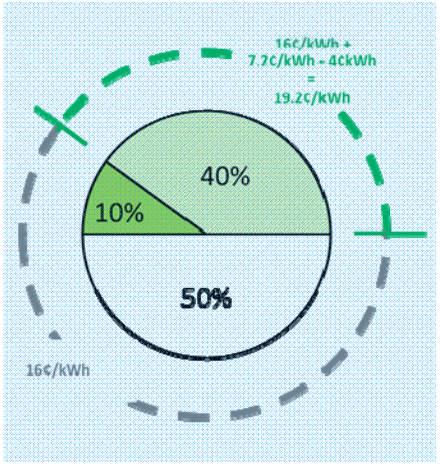
Currently, 10% of all DTE Energy electric generation comes from renewable sources. Therefore, DTE Energy customers can currently claim that 10% of their electric consumption is sourced from renewable energy. This new program will allow customers to purchase additional percentages of renewable energy, in 5% increments, up to 100% of their total energy usage.

Customers of this program are purchasing renewable power generation that will be sourced by a solar array in Lapeer, MI and a wind farm in Michigan's thumb area. Businesses and residential customers will pay the same rate per kilowatt-hour (kWh) for the additional renewable energy generation they subscribe to in this program.

There are no cost subsidies for this energy, meaning non-participating customers will not be paying more or less for their energy based on a customer's decision to participate in this program.

The cost structure follows:

- Customers will receive their bill. The bill will have their total kWh usage. They will pay their normal rate for this usage. The average kWh cost for residential customers is approximately 16¢ per kWh.
- On top of this normal rate, 7.2¢ per kWh will be charged for the amount of renewable energy selected by the customer who enrolled in the program. This 7.2¢ per KWH will remain the same each year. This cost pays to build the system.
- The customer will also get a credit on their bill for each kWh of renewable energy they selected. This credit is based on the fuel costs associated with the traditional fossil fuel energy they are now displacing with renewable energy. This credit will increase each year.
- The credit will be 4¢ per kWh the first year. The customer will see both the 7.2¢ per kWh upcharge and the 4¢ per kWh credit on their bill, as well as the net cost of 3.2¢ per kWh for the first year.
- Eventually the net cost may actually provide a discount to the customers on this program (when the credit exceeds 7.2¢ per kWh). The credit is projected to rise approximately 3% a year, which would take approximately 17 years to exceed the cost of the program.



Customers can participate in the program regardless of whether they rent or own, and can remain on the program even if they change residencies within DTE Energy's electric service territory.

Signup is limited to what can be generated by these 2 facilities. There is a 2 or 3 year enrollment window. Program participants may be charged $50 if they leave before the first year of participation is up.

Most motivating **Least motivating**

However, the program description as presented was confusing to a number of customers who couldn't understand how the pricing structure would impact them.

- The detailed pricing paragraphs elicited the most confusion as some customers had a difficult time grasping the cost structure of the program.
  - *"Too many numbers. I glazed over."*
  - *"Too much language. It appears to be very confusing, do not know what exactly the price would be."*
  - *"The formula isn't really clear and you have to read it a couple of times to understand the billing and credit part."*
- These customers felt that supplemental information, most notably what the program would actually cost *them*, would be helpful in clearing up the confusion.
  - *"I just need to know how my monthly bill will increase. I'm a visual learner, so the chart was clear and well understood."*
  - *"I would like to see a bottom line whether I would be saving or spending more by using renewable energy."*
  - *"It is better to provide a table of costs."*
  - *"Just provide the actual cost. It's not clear about actual cost versus credit."*

Q14. Now, please scan the description one more time and click on the paragraphs and/or graph that may have been confusing to you.

Currently, 10% of all DTE Energy electric generation comes from renewable sources. Therefore, DTE Energy customers can currently claim that 10% of their electric consumption is sourced from renewable energy. This new program will allow customers to purchase additional percentages of renewable energy, in 5% increments, up to 100% of their total energy usage.

Customers of this program are purchasing renewable power generation that will be sourced by a solar array in Lapeer, MI and a wind field in Michigan's thumb area. Businesses and residential customers will pay the same rate per kilowatt-hour (kWh) for the additional renewable energy generation they subscribe to in this program.

There are no cost subsidies for this energy, meaning non-participating customers will not be paying more or less for their energy based on a customer's decision to participate in this program.

The cost structure follows:

- Customers will receive their bill. The bill will have their total kWh usage. They will pay their normal rate for this usage. The average kWh cost for residential customers is approximately 16¢ per kWh.
- On top of this normal rate, 7.2¢ per kWh will be charged for the amount of renewable energy selected by the customer who enrolled in the program. This 7.2¢ per KWH will remain the same each year. This cost pays to build the system.
- The customer will also get a credit on their bill for each kWh of renewable energy they selected. This credit is based on the fuel costs associated with the traditional fossil fuel energy they are now displacing with renewable energy. This credit will increase each year.
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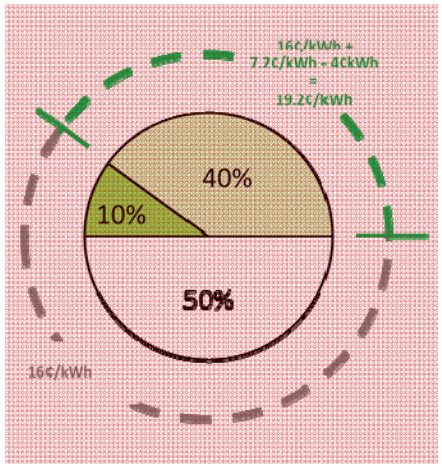


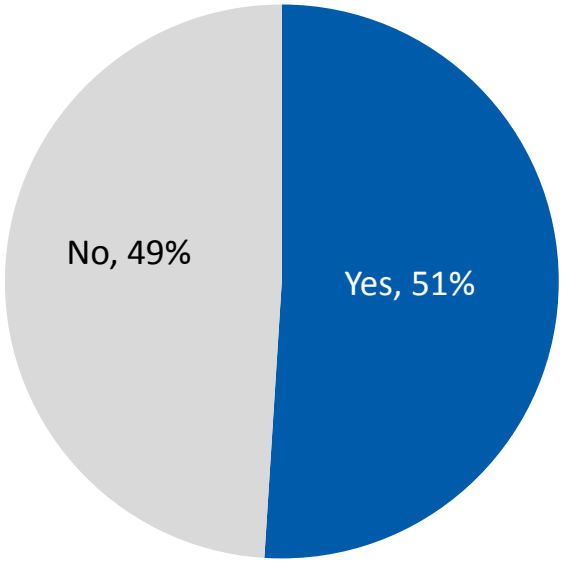
Customers can participate in the program regardless of whether they rent or own, and can remain on the program even if they change residencies within DTE Energy's electric service territory.

Signup is limited to what can be generated by these 2 facilities. There is a 2 or 3 year enrollment window. Program participants may be charged $50 if they leave before the first year of participation is up.

Most confusing **Least confusing**

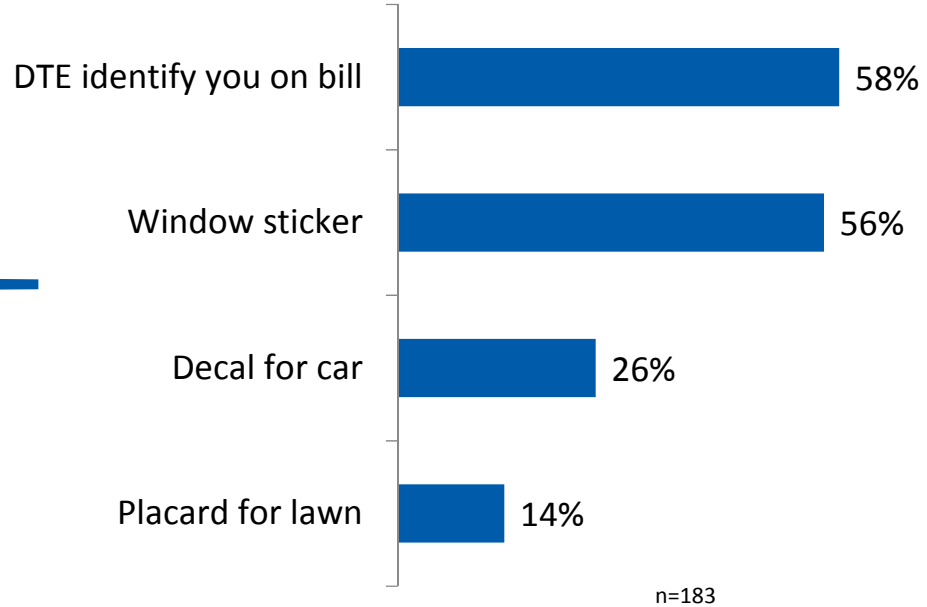
Roughly half of those customers who would at least probably consider the program would want to show that they were a member, most often on their bill or in the form of a window sticker.

Display Membership?
(among those def/prob consider)



n=360

What Form?
(among those def/prob consider)



n=183

Q18. Finally, if you signed up for the program, would you like DTE Energy to provide you with some sort of sticker, decal, or placard to show that you're a member of this program?
Q19. For you, what form would you most prefer to show that you're a member of the program? (Please select all that apply)

Conclusions and Recommendations

The high familiarity of renewable energy among DTE Energy's target market should help interest in the program.

- Residential customers designated "Green" and "Affluent Green," and business customers outside of Detroit have a solid understanding and comprehension of renewable energy.
  - These customers appear to be more familiar with wind and solar energy, effectively aligning the renewable sources of this program with customers' expectations.
  - As such, few would *never* decide to pay more for renewable energy.
  - Not surprisingly, GreenCurrents customers demonstrated the most familiarity with renewables, followed by residential electric-only and combo customers, and then small businesses.
- Additionally, significantly more customers feel that that the positives of producing renewable energy outweigh the negatives.
  - Customers felt that the most positive aspect of renewable energy is the environmental benefit, while the biggest detriment to producing renewable energy is the cost.
  - If a "renewable energy" program can effectively communicate the environmental benefits of the program, while at the same time presenting clear information to help mitigate the higher cost perception, it should succeed.

Beyond targeting the "Green" and "Affluent Green" residential customers, and business customers outside of Detroit, there are other groups that DTE Energy should target first to maximize its marketing dollar.

- If possible, consider targeting the following residential groups, each of which registered significantly higher consideration than their counterparts:
  - Younger
  - Female
  - Caucasian
  - Higher income
  - College graduate
  - Electric-only customers
  - Those residential customers who have a tendency to recycle and use only energy efficient light bulbs and green cleaners
- While small businesses had fewer differentiators for targeting, consider prioritizing the following, if possible:
  - Smaller businesses (under six employees)
  - Those businesses that tend to belong to a recycling and/or donate to charities

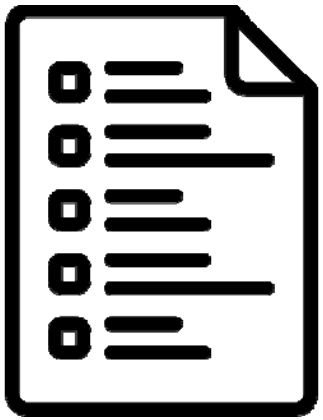
Consider a multi-tiered approach to communicating the program to initially market the most motivating program aspects before delving deeper into the confusing pricing minutiae.

- The most important information should focus on the main reasons customers will consider the program – the altruistic and regional aspects of the program.
  - This would include the benefits of providing a better environment for future generations, along with providing the opportunity to produce renewable energy here in Michigan.
  - This information will be the "hook" to get customers initially interested and should be included in initial communications via "short form" vehicles (i.e. mass media).
- Then provide more generic cost information about the program.
  - This can include statements about the program not being too costly, allowing sign-up at different increment levels, and the inclusion of a credit.
  - This information can be communicated in medium forms of communication, such as brochures or newspaper and might include a generic cost table (i.e. "For the average $100 bill, your additional cost will be "x amount" at 5%, 10%, 15% and so on).
- Finally, include the specific cost detail, but supplement that detail with easy-to-use tools/resources via the website and call center.
  - These tools can include the graph or a price calculator where customers can enter in their $ per kWh and desired renewable purchase %, providing an extremely accurate projection of their cost.
  - Train CSRs thoroughly on the program, providing them with a short spiel. Consider a smaller "Green Power" CSR squad that are even better trained and can answer difficult questions on the program.

Call the program “MI Green Power” and help members communicate their program enrollment.

- Name the program “MI Green Power” to reflect customers’ desire to locally attribute the program and initially understand the program in a clear, concise manner.
- Provide members the option of displaying their participation membership via a window sticker or identify their membership on their bill.
  - To encourage word of mouth and discussion of the program, DTE Energy could consider identifying members on its public maps, simply by placing a green leaf over a member’s address.

Appendix



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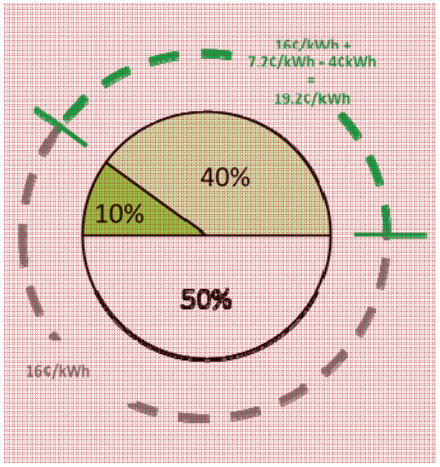
- Customers can participate in the program regardless of whether they rent or own, and can remain on the program even if they change residencies within DTE Energy's electric service territory.
- Signup is limited to what can be generated by these 2 facilities. There is a 2 or 3 year enrollment window. Program participants may be charged $50 if they leave before the first year of participation is up.



Net
Motivating &
Confusing

emicity

MPSC Case No.: U-18352
Respondent: Legal
Requestor: MEC
Question No.: MECDE-2.5
Page: 1 of 1

Question: Refer to Ms. Schroeder's testimony, page 14 lines 20-21: Describe in detail, and produce any documents depicting the results or conclusions of the in-depth consulting project on VGP programs.

Answer: DTE Electric objects to this request because it seeks commercially sensitive confidential business information, the disclosure of which would cause DTE Electric and its customers competitive harm. Documents responsive to this request may be provided to parties that enter a non-disclosure agreement pursuant to a protective order.

CONFIDENTIAL EXHIBIT

MEC-4C

MPSC Case No.: U-18352
Respondent: T. L. Schroeder
Requestor: MEC-1
Question No.: MECDE-1.4a
Page: 1 of 1

Question: Has the Company made any projections regarding the actual cost to customers for participation in the MIGreenPower program?

a. If yes, please provide copies of these projections and any resulting analysis, in electronic Excel spreadsheet format with formulas intact, if possible.

Answer: Yes, DTE made projections regarding the actual cost to customers for participation in the MIGreenPower program which are included in attachment MECDE-1.4a.

	Pinnebog	**Solar RFP**		0.50%	Degradation Factor																					
Capacity	22.8	50		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Capacity Factor	37%	19%		83,220	82,804	82,390	81,978	81,568	81,160	80,754	80,351	79,949	79,549	79,151	78,756	78,362	77,970	77,580	77,192	76,806	76,422	76,040	75,660	75,282	74,905	74,531	74,158	73,787
Capacity Credit	12.6%	52.6%																										
Generation	73,787	73,787	(final year)																									

Blended Product

Total MW	72.8
Capacity Factor	23.15%
Capacity Credit	40.09%
Total Program Generation (MWh)	147,575
Generation per MW (MWh)	2,028

		2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**
	Fuel & PP ($/kWh)	0.026	0.027	0.028	0.029	0.030	0.031	0.032	0.033	0.034	0.035	0.036	0.037	0.038	0.039	0.041	0.042	0.043	0.045	0.046	0.048	0.049	0.051	0.052	0.054	0.056	0.058
% of CONE	**CONE ($/MW-year)**	94.8	94.9	97.3	99.7	102.2	104.8	107.4	110.1	112.8	115.6	118.5	121.5	124.5	127.6	130.8	134.1	137.4	140.9	144.4	148.0	151.7	155.5	159.4	163.4	167.5	171.6
75%	% of CONE	71.1	71.2	73.0	74.8	76.6	78.6	80.5	82.5	84.6	86.7	88.9	91.1	93.4	95.7	98.1	100.6	103.1	105.7	108.3	111.0	113.8	116.6	119.5	122.5	125.6	128.7
	% of CONE x Cap Credit	28.5	28.5	29.2	30.0	30.7	31.5	32.3	33.1	33.9	34.8	35.6	36.5	37.4	38.4	39.3	40.3	41.3	42.4	43.4	44.5	45.6	46.8	47.9	49.1	50.3	51.6
CONE Escalator	kwH / kW/ year	2,028	2,028	2,028	2,028	2,028	2,028	2,028	2,028	2,028	2,028	2,028	2,028	2,028	2,028	2,028	2,028	2,028	2,028	2,028	2,028	2,028	2,028	2,028	2,028	2,028	2,028
2.50%	Capacity Credit / kWh	0.014	0.014	0.014	0.015	0.015	0.016	0.016	0.016	0.017	0.017	0.018	0.018	0.018	0.019	0.019	0.020	0.020	0.021	0.021	0.022	0.022	0.023	0.024	0.024	0.025	0.025
	Program Cost	$0.072	$0.072	$0.072	$0.072	$0.072	$0.072	$0.072	$0.072	$0.072	$0.072	$0.072	$0.072	$0.072	$0.072	$0.072	$0.072	$0.072	$0.072	$0.072	$0.072	$0.072	$0.072	$0.072	$0.072	$0.072	$0.072
Rate Escalation	Total Credit	0.040	0.041	0.042	0.044	0.045	0.046	0.048	0.049	0.050	0.052	0.053	0.055	0.057	0.058	0.060	0.062	0.064	0.066	0.068	0.070	0.072	0.074	0.076	0.078	0.081	0.083
3.20%	Net Cost	$0.032	$0.031	$0.030	$0.028	$0.027	$0.026	$0.024	$0.023	$0.022	$0.020	$0.019	$0.017	$0.015	$0.014	$0.012	$0.010	$0.008	$0.006	$0.004	$0.002	$0.000	($0.002)	($0.004)	($0.006)	($0.009)	($0.011)

MPSC Case No.: U-18352
Respondent: T. L. Schroeder
Requestor: MEC
Question No.: MECDE-2.1a
Page: 1 of 1

Question: Refer to cell G28 in discovery attachment MECDE-1.4a and Terri L. Schroeder's response to discovery question ELPC-1.12a:

a. Which of $0.030 or $0.035 represents the projected net cost to the customer in 2018?

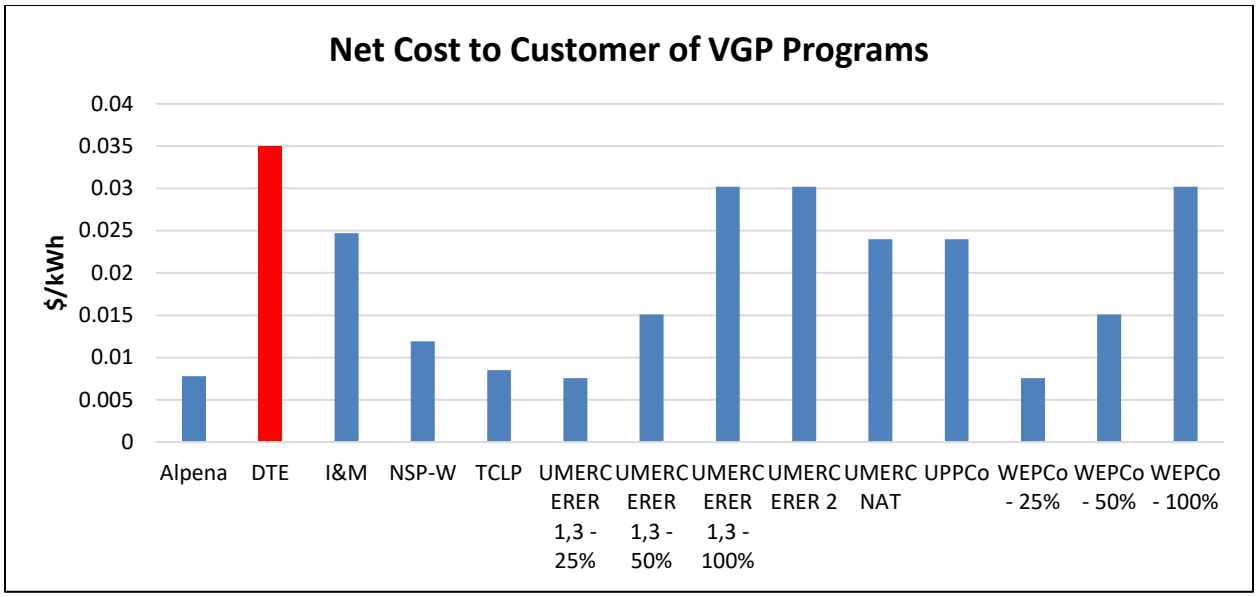
Answer: The net cost to customers in 2018 is $0.035.

MPSC Case No.: U-18352
Respondent: T. L. Schroeder
Requestor: MEC
Question No.: MECDE-2.1b
Page: 1 of 1

Question: Refer to cell G28 in discovery attachment MECDE-1.4a and Terri L. Schroeder's response to discovery question ELPC-1.12a:

b. Reconcile the difference between the two numbers.

Answer: Attachment MECDE-1.4a was a forecast created prior to 2018. The actual credit in 2018 is $0.005 less than forecasted.



Utility	$/kWh	Source
Alpena Power Company (U-18350)	$0.0078	April 18, 2018 Commission Order in Case No. U-18356 et al.
Consumers (U-18351)	Not yet determined	
DTE Electric Company (U-18352)	$0.035	MECDE-2.1a
Indiana Michigan Power Company (U-18353)	$0.0247	April 18, 2018 Commission Order in Case No. U-18356 et al.
Northern States Power Company (U-18354)	$1.19 per 100 kWh RE block	April 18, 2018 Commission Order in Case No. U-18356 et al.
Traverse City Light and Power	$0.0085	http://www.tclp.org/Page/VGP
Upper Michigan Energy Resources Corporation (U-18356)	ERER 1, 3 – 25%: $.00755 ERER 1, 3 – 50%: $.01510 ERER 1, 3 – 100%: $0.03020 ERER 2: $0.03020 Naturewise: $2.40 per 100 kWh RE block	April 18, 2018 Commission Order in Case No. U-18356 et al.
Upper Peninsula Power Company (U-18355)	$2.40 per 100 kWh RE block	April 18, 2018 Commission Order in Case No. U-18356 et al.
Wisconsin Electric Power Company (U-18357)	25%: $.00755 50%: $.01510 100%: $.03020	April 18, 2018 Commission Order in Case No. U-18356 et al.

Michigan Public Service Commission
DTE Electric Company
2016 PA 342 Renewable Energy 2018 Amended Plan
2017 MPSC Staff Transfer Prices

Case No.: U-18232
Exhibit: A-14
Schedule: A1
Witness: M. J. Rivard
Page: 1 of 1

Line No.	(a) Year	(b) MPSC Staff 2017 Transfer Price - Fixed Cost ($/MWh)	(c) MPSC Staff 2017 Transfer Price - Variable Cost ($/MWh)	(d) DTE Electric Proposed / 2017 MPSC Staff Transfer Price ($/MWh)
1	2017	31.74	43.20	74.95
2	2018	32.15	42.03	74.18
3	2019	32.73	41.24	73.97
4	2020	33.29	42.75	76.04
5	2021	33.82	43.33	77.15
6	2022	34.39	45.19	79.58
7	2023	34.97	47.64	82.61
8	2024	35.56	49.66	85.22
9	2025	36.13	50.89	87.02
10	2026	36.71	51.75	88.46
11	2027	37.39	53.33	90.72
12	2028	38.11	54.66	92.77
13	2029	38.79	56.08	94.88

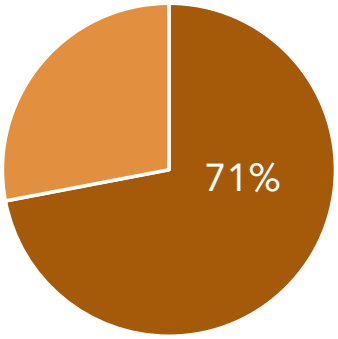
Line No	(a)	(b)	(c)	(d)	(e)	(f)
			Energy Portion of Credit			
		From Company Exhibit A-3		Jester Analysis based on Commission PURPA Cases		
1	Unit Cost of Power Supply (UCPS) (Mills/kWh)	30.44	U-18403 A-1 line 6			
2	Loss Multiplier	1.068	U-18043 A-1 line 9			
3	Adjusted UCPS (Mills/kWh)	32.51	Line 1*Line 2	Variable Cost of CC Generation ($/MWh)	$43.20	U-18232 A-14
4	Bundled Transmission in UCPS (000)	$347,046	U-18043 A-3 Line 31			
5	Transmission adjustment in UCPS (000)	($13,863)	U-18043 A-3 Line 39			
6	Total (000)	$333,183	Line 4 +Line 5			
7	Net System Requirement (GWh)	43,259	U-18403 A-1 Line 5			
8	Transmission by kWh (Mills/kWh)	7.70	Line 6/Line 7	Investment Attributable to Energy	7.065	U-18091
9	Line Loss	1.068	U-18043 A-1 line 9		1.068	U-18043 A-1 Line 9
10	Transmission in UCPS (Mills/kWh)	8.23	Line 8*Line 9		8.17	Line 8*Line 9
11	**Energy Credit ($/kWh)**	**0.024**	(Line 3- Line 10)/1000		**0.05137**	(Line 3+Line 10)/1000
			Capacity Portion of Credit			
12	**Wind Energy Details**					
13	Nameplate Capacity (kW)	22,800			22,800	
14	MISO Capacity Credit	11.20%	MISO Wind Capacity Report		11.20%	MISO Wind Capacity Report
15	UCAP (kW)	2554	Line 13*Line 14		2554	Line 13*Line 14
16	Generation (kWh)	75,000,000			75,000,000	
17	**Solar Energy Details**					
18	Nameplate Capacity (kW)	72,800			72,800	
19	MISO Capacity Credit	52.60%	Estimate		52.60%	Estimate
20	UCAP (kW)	26,300	Line 18*Line 19		26,300	Line 18*Line 19
21	Generation (kWh)	75,000,000			75,000,000	
22	**Voluntary Renewable Product Details**		50% Wind, 50% Solar Generation			50% Wind, 50% Solar Generation
23	Nameplate Capacity (kW)	72,800	Line 13+Line 18		72,800	Line 13+Line 18
24	MISO Capacity Credit	39.60%	(Line 15+Line 20)/Line 23		39.60%	(Line 15+Line 20)/Line 23
26	UCAP (kW)	28,854	Line 23*Line 24		28,854	Line 23*Line 24
27	Generation (kWh)	150,000,000	Line 16 + Line 21		150,000,000	Line 16 + Line 21
28	CONE ($/kW-year)	91	MISO CONE PY 2017/18		91	MISO CONE PY 2017/18
29	75% of CONE ($/kW-year)	68	Line 28*75%		8.40%	NERC GADS Statistical Summary
30	75% of CONE x MISO Capacity Credit ($/kW-year)	27	Line 24*Line 29		99.34	Line 28/(1-Line 29)
31	**Capacity Credit ($/kWh)**	**0.013**	Line 30/Line 27		**0.019**	Line 30/Line 27
	Total	**0.037**	Line 11+Line 31		**0.07037**	Line 11+Line 31

ADVANCED ENERGY ECONOMY

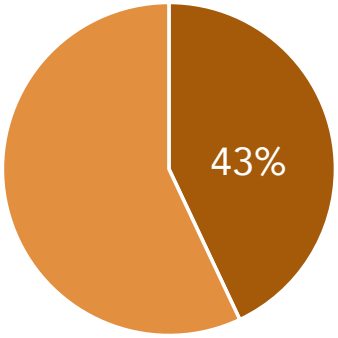
2016 CORPORATE ADVANCED ENERGY COMMITMENTS

71 Fortune 100 companies have targets, driving market demand

Fortune 100



Fortune 500



Corporate America is nothing if not efficient and fast-paced—when companies like Walmart, Microsoft, and Google decide to make a change, they execute. Demand for advanced energy among the nation's top companies is no exception: in 2015, less than a decade after companies first started to sign large-scale, long-term power purchase agreements for renewable energy, corporate wind contracts outstripped utility demand. These purchases were dominated by a small number of large corporations, but businesses large and small are increasingly seeking ways to invest in wind, solar, energy storage, fuel cells, and other advanced energy technologies. As the list of completed projects grows at an accelerating pace, it is clear that the trend initiated by these leading companies is spreading quickly.

To quantify the extent of this growing demand, Advanced Energy Economy (AEE) assessed the renewable energy and sustainability goals of the Fortune 100 and the Fortune 500, which are the top 100 and 500 companies in the United States, respectively, by gross revenue. As of 2016, this analysis shows that 71 Fortune 100 companies and 215 Fortune 500 companies (43%) have a sustainability target, renewable energy target, or both. Just as important as the overall numbers, AEE also found that these targets extend across industry segments—again indicating that target-setting is an increasingly normal element of good business practice.

These targets are good news for states: companies are deploying their private capital to finance projects that will bring in new jobs and tax revenue while improving the resource diversity of the grid and in some cases decreasing reliance on imported electricity. But in many states, there are not clear mechanisms for companies to fulfill their commitment to procure advanced energy. This brief explores the targets companies are setting, and their options for securing the advanced energy projects needed to meet them.

Policy and regulatory changes are needed in many states for companies to follow through on these commitments.

Power purchase agreements (PPAs) are a key way for companies to procure power from large, offsite projects, but they are only available to companies in restructured markets. **Sleeved PPAs** allow companies in traditionally regulated markets to contract with an offsite project, with the utility acting as an intermediary to contract for power from the project on behalf of the customer.

For some companies, negotiating and signing a long-term PPA may not be feasible. Subscription-based **renewable energy tariffs** (sometimes called "green tariffs") allow customers to easily opt-into a portfolio of renewable energy delivered by their regular utility. To serve as a viable option, the tariff must be structured according to customer needs.

Many companies wish to procure power from **onsite** distributed energy resources such as solar, energy storage, or fuel cells, while still remaining connected to the utility grid. There are several purchasing structures for such projects to meet different customer needs and preferences. In some states, companies have a range of options, but in others legislation is needed to enable **third-party ownership** of onsite systems.

Some companies wishing to benefit from distributed energy resources may not be able to host such resources onsite. **Shared (or "community") renewable energy** is a subscription-based model that allows multiple customers to share the output of a single nearby offsite project.

General Motors in Texas

The auto giant has operations across the country, yet the majority of its PPAs to date are in Texas—and for good reason.

With a newly announced goal to source its massive nine terawatt-hour global annual electricity consumption with 100% renewable energy, GM is looking beyond the onsite solar and landfill gas that it already uses to power its facilities. Two of the company's three PPAs signed to date are in Texas, and the third powers its operations in Mexico. Relative to other states where GM operates, mostly in the midwest, Texas has not only favorable economics for wind energy, but also a competitive market structure that more readily accommodates corporate procurement.

Microsoft in Wyoming

In collaboration with Black Hills Energy, Microsoft designed a solution that could be replicated elsewhere

In search of a competitive project to power its new Wyoming data center with renewable energy, Microsoft negotiated two agreements with its local utility provider, Black Hills Energy. One agreement involved Microsoft purchasing Renewable Energy Certificates from a 59-megawatt (MW) wind project adjacent to Microsoft's data center in Cheyenne. In addition, Microsoft approached Black Hills with an innovative solution to deliver reliability without additional costs for ratepayers. Microsoft will be served under a new tariff that allows the utility to reach behind the meter to fulfill grid needs using Microsoft's new, on-site backup natural gas generators, avoiding the need to construct a new power plant. The tariff structure is available to other eligible customers, paving the path for a creative solution that lowers costs while also lowering overall grid emissions.

Lockheed Martin in North Carolina

With full retail choice and no barriers to signing a PPA, Lockheed Martin was able to secure a 17-year contract for 30 MW of solar in North Carolina.

While much of North Carolina is under Duke Energy's vertically integrated utility territory, the eastern part of the state is restructured, allowing Lockheed Martin to sign a power purchase agreement with a solar farm selling into the wholesale market. Because restructured markets provide a clear pathway for companies to pursue PPAs, Lockheed Martin was able to focus solely on key aspects of the deal itself, such as price, risk, and contract length. That does not mean the project was easy—as a government defense contractor, Lockheed Martin has a number of additional logistical hurdles to gain approval of any long-term project—but without additional regulatory hurdles the project was able to move forward.

AIMING FOR 100%

Of the Fortune 500, there are a number of companies that have committed to get 100% of their electricity needs from renewable energy. These companies (and their ranking in the Fortune 500) are listed below:

1. Walmart (#1)
2. Apple (#3)
3. General Motors (#8)
4. Amazon (#18)
5. HP (#20)
6. Microsoft (#25)
7. Bank of America (#26)
8. Wells Fargo (#27)
9. Procter & Gamble (#34)
10. Alphabet (#36)
11. Johnson & Johnson (#39)
12. Goldman Sachs Group (#74)
13. Nike (#91)
14. AbbVie (#123)
15. Starbucks (#146)
16. Facebook (#157)
17. VF (#231)
18. Voya Financial (#252)
19. Biogen (#263)
20. Avon Products (#370)
21. Salesforce (#386)
22. Coca-Cola European Partners (#397)

As with the initial trend of top companies leading the push to purchase advanced energy, these 22 companies are concentrated at the top of the Fortune 500: 11 are in the Fortune 50 and only six fall below the Fortune 200. Overwhelmingly, these companies are heading into a 100% renewable energy commitment having already completed a renewable energy purchase of one form or another—but that does not mean that reaching 100% will be easy.

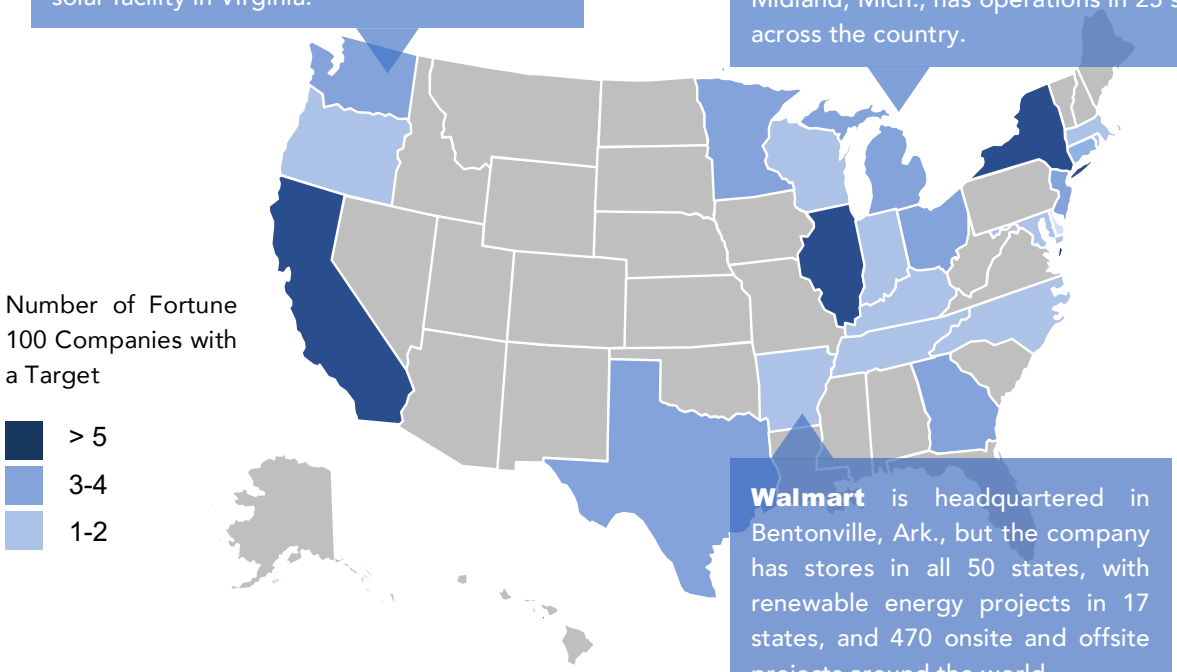
For companies with operations in states that do not have a clear pathway to purchase advanced energy, achieving these commitments takes significant effort and creativity. In some cases, this groundwork is being used to develop a clear path for other companies to follow suit. In contrast, in states that allow multiple pathways to purchase advanced energy onsite and offsite, following through on renewable energy commitments simply requires that a company do the due diligence to select a pathway and execute a deal. While this work can itself be significant, it is much easier without the added complexity of regulatory and market barriers.

COMPANIES ARE SEEKING ADVANCED ENERGY ACROSS THE MAP

Companies headquartered across the country are setting renewable energy and/or sustainability targets—and they often want to site projects close to their operations, which are even more spread out.

Amazon, headquartered in Seattle, Wash., recently negotiated an innovative deal with Dominion Virginia Power to match the price of its utility-delivered electricity and the price of its wind PPAs in the PJM market. The company has PPAs with wind facilities in Ohio, Indiana, and North Carolina, and a solar facility in Virginia.

Ford Motor Company, headquartered in Dearborn, Mich., also has operations in Illinois, Missouri, Kentucky, and Ohio. **The Dow Chemical Company,** based in Midland, Mich., has operations in 25 states across the country.

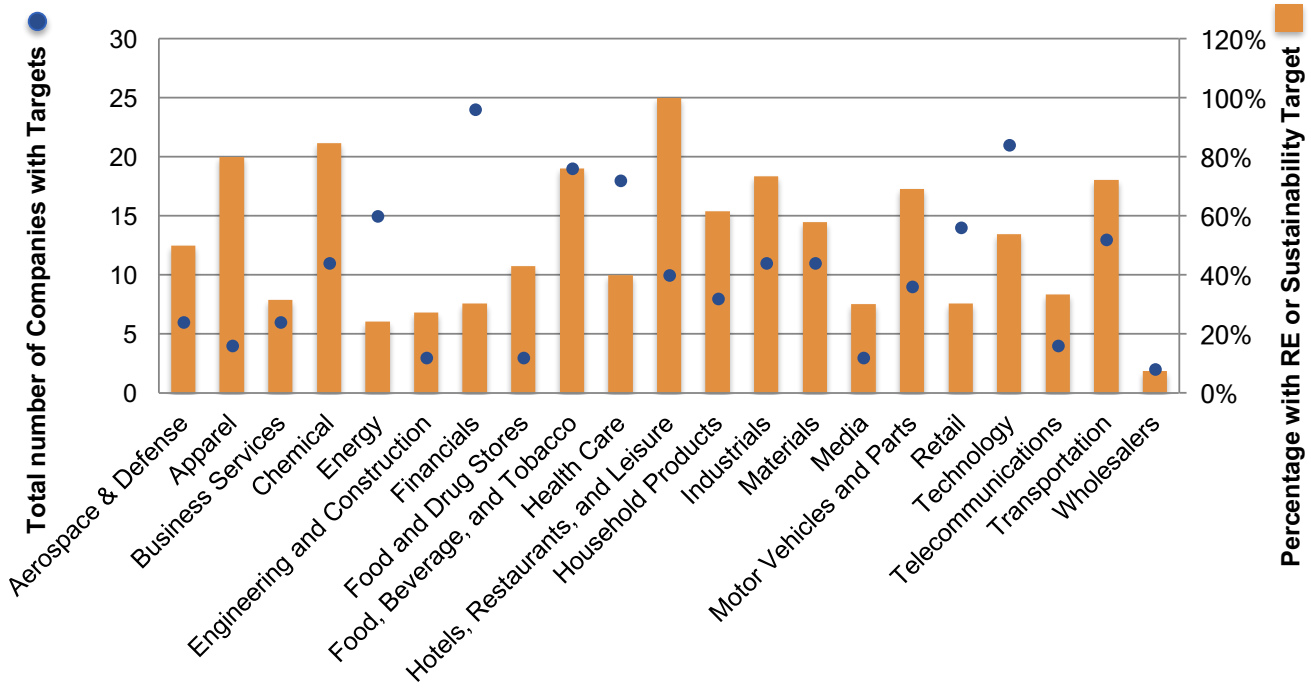


Walmart is headquartered in Bentonville, Ark., but the company has stores in all 50 states, with renewable energy projects in 17 states, and 470 onsite and offsite projects around the world.

As companies with operations generally spanning many states, the Fortune 100 and Fortune 500 are faced with a patchwork of different choices when sourcing advanced energy. In some states, these companies can pursue either onsite or offsite projects with relative ease, while in other states such options are either very difficult to negotiate or off the table entirely. Leading companies have thus far made a lot of progress toward their goals by pursuing projects in states without regulatory or market barriers, and by negotiating one-off deals in states that do have barriers. Smaller companies—those lower down on the Fortune 500 list, or off the Fortune 500 list—are often financially and logistically unable to navigate these market and regulatory barriers. Large and small companies alike would reach (or, in some cases, maintain) their goals much more readily and cost-effectively if their options to do so extended across the entire footprint of their operations—that is to say, collectively, all 50 states.

TARGETS SPAN ALL SECTORS

Hospitality, chemical, and apparel lead with 100%, 85%, and 80% of companies setting targets, respectively.



Looking at the commitments across the Fortune 500 by sector, it is clear that setting renewable energy and sustainability targets is not a sector-specific trend, but rather an economy-wide norm.

Of course, there are outliers on both sides. Leading sectors in 2016 are hotels, restaurants, and leisure (10 of 10 companies); chemical (11 of 13 companies); apparel (4 of 5 companies); food, beverage, and tobacco (19 of 25 companies); industrials (11 of 15 companies); transportation (13 of 18 companies); and motor vehicles and parts (9 of 13 companies). Sectors lagging behind are wholesalers (2 of 27 companies); energy (15 of 62 companies); and engineering and construction (3 of 11 companies). This sector-by-sector clustering of leading and lagging companies may reflect a certain degree of peer leadership, with target-setting becoming a norm more rapidly in certain sectors than others.

Interestingly, with only four exceptions, the top-ranked Fortune 500 company within each sector did have a target—and there were only two sectors in which there were no companies in the top three that had set a renewable energy and/or sustainability target (wholesalers and business services).

If companies are following their peers, we can expect to see the portion of companies that have set renewable energy and/or sustainability targets to continue to rise above the current 71% and 43% for the Fortune 100 and Fortune 500, respectively. As these figures rise, so too will the urgency to develop clear and replicable pathways for companies to follow through on these commitments across all 50 states.

A note on methodology: The tallies of company commitments are based on publicly available information, gathered in August, 2016. Companies with recently achieved targets were included. Only companies with numeric targets were included in the targets, i.e., companies with aspirational goals to "rely more on renewable energy" were not counted as having a target. Company examples are based on press releases and other publicaly available information. The Fortune 500 list, sector breakdown, and headquarter locations all came from Fortune.com.

December 2016

MPSC Case No.: U-18352
Respondent: T. L. Schroeder
Requestor: MEIBC IEI AEE
Question No.: MEIBC IEI AEEDE-1.1
Page: 1 of 1

Question: Please provide the Company's sales of voluntary renewable energy for each of the years 2010 through 2017, broken down by program and customer class.

Answer: Listed below are the Company's sales through the MIGreenPower program:

MIGreenPower	
	2017 MWh Sales*
Residential	1,698
Commercial	3,653
	5,351

2017 included 8 months of sales

MPSC Case No.: U-18352
Respondent: T. L. Schroeder
Requestor: MEIBC IEI AEE
Question No.: MEIBC IEI AEEDE-1.2
Page: 1 of 1

Question: Please provide the Company's most recent forecast of future voluntary renewable energy purchases from the Company, by customer class.

Answer: Listed below is the Company's most recent sales forecast for 2018. The Company only forecasted the sales through 2018.

	MIGreenPower (MWh)		
	Annualized 2017	2018 Additions	Combined Forecast
Residential	3,650	12,500	16,150
Commercial	4,434	2,300	6,734
Total	8,084	14,800	22,884

The 2018 Renewable Energy Plan tentatively includes approximately 40,000 MWh sold through 2018, and 100,000 MWh sold through 2019, based on the Company's request to extend the enrollment period through 2019. This is based on an optimistic scenario to ensure that the unsubscribed RECs in the REP, which are used for compliance, are not overstated in the REP.

MPSC Case No.: U-18352
Respondent: T. L. Schroeder
Requestor: MEIBC IEI AEE
Question No.: MEIBC IEI AEEDE-1.3
Page: 1 of 1

Question: Please provide any market analysis, customer survey reports, or other assessments made by the Company or on its behalf to assess interest in voluntary renewable energy purchases that have not already been provided in Company testimony in this case.

Answer: See the Company's responses to MECDE – 1.1-1.3 and associated attachments.

MPSC Case No.: U-18352
Respondent: T. L. Schroeder
Requestor: MEIBC IEI AEE
Question No.: MEIBC IEI AEEDE-1.4
Page: 1 of 1

Question: Has the Company directed its account representatives to discuss voluntary renewable energy interests with its commercial and industrial customers? If so, what information is being provided to customers? If so, what intelligence about customer interest is reported to the Company?

Answer: The Company has shared information and marketing materials for MIGreenPower with the major account representatives. See attachments MiEIBC IEI AEEDE – 1.4(1) through (4) for the materials shared with this group. Based on initial conversations with the account representatives, at least six follow up meetings have occurred.

DTE has received consistent feedback similar to the Buyers' Principles, as outlined on http://buyersprinciples.org/principles/. Customers are interested in working with utilities to procure renewable energy and secure long-term contracts. Customers are looking for additionality and no premium.

MPSC Case No.: U-18352
Respondent: T. L. Schroeder
Requestor: MEIBC IEI AEE
Question No.: MEIBC IEI AEEDE-1.5a
Page: 1 of 1

Question: Attached is a spreadsheet titled EIBC VGP Committed Purchaser Lists. This spreadsheet contains two tabs, one titled "Committed Companies" and one titled "Public Institutions". These tabs list, respectively, large corporations and Michigan public institutions known by EIBC to have made public commitments either to renewable energy purchasing or greenhouse gas emissions reductions that entail renewable energy purchasing for their own use.

a. How many of the listed companies and public institutions are customers of the Company?

Answer: DTE Electric cannot confirm whether the names listed on the spreadsheet are accurate, however, based on the names provided on the spreadsheet, 38 of the listed companies and public institutions are customers of the Company.

MPSC Case No.: U-18352
Respondent: Legal/T. L. Schroeder
Requestor: MEIBC IEI AEE
Question No.: MEIBC IEI AEEDE-1.5b
Page: 1 of 1

Question: Attached is a spreadsheet titled EIBC VGP Committed Purchaser Lists. This spreadsheet contains two tabs, one titled "Committed Companies" and one titled "Public Institutions". These tabs list, respectively, large corporations and Michigan public institutions known by EIBC to have made public commitments either to renewable energy purchasing or greenhouse gas emissions reductions that entail renewable energy purchasing for their own use.

b. Which of the listed companies and public institutions are customers of the Company?

Answer: DTE Electric objects to this request because it is not reasonably calculated to lead to the discovery of admissible evidence. DTE Electric also objects to this request because disclosure of the requested information would violate the Company's Rules and Regulations, specifically Rule C14.1 which prohibits the disclosure of specific customer information. Subject to and without waiving this objection, DTE Electric answers as follows:

DTE Electric serves approximately 2.2 million customers in Southeastern Michigan. The link below provides a map and tools showing the service territory that the Company serves. If the listed companies on the spreadsheet provided reside in DTE Electric's service territory, then they are likely customers of DTE.

https://www.newlook.dteenergy.com/wps/wcm/connect/dte-web/home/service-request/residential/moving/service-map

MPSC Case No.: U-18352
Respondent: T. L. Schroeder
Requestor: MEIBC IEI AEE
Question No.: MEIBC IEI AEEDE-1.5c
Page: 1 of 1

Question: Attached is a spreadsheet titled EIBC VGP Committed Purchaser Lists. This spreadsheet contains two tabs, one titled "Committed Companies" and one titled "Public Institutions". These tabs list, respectively, large corporations and Michigan public institutions known by EIBC to have made public commitments either to renewable energy purchasing or greenhouse gas emissions reductions that entail renewable energy purchasing for their own use.

c. Is the Company aware of other customers of the Company that have made public commitments to either renewable energy purchasing or greenhouse gas emissions reductions that entail renewable energy purchasing for their own use?

Answer: Yes. The Company is generally aware of other companies with renewable energy, greenhouse gas reduction, or sustainability commitments.

MPSC Case No.: U-18352
Respondent: Legal
Requestor: MEIBC IEI AEE
Question No.: MEIBC IEI AEEDE-1.5d
Page: 1 of 1

Question: Attached is a spreadsheet titled EIBC VGP Committed Purchaser Lists. This spreadsheet contains two tabs, one titled "Committed Companies" and one titled "Public Institutions". These tabs list, respectively, large corporations and Michigan public institutions known by EIBC to have made public commitments either to renewable energy purchasing or greenhouse gas emissions reductions that entail renewable energy purchasing for their own use.

d. Which of the listed companies and public institutions has the Company either surveyed or met with to determine voluntary renewable energy interest?

Answer: DTE Electric objects to this request for the reason that it is not reasonably calculated to lead to the discovery of admissible evidence. The Company also objects to this request for the reason that the information requested consists of confidential, proprietary, or commercial information, the disclosure of which would cause DTE Electric, its ratepayers, and its customers competitive harm.

MPSC Case No.: U-18352
Respondent: Legal
Requestor: MEIBC IEI AEE
Question No.: MEIBC IEI AEEDE-1.5e
Page: 1 of 1

Question: Attached is a spreadsheet titled EIBC VGP Committed Purchaser Lists. This spreadsheet contains two tabs, one titled "Committed Companies" and one titled "Public Institutions". These tabs list, respectively, large corporations and Michigan public institutions known by EIBC to have made public commitments either to renewable energy purchasing or greenhouse gas emissions reductions that entail renewable energy purchasing for their own use.

e. Which of the listed companies and public institutions has the Company either surveyed or met with to determine voluntary renewable energy program design preferences?

Answer: DTE Electric objects to this request because it is not reasonably calculated to lead to the discovery of admissible evidence. The Company also objects to this request for the reason that the information requested consists of confidential, proprietary, or commercial information, the disclosure of which would cause DTE Electric, its ratepayers, and its customers competitive harm.

MPSC Case No.: U-18352
Respondent: Legal / T. L. Schroeder
Requestor: MEIBC IEI AEE
Question No.: MEIBC IEI AEEDE-1.5f
Page: 1 of 1

Question: Attached is a spreadsheet titled EIBC VGP Committed Purchaser Lists. This spreadsheet contains two tabs, one titled "Committed Companies" and one titled "Public Institutions". These tabs list, respectively, large corporations and Michigan public institutions known by EIBC to have made public commitments either to renewable energy purchasing or greenhouse gas emissions reductions that entail renewable energy purchasing for their own use.

f. How many of the listed companies and public institutions are currently voluntarily purchasing renewable energy from the Company?

Answer: DTE Electric objects to the extent this request is seeking specific customer names as disclosure of this information would violate the Company's Rules and Regulations, specifically Rule C14.1 which prohibits the disclosure of specific customer information. The Company also objects for the reason that the information requested consists of confidential, proprietary, or commercial information, the disclosure of which would cause DTE Electric, its ratepayers, and its customers competitive harm. Subject to and without waiving this objection, DTE Electric answers in the aggregate as follows:

As of February 28, 2018, the Company has 7 commercial/industrial customers enrolled in its MIGreenPower tariff.

MPSC Case No.: U-18352
Respondent: Legal
Requestor: MEIBC IEI AEE
Question No.: MEIBC IEI AEEDE-1.5g
Page: 1 of 1

Question: Attached is a spreadsheet titled EIBC VGP Committed Purchaser Lists. This spreadsheet contains two tabs, one titled "Committed Companies" and one titled "Public Institutions". These tabs list, respectively, large corporations and Michigan public institutions known by EIBC to have made public commitments either to renewable energy purchasing or greenhouse gas emissions reductions that entail renewable energy purchasing for their own use.

g. What are the Company's aggregate annual energy sales to listed companies and public institutions?

Answer: DTE Electric objects to this request for the reason that it is overly broad, unduly burdensome and not reasonably calculated to lead to the discovery of admissible evidence. This is a contested case to evaluate whether DTE Electric's proposed MIGreenPower voluntary green pricing program complies with applicable statutory requirements. It is inconceivable how the requested information bears any relationship to this case. Further, the Company objects to the extent that this request seeks individual customer sales data because the requested information contains confidential and proprietary customer information, the disclosure of which will cause the Company and its ratepayers competitive harm.

MPSC Case No.: U-18352
Respondent: T. L. Schroeder
Requestor: MEIBC IEI AEE
Question No.: MEIBC IEI AEEDE-1.5h
Page: 1 of 1

Question: Attached is a spreadsheet titled EIBC VGP Committed Purchaser Lists. This spreadsheet contains two tabs, one titled "Committed Companies" and one titled "Public Institutions". These tabs list, respectively, large corporations and Michigan public institutions known by EIBC to have made public commitments either to renewable energy purchasing or greenhouse gas emissions reductions that entail renewable energy purchasing for their own use.

h. What are the Company's aggregate annual voluntary renewable energy sales to listed companies and public institutions?

Answer: See MEIBC IEI AEEDE-1.1 for MIGreenPower commercial sales.

MPSC Case No.: U-18352
Respondent: T. L. Schroeder
Requestor: MEIBC IEI AEE
Question No.: MEIBC IEI AEEDE-1.5i
Page: 1 of 1

Question: Attached is a spreadsheet titled EIBC VGP Committed Purchaser Lists. This spreadsheet contains two tabs, one titled "Committed Companies" and one titled "Public Institutions". These tabs list, respectively, large corporations and Michigan public institutions known by EIBC to have made public commitments either to renewable energy purchasing or greenhouse gas emissions reductions that entail renewable energy purchasing for their own use.

i. How much aggregate annual voluntary renewable energy sales to the listed companies is included in the Company's most recent forecast of future voluntary renewable energy purchases from the Company?

Answer: DTE has not forecasted renewable energy sales for specific companies. See MEIBC IEI AEEDE – 1.2 for the Company's MIGreenPower forecast. Additionally, DTE is currently examining interest in a custom program for large customers. An initial pilot program could accept up to 300 MW of capacity. Furthermore, DTE could offer additional programs if there was more interest.

Status and Trends in the U.S. Voluntary Green Power Market (2016 Data)

Eric O'Shaughnessy, Jenny Heeter, Jeff Cook, and Christina Volpi
National Renewable Energy Laboratory

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC

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Technical Report
NREL/TP-6A20-70174
October 2017

Contract No. DE-AC36-08GO28308

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Prepared under Task No. OOSP.10291.05.02.04

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List of Acronyms

CAISO	California Independent System Operator
CCA	community choice aggregation
ERCOT	Electric Reliability Council of Texas
ISONE	Independent System Operator of New England
kWh	kilowatt-hour
MISO	Midwest Independent System Operator
MW	megawatt
MWh	megawatt-hour
NREL	National Renewable Energy Laboratory
PG&E	Pacific Gas and Electric
PJM	Pennsylvania, Jersey, Maryland Power Pool
PPA	power purchase agreement
PV	photovoltaic
RE	renewable energy
REC	renewable energy certificate
RPS	renewable portfolio standard
SPP	Southwest Power Pool
SREC	solar renewable energy certificate
TVA	Tennessee Valley Authority

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Executive Summary

Green power—for the purposes of this report—refers to renewable electricity voluntarily purchased by retail electricity customers. It is substantiated through renewable energy certificates (RECs). The voluntary green power market encompasses seven green power procurement mechanisms: utility green pricing programs, utility renewable contracts, unbundled RECs, competitive suppliers, community choice aggregations (CCAs), power purchase agreements (PPAs), and community solar.

About 6.3 million customers procured about 95 million megawatt-hours (MWh) of green power in 2016 (Table ES-1), which represents a 45% increase in the number of customers and a 19% increase in the amount sales from 2015. The voluntary green power market now accounts for about 28% of all U.S. renewable energy sales, excluding large hydropower.

Table ES-1. Voluntary Green Power Participation and Sales in 2016

Green Power Option	Sales (MWh)	Participants
Utility green pricing	8,012,000	816,000
Utility renewable contracts	2,930,000	9
Competitive suppliers	16,047,000	2,011,000
Unbundled RECs	51,800,000	108,000
CCAs	8,738,000	3,336,000
PPAs	7,891,000	210
Community solar	258,000	23,000
Total[a]	95,450,000	6,276,000

[a] Total excludes community solar except for PG&E's Solar Choice program because most customers do not retain RECs.

Sales and participation increased across all green power mechanisms from 2015 to 2016. Unbundled RECs account for more than half of the green power market in terms of sales. Unbundled REC sales have continued to increase in recent years as corporations and other large non-residential customers make large green power purchases to meet internal renewable energy or sustainability goals. CCAs now account for more than half of green power customers. The significant increase in green power participation from 2015 to 2016 is primarily attributable to the enrollment of large numbers of residential customers into new and growing CCAs in California, Illinois, Massachusetts, and New York.

For the first time in this annual series, this report includes a state-level analysis of the geography of voluntary green power sales and customers. Demand for green power is ubiquitous in the United States. Where green power is available, green power customers procure green power through locally available options such as utility green pricing programs, competitive suppliers, and CCAs. Customers also procure green power through unbundled RECs or PPAs, especially in states and utility service territories without local green power options. The geographic expansion of green power will likely continue as green power costs decline and providers continue to develop innovative green power products.

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Table of Contents

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List of Figures

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List of Tables

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1 Introduction

Green power—for the purposes of this report—refers to renewable electricity voluntarily purchased by retail electricity customers. It is substantiated through renewable energy certificates (RECs). This report summarizes data on the various ways in which voluntary purchasers—including residential, commercial, and institutional customers—purchase renewable energy, often to meet their own sustainability goals.

Electricity customers have several mechanisms through which to buy green power (Table 1). This report also summarizes the status and trends of renewable energy purchases through these procurement mechanisms.

Table 1. Green Power Procurement Mechanisms

Mechanism	Report Section	Description
Utility green pricing	3	Utility customers procure green power on a month-to-month basis through an added fee on their utility bill
Utility renewable contracts	4	Utility customers procure green power from their utility through a special tariff or bilateral contract, typically on a long-term basis sourced from a new renewable energy generator
Unbundled RECs	5	Customers buy RECs separated or "unbundled" from the underlying electricity
Competitive suppliers	6	Customers in competitive electricity markets may select a green power option from an alternative retail electricity supplier
Community choice aggregations (CCA)	7	Communities aggregate their loads to collectively procure green power as a bulk purchaser through an alternative electricity supplier
Power purchase agreements	8	Customers procure green power through a long-term contract with an off-site renewable energy project
Community solar	9	Customers buy a subscription in a shared solar project and accrue green power in proportion to their subscription

This report focuses on renewable energy procured voluntarily; it does not include purchases made to comply with renewable portfolio standard (RPS) obligations. For example, competitive suppliers and community choice aggregations (CCAs) are subject to RPS compliance in states with RPS, and therefore a fraction of their sales are used to meet their compliance obligations.

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All sales estimates (megawatt-hours) for competitive suppliers and CCAs factor out the portion of renewable energy sales used toward RPS compliance.

Further, this report does not include data on green power consumption where RECs are not delivered to and retained by the customer. For example, if the RECs from a community solar project are used by the utility to meet RPS compliance, the project is not counted as voluntary purchasing. Similarly, for on-site photovoltaic (PV) systems, often the system owner grants to the RECs to the utility in exchange for a subsidy and the utility counts the system toward RPS obligations. In these cases, the system is also not counted in voluntary market totals. Lastly, this report does not include data from on-site systems where RECs are not procured through one of the mechanisms in Table 1. Data from the U.S. EPA's Green Power Partnership suggest that on-site green power consumption may amount to about 4% of the green power market summarized in this report, or about four million MWh annually. Additional on-site green power, not accounted for in this report, is occurring through residential installations and organizations that are not part of the Green Power Partnership.

Data Sources and Limitations

Green power market data are based on figures provided to the National Renewable Energy Laboratory (NREL) by utilities and independent renewable energy marketers and publicly available data (Table 2). The data on voluntary market trends presented in this report build on data presented in *Status and Trends in the U.S. Voluntary Green Power Market (2015 Data)* (O'Shaughnessy, Liu, and Heeter 2016).

Table 2. Methodologies, Resources, and Data Limitations

Mechanism	Methodology, Resources, and Limitations
Utility green pricing	National estimate extrapolated from data collected from 42 utility programs. NREL estimates that the data sample represents over 75% of utility green pricing sales.
Utility renewable contracts	Estimates based on data from WRI (2017) and Heeter, Cook, and Bird (2017)
Unbundled RECs	National estimate extrapolated from data provided by the Green-e national certification program (Leschke 2017)
Competitive suppliers	National estimate extrapolated from data collected from six suppliers and publicly available data from the Electric Reliability Council of Texas (ERCOT); data limitations associated with the small sample size for competitive suppliers limit the interpretation of status and trends in this green power mechanism.
Community choice aggregations	Estimates for California, Massachusetts, New York, and Ohio based on data collected from CCAs; estimates for Illinois based on Dynegy (2017) and ICC (2017)
Power purchase agreements	Based on data obtained from BNEF (2017)

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Mechanism	Methodology, Resources, and Limitations
Community solar	Based on data on operational community solar projects compiled from various sources, state-level solar capacity factors, and assumed average subscription sizes per customer; REC treatment is unknown for the majority of projects. Community solar sales and participation figures are therefore excluded from green power market totals, except for sales and participation from PG&E's Solar Choice program (where by design customers retain RECs).

Structure of this Report

Section 2 provides an overall summary of the status of the green power market with national totals of sales (MWh) and participation (number of customers). Sections 3–9 summarize the status and trends for each of the green power procurement mechanisms. Section 10 summarizes the geography of green power markets. Section 11 provides conclusions.

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2 Summary of Voluntary Green Power Participation and Sales

About 6.3 million U.S. electricity customers purchased about 95 million MWh of green power in 2016 (Table 3).

Table 3. Voluntary Green Power Participation and Sales in 2016

Green Power Option	Sales (MWh)	Participants
Utility green pricing	8,012,000	816,000
Utility renewable contracts	2,930,000	9
Competitive suppliers	16,047,000	2,011,000
Unbundled RECs	51,800,000	108,000
CCAs	8,738,000	3,336,000
PPAs	7,891,000	210
Community solar	258,000	23,000
Total[a]	95,450,000	6,276,000

[a] The total excludes community solar except for PG&E's Solar Choice program because most community solar customers do not retain RECs.

Figure 1 illustrates the percentage changes in green power participation and sales from 2015 to 2016. Increasing corporate interest in green power and low REC prices are contributors to growth in unbundled RECs (Section 5). New CCA programs and program expansions in California, Massachusetts, and New York have fueled the growth of CCAs (Section 7). Community solar continues to grow rapidly as new projects are developed (Section 9).

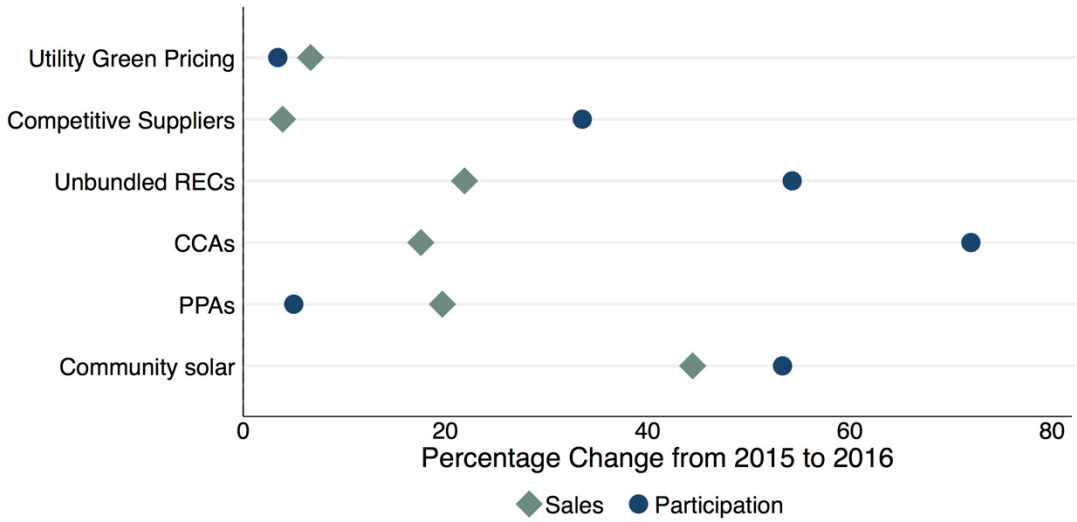

Figure 1. Percentage changes (2015–2016) in green power market participation and sales

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Green power sales have generally increased over time, in part because sales within certain mechanisms have increased, but also because new mechanisms have become available over time (Table 4, Figure 2). Sales growth has been relatively steady in green pricing programs and competitive suppliers, and more pronounced in relatively newer markets such as PPAs and community solar.

Table 4. Estimated Green Power Sales (millions of MWh), 2010–2016[a]

Green power option	2010	2011[b]	2012	2013	2014	2015	2016
Utility green pricing	5.4	5.8	6.0	6.9	7.0	7.5	8.0
Utility contracts	0	0	0	0.2	0.7	1.9	2.9
Competitive suppliers	10.4	11.0	11.6	14.5	16.2	15.4	16.0
Unbundled RECs	19.8	25.4	31.0	31.4	36.0	42.5	51.8
CCAs	-	-	-	8.1	7.7	7.4	8.7
PPAs	1.3	2.1	2.2	2.7	5.1	6.6	7.9
Community solar	0.005	0.050	0.080	0.100	0.150	0.180	0.260
Total[c]	**37**	**44**	**51**	**64**	**72**	**80**	**95**

[a] Historical results may differ from previous reports because of methodology adjustments; dashes indicate that reliable estimates for historical data are unavailable.
[b] Utility green pricing and unbundled RECs data were not collected for 2011. Estimates for 2011 are based on the midpoint between 2010 and 2012.
[c] The total does not include community solar outside of PG&E program (customers typically do not retain the RECs).

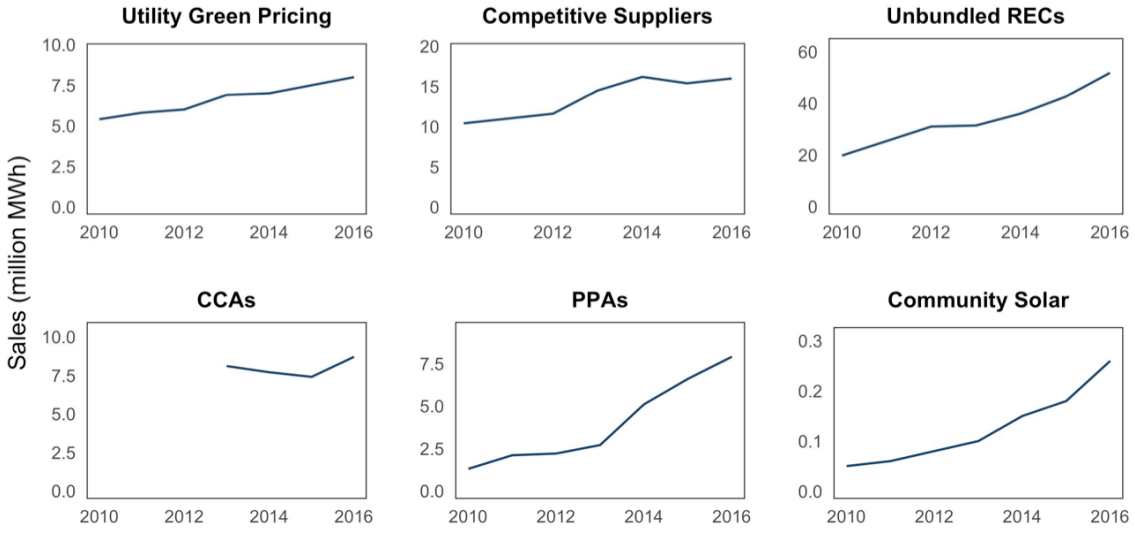

Figure 2. Green power sales by mechanism (2010–2016)

Plots are on different scales. Utility renewable contracts are excluded (most capacity came online in 2015).

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After declining for two years, green power participation increased by more than 50% from 2015 to 2016 (Table 5, Figure 3). The large increase in 2016 is primarily attributable to the expansion of CCAs in California and Massachusetts, where new programs began providing green power to large numbers of residential customers (Section 7).

Table 5. Estimated Green Power Participation (×1,000 customers), 2010–2016[a]

Green power option	2010	2011[b]	2012	2013	2014	2015	2016
Utility green pricing	570	570	570	706	743	789	816
Utility contracts	0	0	0	0.001	0.001	0.001	0.001
Competitive suppliers	1,200	1,200	1,200	2,200	1,584	1,506	2,011
Unbundled RECs	60	85	110	95	89	70	108
CCAs	-	-	-	2,400	2,500	1,940	3,336
PPAs	0.09	0.13	0.15	0.17	0.18	0.20	0.21
Community solar	0.4	4	7	8	13	15	23
Total[c]	**1,830**	**1,855**	**1,880**	**5,401**	**4,916**	**4,305**	**6,276**

[a] Historical results may differ from previous reports of methodology adjustments; dashes indicate that reliable estimates for historical data are unavailable.
[b] Utility green pricing and unbundled RECs data were not collected for 2011. Estimates for 2011 are based on the midpoint between 2010 and 2012.
[c] The total does not include community solar outside of PG&E program (customers typically do not retain the RECs).

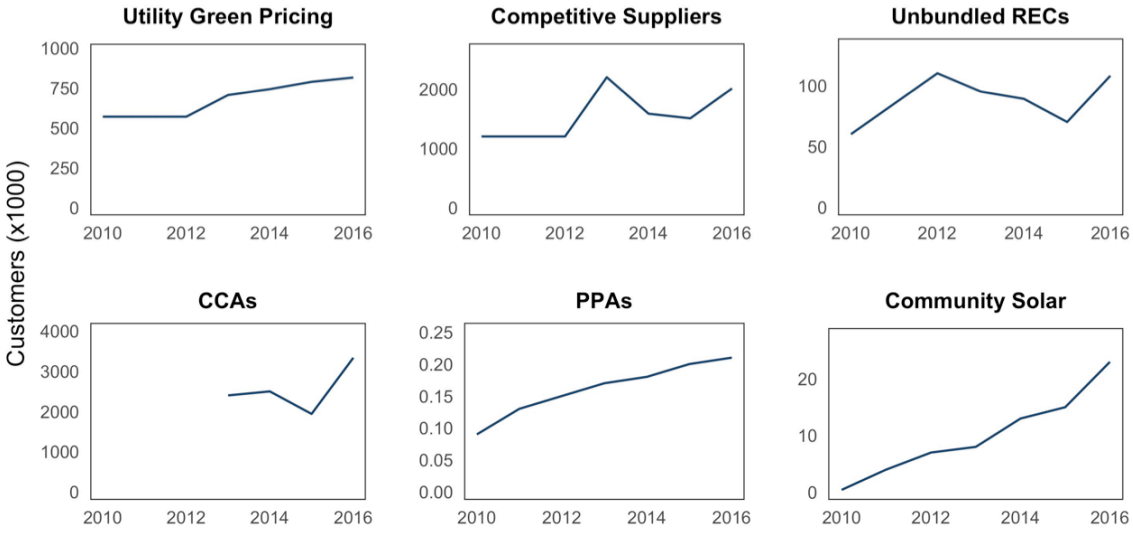

Figure 3. Green power participation by mechanism (2010–2016)

Plots are on different scales. Utility renewable contracts are excluded (most capacity came online in 2015).

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Unbundled RECs remain the largest source of green power sales, though the share of the market met by unbundled RECs fell beginning in 2012 because of the emergence of CCAs and PPAs (Figure 4). Green pricing programs, competitive suppliers, and CCAs—mechanisms that cater primarily to residential customers—comprise the majority of the green power customer base. CCAs now account for more than half of green power customers.

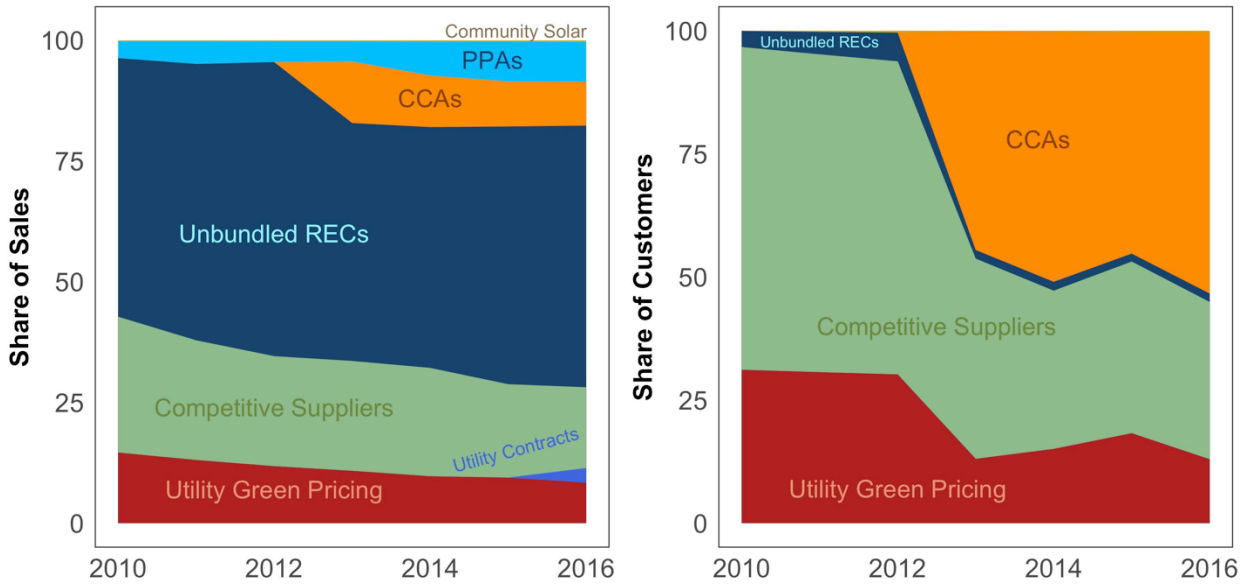

Figure 4. Shares of green power sales (left pane) and customers (right pane) over time by mechanism

Community solar, PPAs, and utility contracts collectively account for less than 1% of customers.

Figure 5 places the voluntary green power market in the context of the broader renewable energy market, excluding large hydropower. The majority of U.S. renewable energy sales are used to comply with state RPS programs. In 2016, compliance-based sales in state programs that require regulated entities to procure RECs from "new" projects accounted for about 42% of renewable energy sales, while compliance-based sales from existing projects accounted for about 26% of renewable energy sales in 2016. The voluntary market accounted for about 28% of all U.S. non-hydro renewable energy sales in 2016. The group "other renewables" in Figure 5 includes utility renewable energy purchasing beyond RPS requirements and on-site generation. Compliance-based REC sales are based on data compiled by the Lawrence Berkeley National Laboratory (LBNL 2017). Total U.S. renewable energy sales are based on retail electricity sales data from the U.S. Energy Information Administration (EIA 2017).

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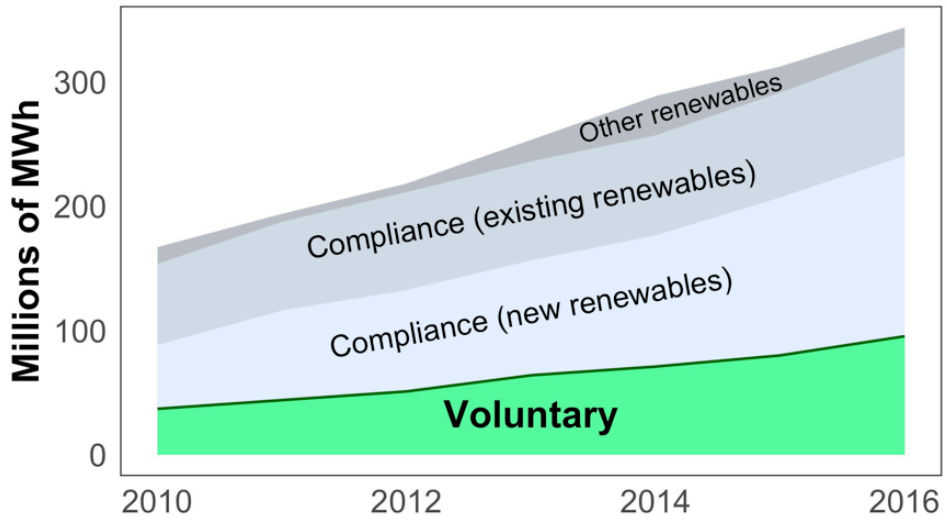

Figure 5. Renewable energy sales in voluntary, compliance, and other markets from 2010 to 2016

The figure is based on data from EIA 2017 and LBNL 2017.

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3 Utility Green Pricing

Many utilities sell green power to residential and non-residential customers through utility green pricing programs (Figure 6). In a typical green pricing structure, the utility generates or procures green power and retires RECs on behalf of the customer in proportion to the quantity of green power purchased by the customer. Green pricing customers generally pay for the green power through an additional line item on their utility bill. Green pricing sales and participation data in this report are based on data from a questionnaire sent to 42 utility green pricing programs.

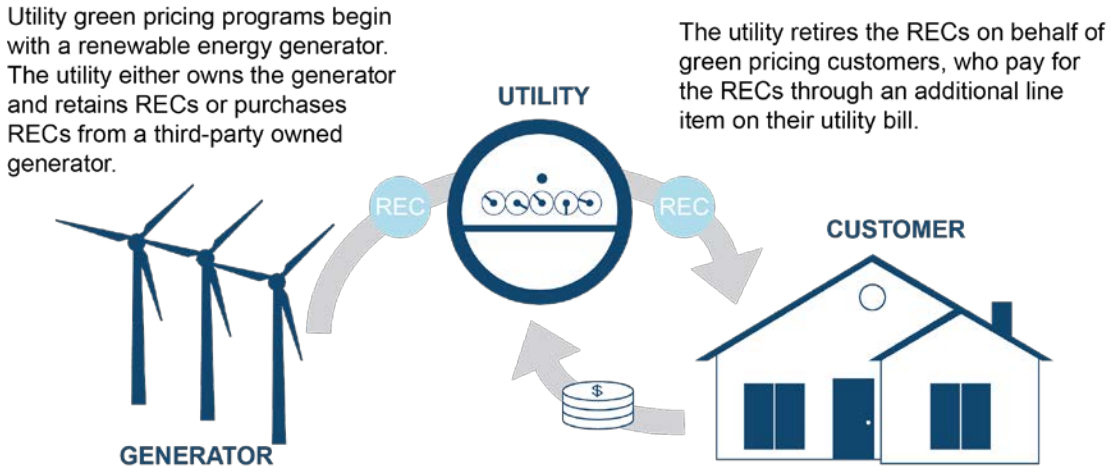

Figure 6. How utility green pricing programs work

The figure provides a simplified schematic for visualization purposes. Specific program structures vary.

3.1 Status of Utility Green Pricing Programs

In 2016, about 816,000 customers bought about eight million MWh of green power through utility green pricing programs (Figure 7). Utility green pricing programs continue to exhibit growth overall, as sales increased by 6% from 2015 to 2016.

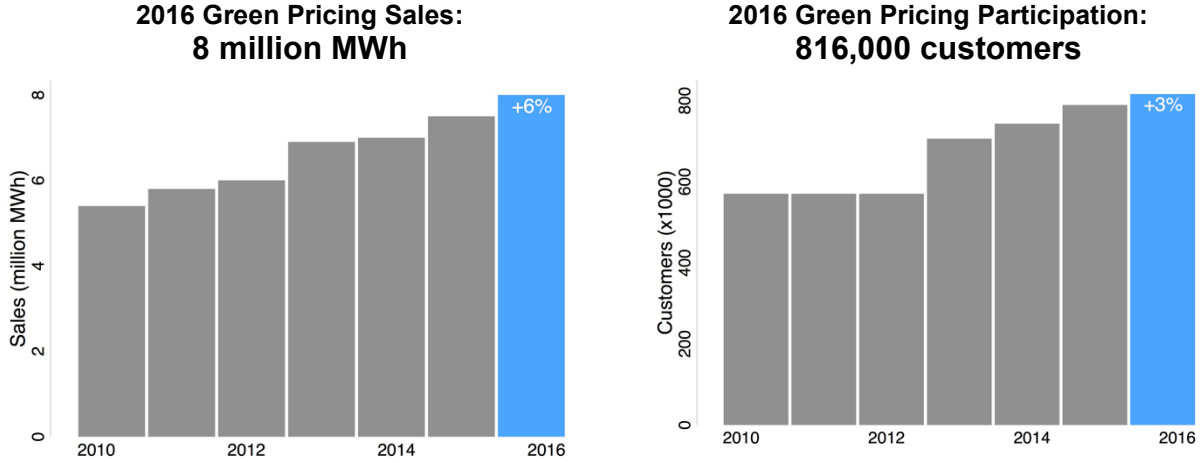

Figure 7. Utility green pricing program sales and participation from 2010 to 2016

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3.2 Trends in Utility Green Pricing Programs

Consistent with previous years, utility green pricing program sales continue to grow only because of the expansion of a few large programs. Large programs (>100,000 MWh/year) increased sales by about 7% from 2015 to 2016, driving an increase in sales overall. Sales among all remaining programs dropped by about 5% from 2015 to 2016.

Utility green pricing program premiums ranged from $0.001/kWh to $0.05/kWh for both residential and non-residential customers (Figure 8). The average residential premium was about $0.018/kWh, or about $195/year based on average home electricity use. The average non-residential premium was about $0.017/kWh. Premiums vary for many reasons, such as technology and locational attributes of the renewable energy resource. For example, utility green pricing programs that offer local solar products typically charge higher premiums than programs that offer national wind products. Programs also offer a variety of premium structures. For instance, some programs offer tiered premiums that result in lower premiums for customers that purchase large quantities of green power.

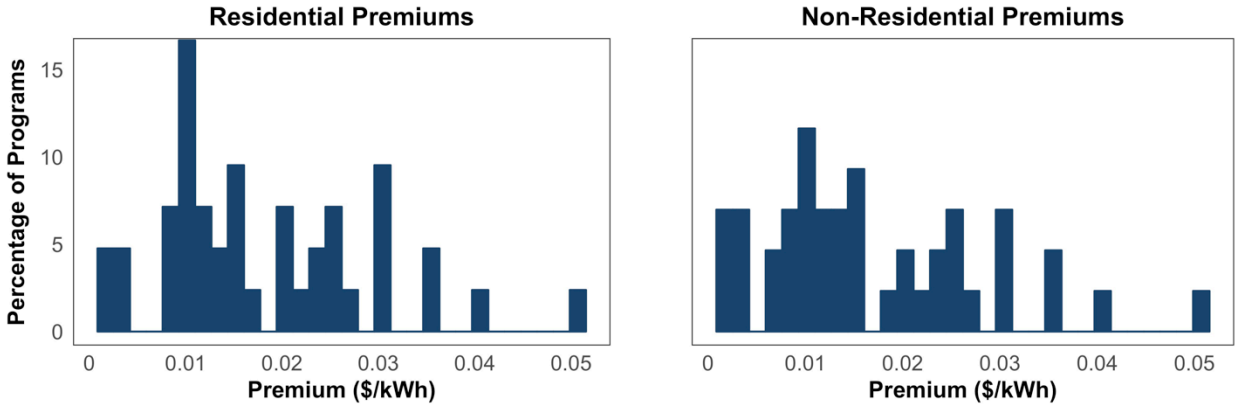

Figure 8. Distributions of utility green pricing program premiums

From 2015 to 2016, solar's share of green pricing program generation increased from 4% to 8%, and landfill gas' share increased from 4% to 7%. The shift toward solar and landfill gas may represent a broader shift toward local renewable resources. Wind remains the primary resource procured through utility green pricing programs (Figure 9).

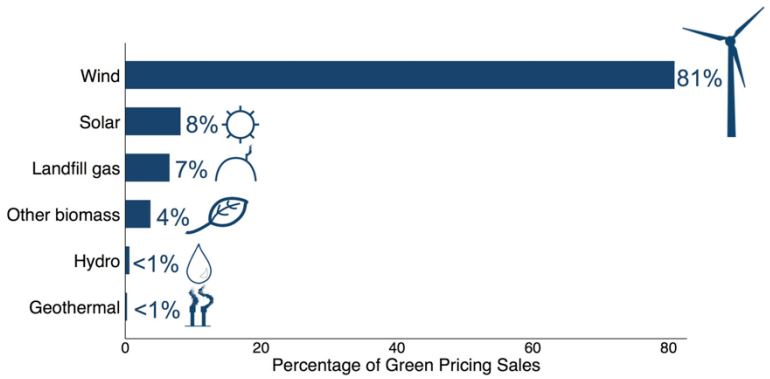

Figure 9. Utility green pricing program renewable energy resources

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Unbundled RECs remain the primary method for green power procurement in utility green pricing programs (Table 6), though the share of unbundled RECs fell by six percentage points from 2015 to 2016. Green power procured through utility-owned projects and from utility customers increased from 4% to 10% from 2015 to 2016. In terms of contract length (the duration of the REC purchasing period), more than half of RECs are procured through contracts of less than five years. RECs bundled with electricity or through projects owned by utilities are generally procured through longer-term (>5 year) contracts.

Table 6. Contract Length by Type of Utility Green Power Procurement (MWh), 2015

Contract Length	Unbundled RECs (%)	RECs Bundled with Electricity (%)	Projects Owned by Utility (%)	RECs Produced by Utility Consumers (%)
≤1 year	25.1	~0.0	~0.0	0.0
2–5 years	25.6	2.8	0.0	1.9
6–10 years	5.4	11.9	2.9	0.1
≥11 years	1.2	18.2	1.6	3.2
Percent of total procurement	57.0	33.0	5.0	5.0

Many utilities with green pricing programs are considering developing new programs (i.e., new types of green pricing programs or other utility programs) to offer renewable energy to their customers. About 64% of utilities that provided information on their green pricing programs (27 programs) are considering a community solar program (Section 9), and about 7% are considering a utility renewable contract program (Section 4).

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4 Utility Renewable Contracts

Utilities have begun to offer more targeted renewable energy contractual offerings for large commercial customers outside their traditional green pricing programs. These utility contractual offerings may take the form of one-off bilateral agreements between a utility and a single customer or they may form part of a larger program known as a utility green tariff. We summarize key differences between bilateral agreements (Section 4.1) and utility green tariffs (Section 4.2), but for simplicity and for the purposes of this report, we group the two contractual approaches under the single label of *utility renewable contracts*. These utility renewable contracts are evolving and vary from utility to utility and, in the case of bilateral agreements, from project to project.

Utility renewable contracts differ from green pricing programs in three ways. First, renewable contract customers may, depending on the program structure, specify the resource and project from which to procure renewable energy. Second, customers pay for green power through a bilateral contract or green tariff rate rather than a premium added to the customer's existing service and get some credit for the energy and capacity provided by their renewable purchase. This second difference gives rise to the potential for future cost savings (relative to traditional utility rate) that are often not possible through green pricing programs. Third, utility renewable contracts are typically based on long-term agreements between customers, utilities, and generators. This enhances the customer's likelihood for future cost savings and allows generators to finance new projects. As a result of these three differences, utility renewable contracts are generally catered to or reserved for large non-residential customers who are willing to make longer-term and administratively complex contractual agreements with utilities in order to avoid the cost premiums associated with utility green pricing programs.

Utility renewable contract sales and participation estimates in this report are based on data from WRI (2017) and Heeter, Cook, and Bird (2017).

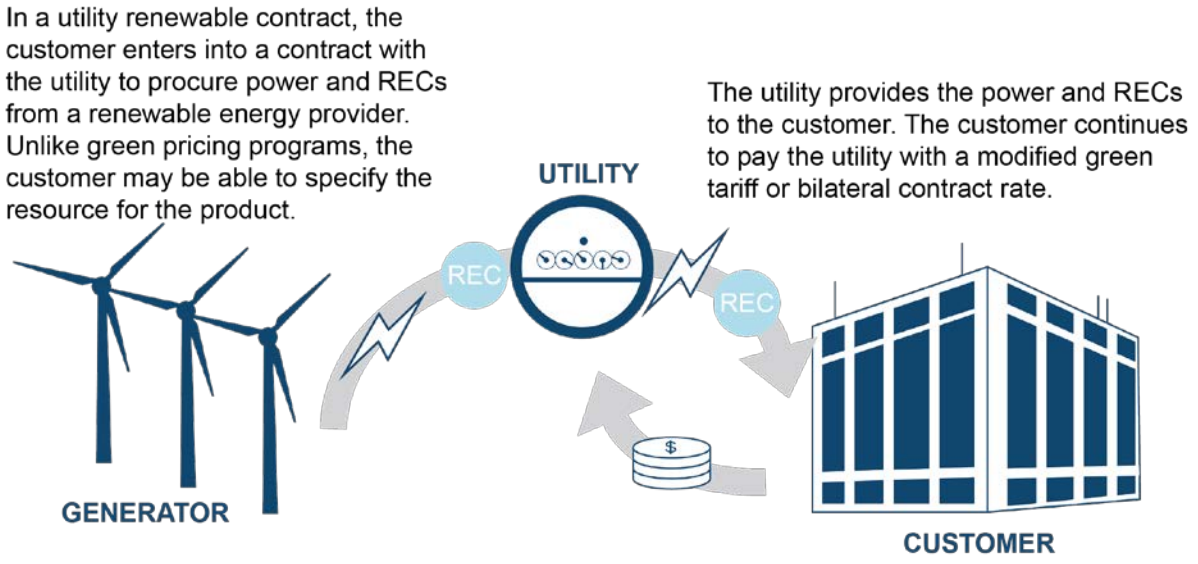

Figure 10. How utility renewable contracts work

The figure provides a simplified schematic for visualization purposes. Specific program structures may vary. Tariff structures may also vary within programs on a case-by-case basis.

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4.1 Utility Bilateral Agreements

In a bilateral agreement, a utility procures renewable energy on behalf of a single non-residential customer through a one-off contract. The terms of bilateral agreements are generally unavailable to other customers (Bonugli 2017); hence, bilateral agreements may vary from project to project even within the same utility. Bilateral agreements can be difficult to track, because capacity may not be publically disclosed.

At least 12 renewable energy projects have been contracted via a bilateral agreement through June 2017 (Table 7).[1] Six projects have published contracted capacity, and these have a cumulative capacity of 745 MW. Of this capacity, 623 MW of green power were contracted through bilateral contracts before 2016 and generated electricity in that year.[2] In 2016, these projects had a combined generation of 2,228,000 MWh.[3] This generation is likely to increase in 2017, assuming projects contracted in 2016 are constructed. Half of the bilateral agreements are in the Midwest (Table 7). Wind serves 623 MW (84%) of the contracted capacity for the six projects that have published capacity and technology data.

Table 7. Bilateral Agreements for Renewable Energy by State, Company, and Utility

State	Corporation	Utility	Project	Capacity	Estimated Contract Year
AL	Google	TVA	In development	Unknown	NA
TN	Google	TVA	In development	Unknown	NA
VA	Microsoft	Dominion Virginia Power	In development	20 MW	NA
AL	Walmart	Alabama Power	Lafayette Solar Project	72 MW	2016
GA	Procter & Gamble	Georgia Power	Constellation Albany Biomass Plant	50 MW	2015
VA	Amazon Web Services	Dominion Virginia Power	Amazon Solar Farm	80 MW	2015
IA	Google	MidAmerican Energy	Wind VIII Project	407 MW	2014
IA	Facebook	MidAmerican Energy	Wellsburg Wind Project	138 MW	2013
NE	Becton Dickinson	Nebraska Public Power District	Steel City Project (wind)	30 MW	2013

[1] NREL (2017)
[2] Though the Constellation Albany biomass plant was contracted in 2015, it has not yet come online.
[3] Electricity generation was sourced from SNL Financial Inc. data.

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State	Corporation	Utility	Project	Capacity	Estimated Contract Year
OK	Google	Grand River Dam Authority	Canadian Hills Wind	48 MW	2012
AZ	IO	Arizona Public Service	Mix of 95% wind and 5% solar	Unknown	Unknown
AZ	EBay	Arizona Public Service	Not disclosed	Unknown	Unknown

Source: Heeter, Cook, and Bird 2017

4.2 Utility Green Tariff Programs

Utility green tariffs are programs that allow customers to switch to new tariff rates to procure renewable energy via the utility. Unlike bilateral agreements, utility green tariffs are available to a class of customers and allow multiple customers to procure renewable energy under the same terms (Bonugli 2017).

Utility green tariff program designs vary, but eligibility criteria generally limit these programs to large non-residential customers. By the end of 2016, 599 MW of renewable energy capacity had been procured through utility green tariffs, with 279 MW contracted in 2016 alone (WRI 2017).[4] An additional 360 MW has been contracted in 2017, which lends to a cumulative total of 959 MW of contracted capacity. Another 465 MW of project capacity is anticipated to be under negotiation (WRI 2017). For those projects that were contracted before 2016 (320 MW), we estimate about 702,000 MWh of green power generation in 2016.

[4] The WRI data are augmented by the inclusion of Microsoft's agreement with Black Hills Corporation to purchase wind from the 59-MW Happy Jack and Silver Sage wind farms (Smith 2016).

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Twelve utilities in twelve states offer utility green tariffs, with Kentucky, Nebraska, Michigan, Minnesota, Nebraska, and Wisconsin adding new programs in 2017 (Figure 11). The NV Energy Green Energy Rider has resulted in the most contracted green power capacity to date, with 449 MW of contracted renewable energy capacity (all PV) by June 2017 (Figure 12).

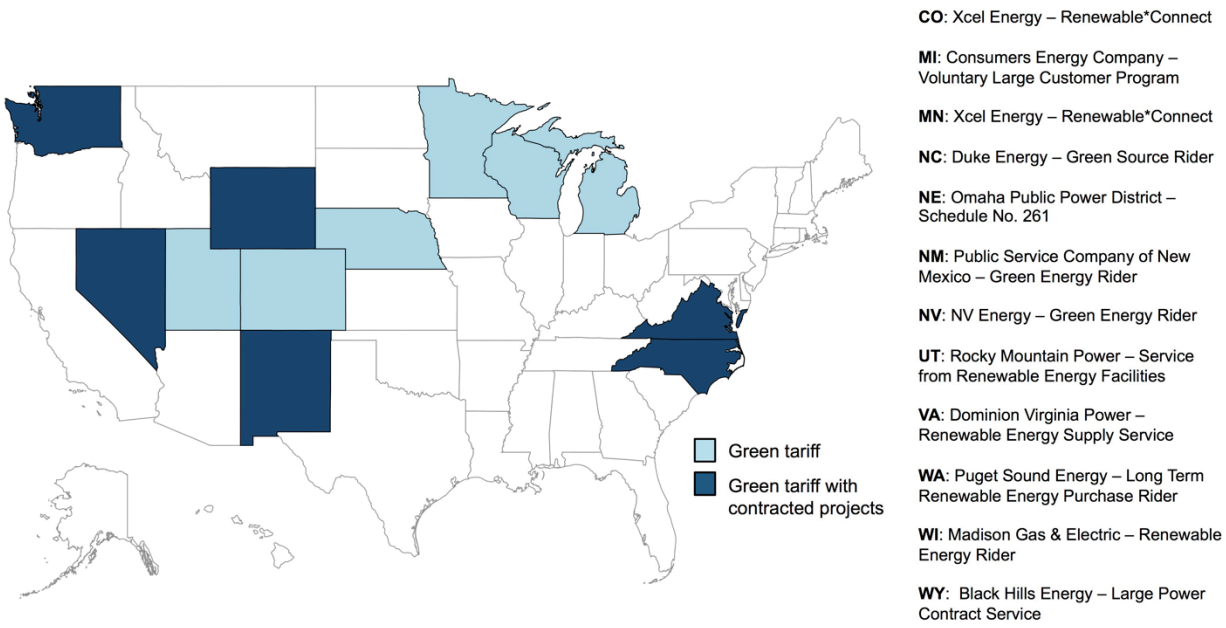

Figure 11. Utility green tariff programs

Map based on information from Tawney et al. 2017

Of the 900 MW of contracted capacity through 2017, 730 MW are associated with solar projects. The remaining 130 MW are contracted with one wind project to serve Puget Sound Energy's program in Washington state (WRI 2017). It is unclear whether solar will continue to dominate the green tariff market, given the 465 MW of capacity under negotiation. With several Midwestern states beginning to offer programs, future contracted capacity may rely on wind, which has a higher resource potential in those states. If the negotiated capacity is added, green tariffs may surpass bilateral agreements as the top utility renewable contract pathway for procuring renewable energy, in terms of capacity.

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Figure 12 illustrates total contracted capacity through utility renewable contracts—through both utility bilateral agreements and utility green tariff programs—by state.

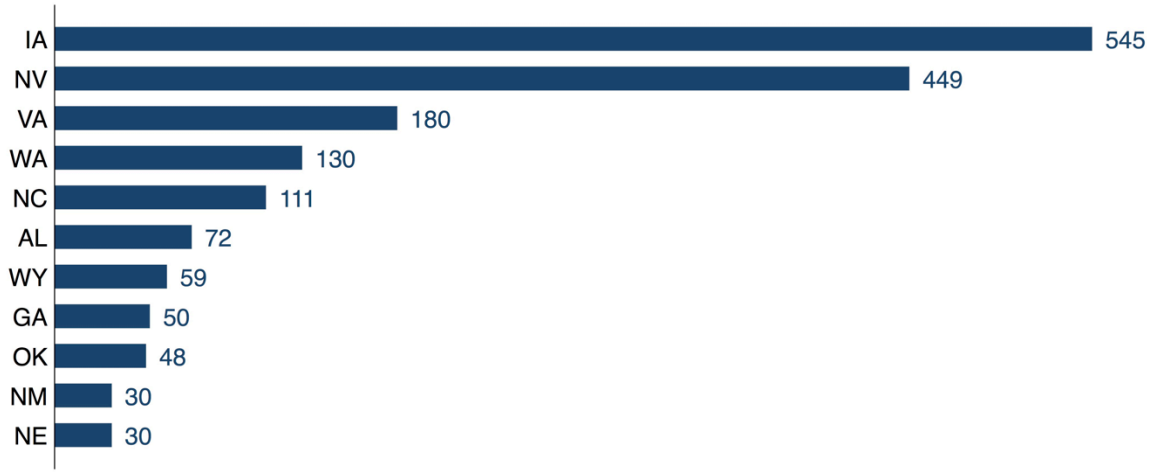

Figure 12. Cumulative utility renewable contract capacity by state (MW)

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5 Competitive Suppliers

In restructured electricity markets, customers can choose their electricity service from a competitive supplier, many of whom now offer a green power rate (Figure 13). Some suppliers only offer products with high renewable content, while others offer products with only nominally more renewables than required by state renewable portfolio standards. Competitive supplier sales and participation estimates in this report are based on data from a sample of six competitive suppliers and publically available data from ERCOT.

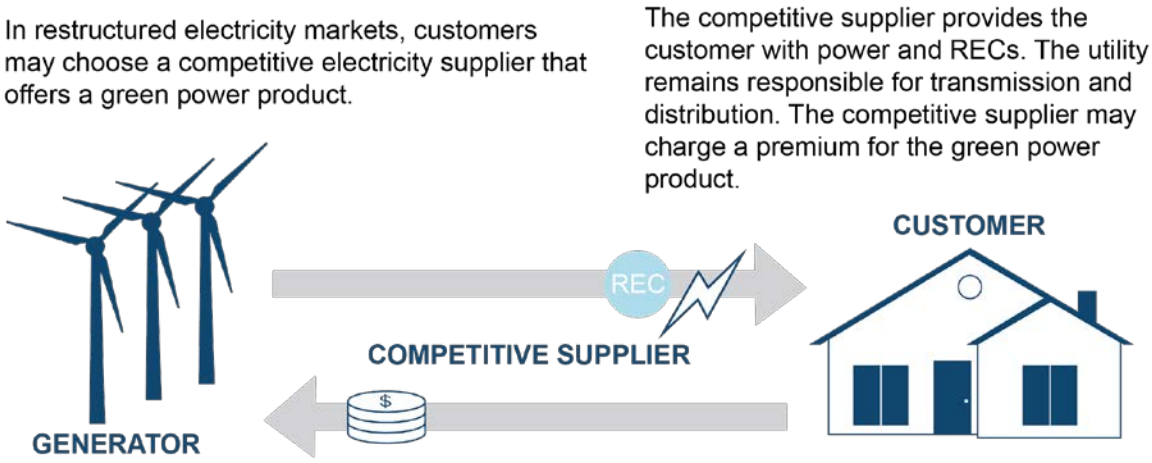

Figure 13. How competitive suppliers work

The figure provides a simplified schematic for visualization purposes. Specific transactions may vary.

5.1 Status of Competitive Supplier Green Power

In 2016, competitive suppliers sold about 16 million MWh of renewable energy to about 2 million customers (Figure 14).

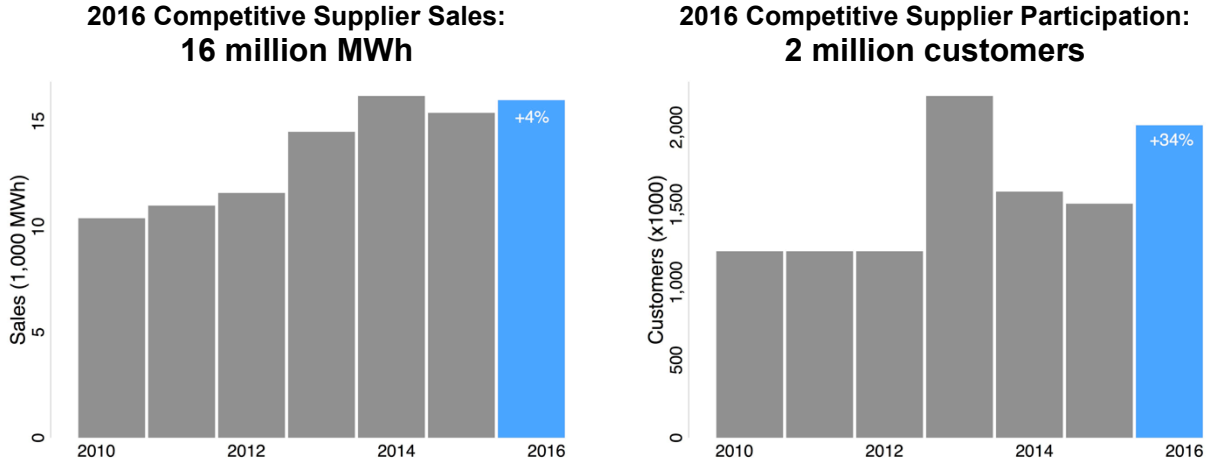

Figure 14. Competitive supplier sales and participation from 2010 to 2016

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5.2 Trends in Competitive Supplier Green Power

Competitive supplier green power estimates rely on responses to a questionnaire from a small sample of suppliers and publicly available data from ERCOT. Extrapolating from these samples to the national level obscures any granular trends in the data.[5] This year's sales estimate is roughly consistent with estimates from previous years; however, this year's estimate for participation suggests a significant increase in the number of customers (Figure 14). Due to data limitations, it is difficult to interpret these trends. The increase in the number of customers may be due to actual trends and possibly a shift toward more residential customers from 2015 to 2016. However, this trend may also be a result of data noise owing to the small sample size.

One evident trend is that Texas wind is the primary source of green power for the national competitive supplier market. In 2016, nearly 25 million MWh of RECs were retired in ERCOT for voluntary purposes, including competitive supplier RECs and retirements for other voluntary RECs. Due to low cost wind resources, Texas also provides the largest source of unbundled RECs to the national voluntary market. In Figure 15, we present total voluntary REC retirements in ERCOT, by vintage. Retirements in 2016 (of any vintage REC) declined slightly from a high of 27 million MWh retired in 2015.

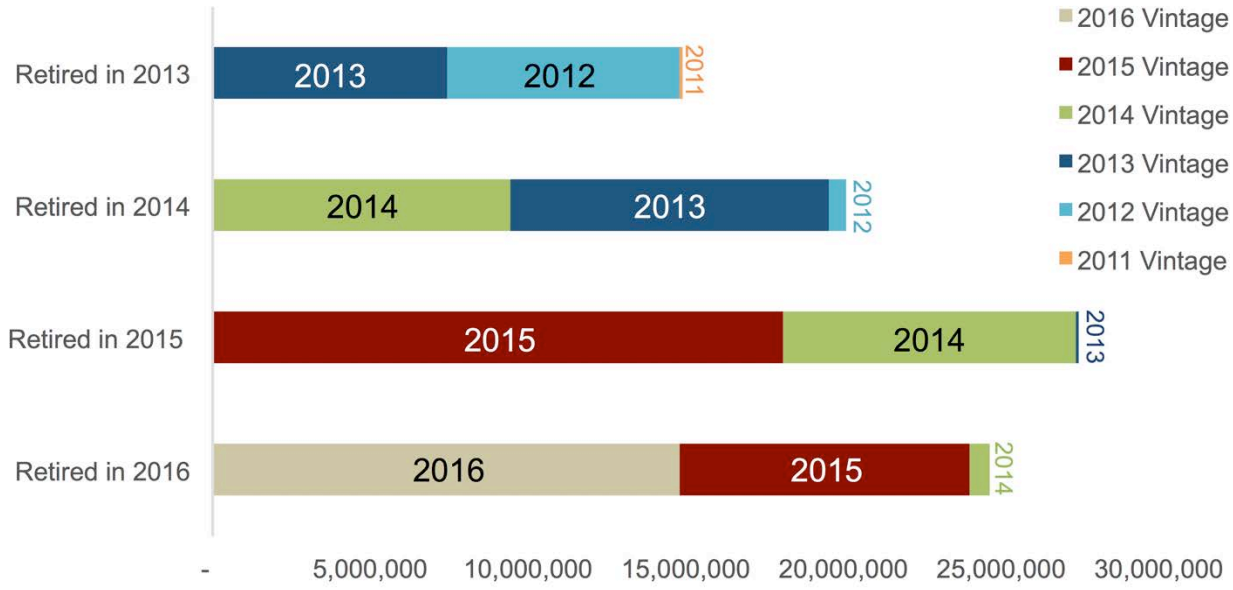

Figure 15. Voluntary REC retirements in ERCOT

Source: ERCOT 2017

[5] Historical estimates of competitive supplier sales and participation are affected by similar data limitations.

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6 Unbundled RECs

Some renewable energy generators sell electricity into local electricity markets without selling the associated RECs. RECs separated from the underlying electricity are known as unbundled RECs, and these may be sold into voluntary markets (Figure 16). Any electricity customer in the United States can buy unbundled RECs, typically through a third-party marketer. The unbundled RECs market is consistently the largest source of green power sales in the overall green power market. Unbundled RECs sales and participation estimates in this report are based on data provided by the Green-e national certification program (Leschke 2017).

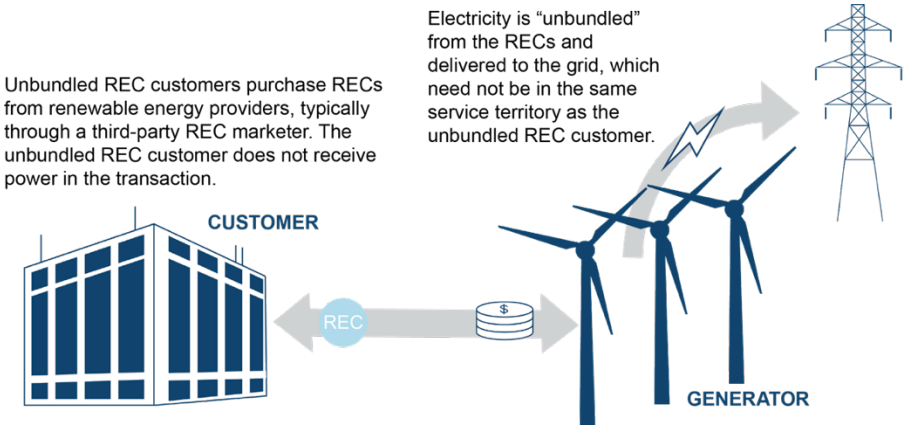

Figure 16. How unbundled RECs work

The figure provides a simplified schematic for visualization purposes. Specific transactions may vary.

6.1 Status of Unbundled RECs

We estimate that about 108,000 customers bought about 51.8 million MWh of green power through unbundled RECs in 2016 (Figure 17). The increase in customer numbers is likely due to more marketers actively targeting residential customers.

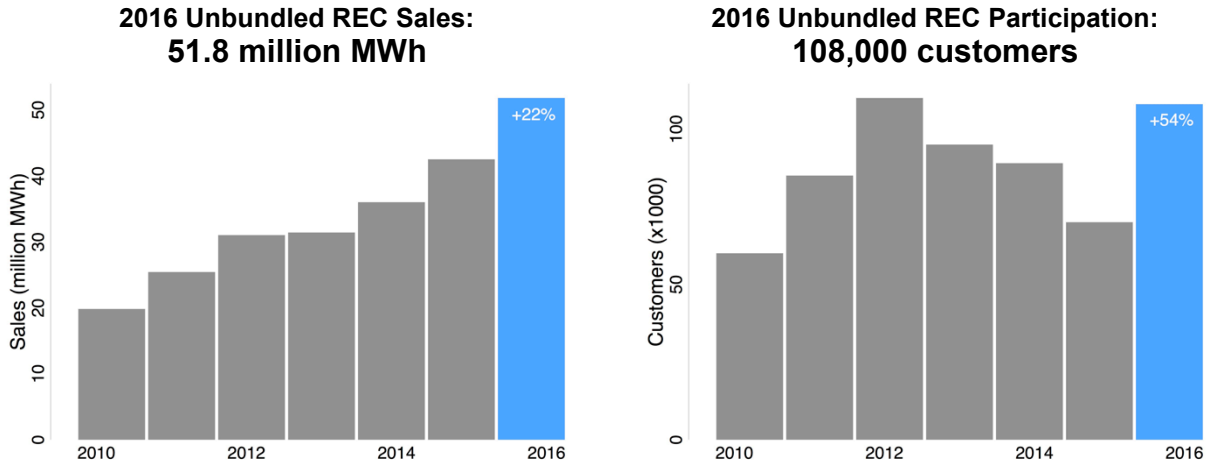

Figure 17. Unbundled REC sales and participation from 2010 to 2016

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6.2 Trends in Unbundled RECs

Customer participation in unbundled RECs increased by more than half from 2015 to 2016, while sales increased by 22%. The significant increase in participation from 2015 to 2016 was driven by more residential customers buying unbundled RECs, which is likely due to the efforts of some REC providers to aggressively market to residential customers who would otherwise purchase a utility green pricing product. In this section, we highlight two trends in unbundled REC markets: increased customer interest in renewable energy and continuation of low REC prices. We also present data on compliance REC pricing.

Increased Large Customer Commitments to Renewable Energy

The interest of large customers in unbundled RECs—part of a larger trend in other green power markets including PPAs—is one key driver behind sustained growth in unbundled REC sales. Large customers are continuing to make commitments to renewable energy and greenhouse gas reductions. As these companies start investigating renewable energy purchasing options, they often begin with an unbundled REC purchase, as the purchase has low transaction costs, does not require a long-term commitment, and is straightforward compared to an off-site PPA or participation in a green tariff.

In 2016 and 2017, more large corporate customers began making pledges through the RE100 Campaign, and the We Are Still In campaign, and the Buyers' Principles:

- Companies are increasingly making commitments to use 100% renewable energy through the RE100 Campaign.[6] One hundred and six companies have made a commitment to use 100% renewable energy, though their end-year targets differ. Many companies signing on to RE100 are international companies committed to sourcing renewables in all of the countries they operate in, which is driving renewable demand across the globe (Bird et al. 2017).
- As of September 2017, more than 2,300 organizations had committed to climate action through the We are Still In pledge, which was launched in June 2017.[7] The organizations include more than 1,700 businesses and more than 200 cities and counties, as well as states, tribes, and colleges and universities.
- The Buyers' Principles are criteria to help companies meet their renewable energy goals.[8] Companies support greater choice in procurement options, more access to cost competitive options, longer- and variable-term contracts, access to new projects, improved financing and contracting, and opportunities to work with utilities and regulators to expand renewable choices. Seventy companies had signed on to the Buyers' Principles as of September 2017, up from 62 companies in September 2016 and 43 companies in September 2015. And, the renewable demand from these companies had grown to 54 million MWh in September 2017, up from 45 million MWh in September 2016 and to 30 million MWh in September 2015.

Although it remains to be seen whether these companies all meet their commitments, the market will likely continue to grow in the near term, given low unbundled REC prices. More than 1,300 organizations are already buying renewable energy in some form and are participating in

[6] http://there100.org/
[7] https://www.wearestillin.com/
[8] http://buyersprinciples.org/

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partnerships such as the EPA's Green Power Partnership, RE100, and the Buyers Principles (Figure 18).

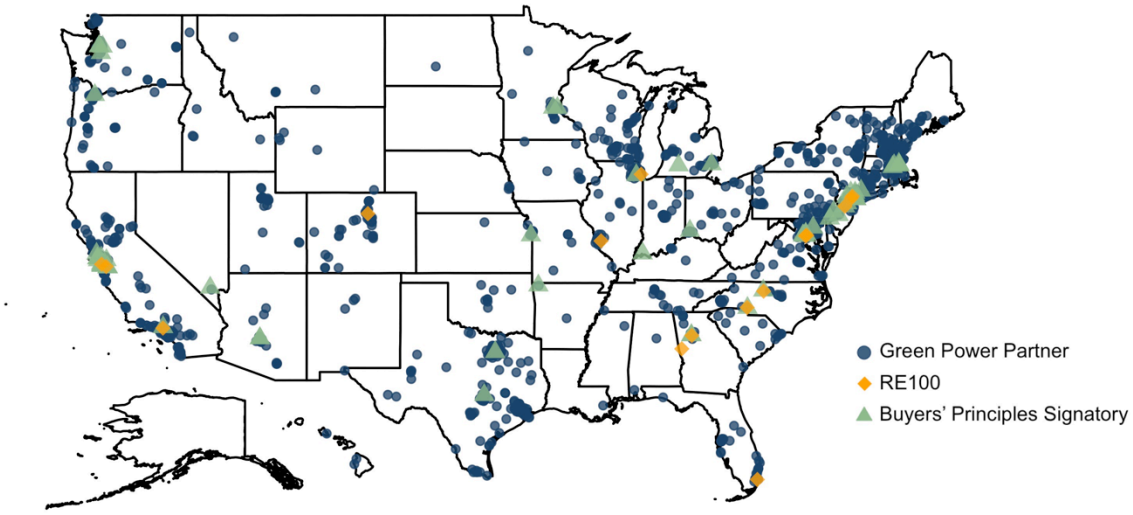

Figure 18. Large customer renewable energy commitments and purchasers

Map is based on information from WRI and WWF. n.d., EPA 2017, and RE100 2017.
Location is generally based on corporate headquarters.

REC Pricing Trends

REC prices continued to remain low throughout 2016, after peaking at around $1.13/MWh[9] in January 2014 (Figure 19). 2016 REC prices averaged around $0.35/MWh. The continuation of low REC prices likely explains the increase in much of the unbundled RECs market from 2015 to 2016. Purchasers with a set budget for purchasing renewable energy can purchase more RECs at lower prices.

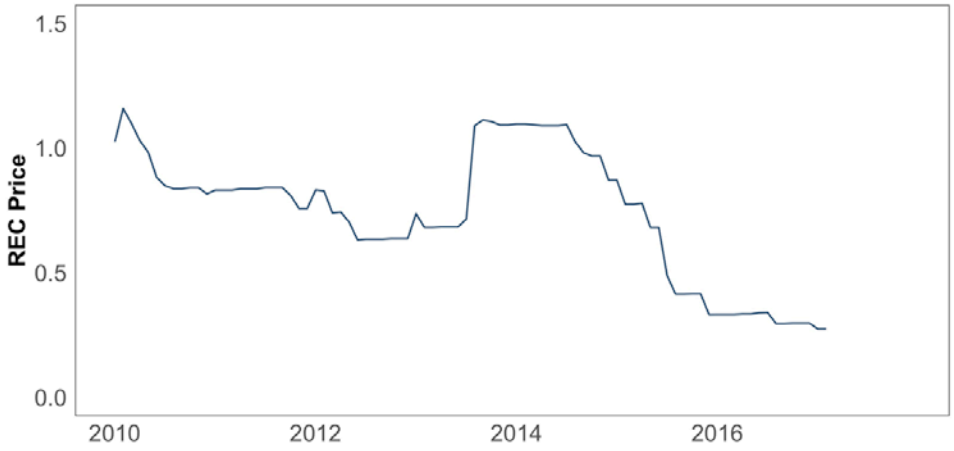

Figure 19. Voluntary national REC prices

Sources: SNL Energy 2017, Marex Spectron 2016

[9] A REC represents the clean energy attributes of one megawatt-hour of renewable energy generation. Hence, REC prices are commonly stated in terms of $/MWh, though the terminology is interchangeable with $/REC.

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RECs used for voluntary purposes have different pricing than RECs used for RPS compliance. Prices for RECs used for compliance purposes tend to be higher due to RPS programs that require regulated entities to source RECs from specific states or regions. These restrictions limit the supply of eligible RECs while ensuring demand from load-serving entities, causing upward pressure on prices for RECs retired for compliance purposes.

Prices for REC used for RPS compliance continued to decline in 2016 in most states, with the greatest reductions coming in the historically high-priced New England states (Figure 20). For example, prices in New Hampshire declined from more than $45/MWh in 2015 to around $25/MWh in early 2017. Prices in New England states tend to track together because state RPS rules generally allow RECs from anywhere within the New England Power Pool to be used for main tier compliance.

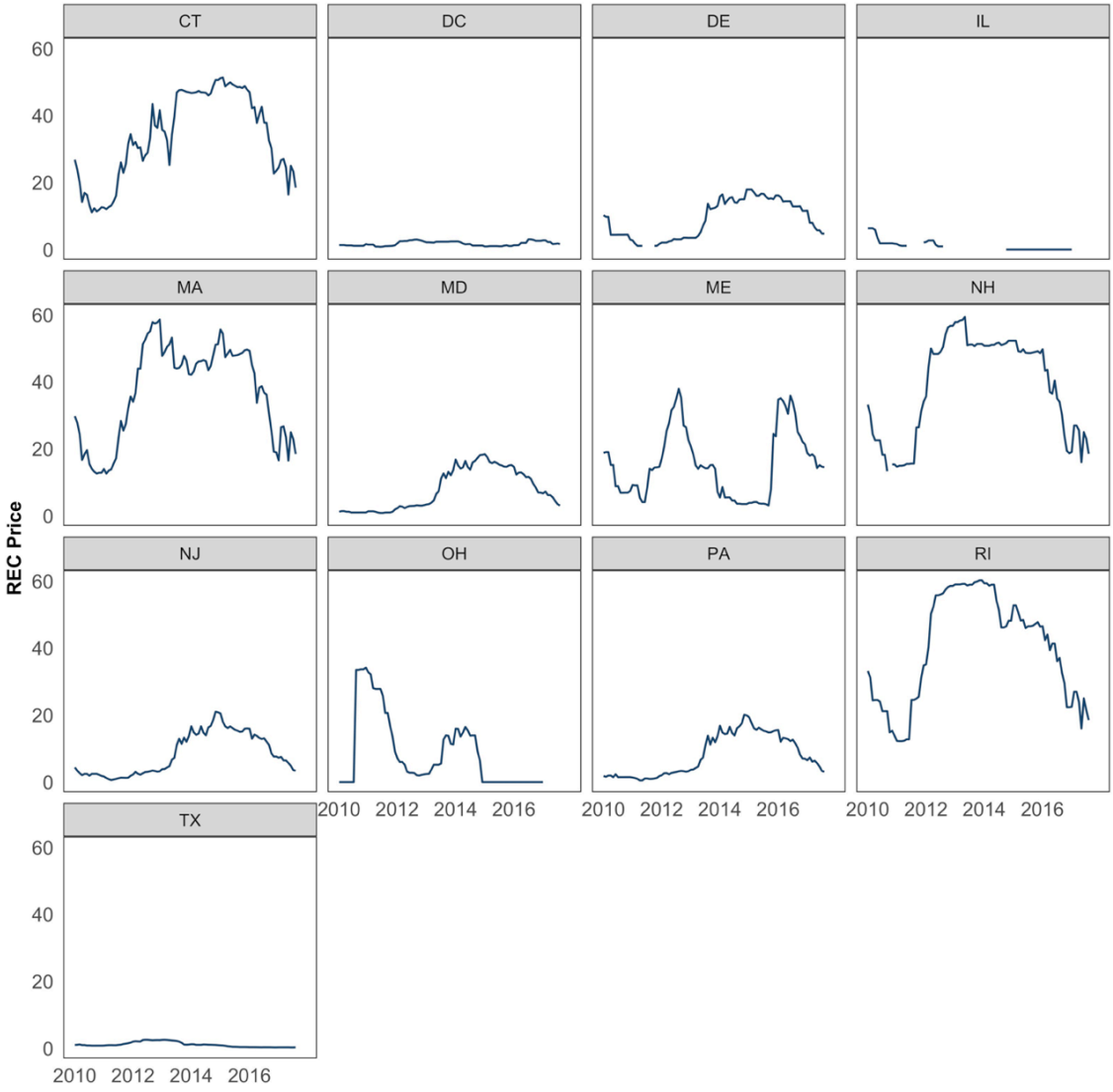

Figure 20. Prices of RECs used for compliance (excluding SRECs), January 2010—August 2017

Sources: SNL Energy 2017 and Marex Spectron 2016
Line breaks indicate missing data. The Ohio RPS program was frozen in 2015 and 2016.

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Some states have RPS carve-outs to support solar or distributed generation. Regulated entities use solar RECs (SRECs) to demonstrate compliance with solar-specific RPS requirements. SRECs are generally costlier than other compliance RECs due to limited supply of solar in SREC states. In Massachusetts and New Jersey, SREC prices fell from highs in 2015, while pricing in Washington, D.C. rebounded from a dip in late 2015 to record high levels by early 2017 (Figure 21). In Maryland, SREC prices saw a large drop from 2015 into 2016 as the market became oversupplied; in early 2017, SREC prices in Maryland were in the $10–$15/MWh range, down from more than $150/MWh in 2015.

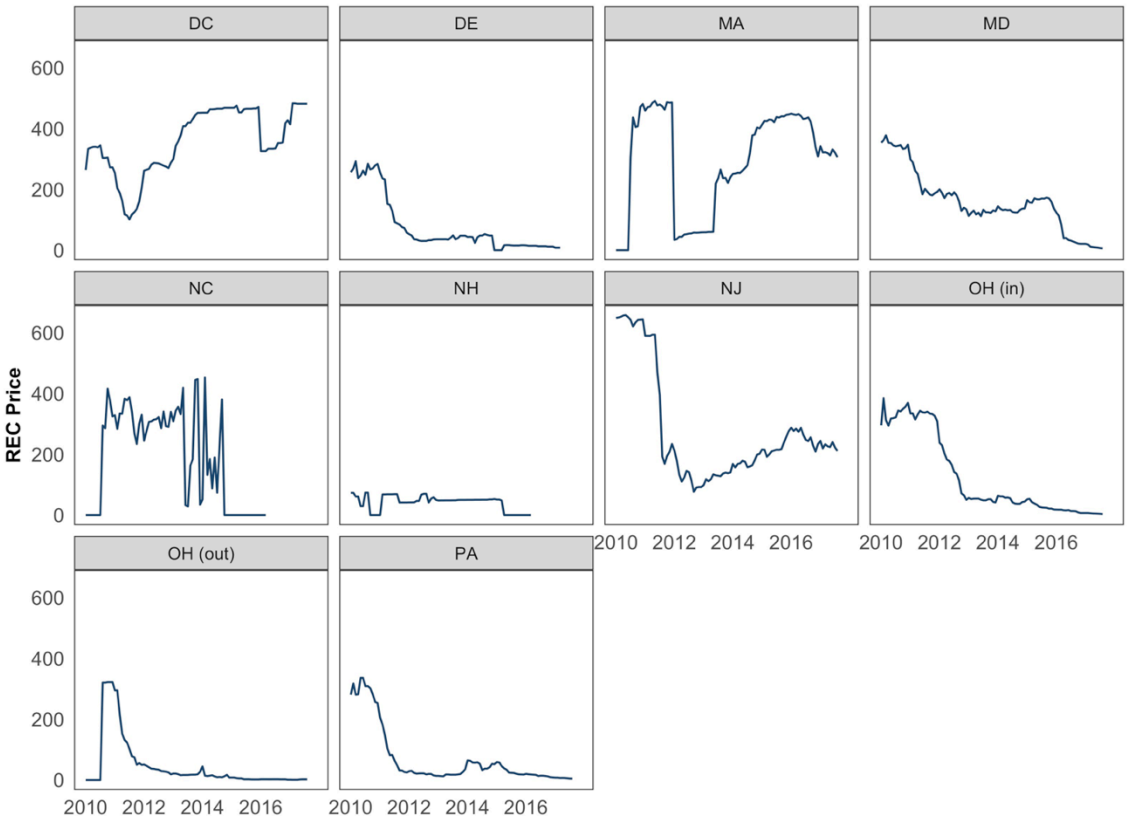

Figure 21. SREC pricing, January 2010—August 2017

Sources: SNL Energy 2017 and Marex Spectron 2016

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7 Community Choice Aggregation

Seven states to date have passed legislation that allows certain jurisdictions to form community choice aggregations (CCA). A CCA aggregates electricity customers within the jurisdiction to procure electricity and RECs from an alternative electricity supplier (Figure 22). In general, electricity customers are automatically enrolled in the electricity service selected by the CCA, although customers may opt out if they do not want to participate in the CCA. While CCAs can source their electricity from any generation type, several CCAs have procured green power products through alternative suppliers. CCAs may offer green power products either by default or as an optional premium package. CCA sales and participation estimates in this report are based on questionnaire responses (California, Massachusetts, New York, and Ohio) from publically available data (Illinois).

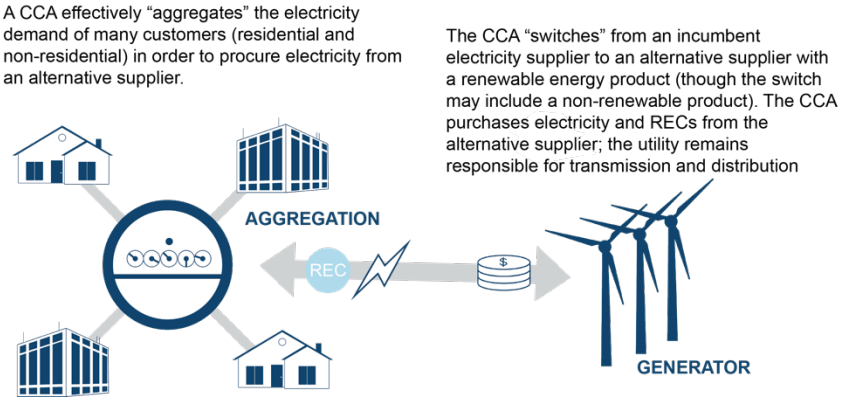

Figure 22. How community choice aggregation works

The figure provides a simplified schematic for visualization purposes. Specific program structures may vary.

7.1 Status of CCAs

In 2016, community choice aggregations sold about 8.7 million MWh of green power to about 3.3 million customers (Figure 23) in five states: California, Illinois, Massachusetts, New York, and Ohio.

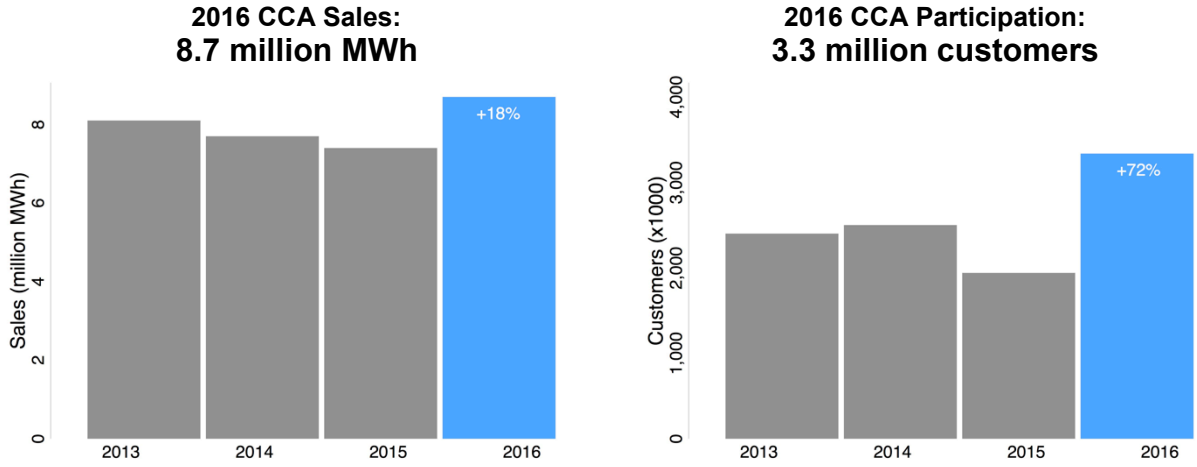

Figure 23. CCA sales and participation from 2013 to 2016

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7.2 Trends in CCAs

Green power sales and participation in CCAs increased from 2015 to 2016 in all five states with green power CCAs (Table 8). Illinois continues to lead the states with over two million CCA participants and its sales volume has remained relatively steady, while Massachusetts showed the largest increase in CCA participation on a percentage basis because of the addition of several new CCAs. California CCAs added the most green power sales in 2016. This section discusses trends in each of the five states with green power CCAs.

Table 8. CCA Green Power Sales and Participation by State in 2016

State	Estimated Green Power Sales (MWh) (%Δ from 2015)	Participants in CCAs with Green Power Products (%Δ from 2015)	CCAs with Green Power Products (as of 12/31/16)
Illinois[a]	4,972,000 (1%)	1,909,997 (32%)	62 programs
California[b]	2,574,000 (56%)	528,000 (43%)	CleanPowerSF Lancaster Choice Energy Marin Clean Energy Sonoma Clean Power
Ohio[b]	513,000 (-12%)	119,000 (49%)	City of Cincinnati City of Cleveland
Massachusetts[b]	430,000 (54%)	673,000 (2000%)	17 programs
New York[b]	248,500	106,473	Sustainable Westchester

[a] Estimate extrapolated from publicly available reports of green power products in CCAs applied to historical data on electricity usage
[b] Based on data collected by NREL. Percentage changes are omitted because the program began in 2016.

California

California saw the largest jump in estimated green power sales year over year of any state where CCAs are available. One factor driving this trend was the rollout of CleanPowerSF in May 2016, which added over 75,000 customers. In addition, Marin Clean Energy expanded its service territory in September 2016 to include seven more municipalities, adding as many as 94,000 customers (Kaften 2016).

The California CCA market is likely to continue to grow as other municipalities implement new programs. In 2016, San Mateo County launched Peninsula Clean Energy, which currently serves all county residents with its ECOPlus (50% renewable) and ECO100 (100% renewable) programs (PCE 2017). Three other CCAs were formed in April and May 2017: Apple Valley Choice Energy, Redwood Coast Energy Authority, and Silicon Valley Clean Energy (Lean Energy U.S. 2017).

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A variety of municipalities and counties, including Los Angeles and San Diego counties are considering launching CCAs (Figure 24). If these and other interested jurisdictions establish CCAs, as much as 85% of California's electricity load could be served by CCAs, direct access, or customer sited generation by the mid-2020s (CPUC 2017a).

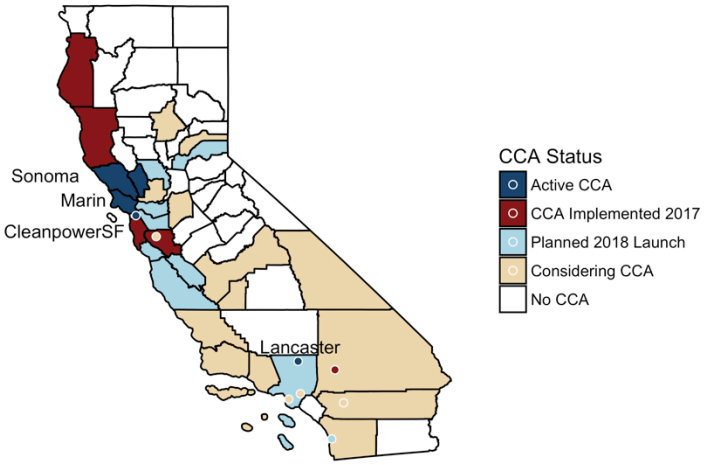

Figure 24. California CCAs

Figure based on information from Lean Energy U.S. 2017

Given these market dynamics, the CPUC held a hearing on CCAs with the California Energy Commission on May 19, 2017 to understand the potential impacts of CCA expansion (CPUC 2017b). The hearing focused on resource planning and cost allocation, among other topics. The CPUC has the authority to review utility resource plans and require long-term investments to meet state policy goals. It is unclear whether the CPUC has the same authority over CCAs. If not, staff argued this may limit the state's ability to achieve long-term policy goals, including reducing greenhouse gas emissions (CPUC 2017c).

In contrast, the CPUC has clearer authority to allocate costs across ratepayers, both utility ratepayers and those ratepayers leaving utilities for a CCA. The CPUC has approved utility requests to recover investments made to serve the load of departing CCA customers via the Power Charge Indifference Adjustment, also known as an exit fee. These exit fees are designed to allow utilities to recover stranded investments, including investments in solar and wind projects to meet historical and future RPS requirements. On June 29, 2017, the CPUC proposed a rulemaking to review and revise exit fees. While the outcome of this proceeding is uncertain, changes to the exit fees would influence the electricity rates offered by CCAs and how they compare to those of the regulated utility. Current CCA rates are marginally lower than those of the utility for at least some customer classes (Table 9). Exit fee increases could increase the number of new customers that decide to opt out of CCAs and remain with their existing utility service. For example, the CPUC authorized Pacific Gas & Electric (PG&E) to increase its exit fee to relevant CCA customers in late 2015. This exit fee increase may have contributed to a 27% increase in the percentage of customers opting out of CCAs between 2015 and 2016, according to NREL survey results. The average CCA dropout rate in California in 2016 was about 15%.

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Table 9. Select CCA Residential Rate Comparison with Certain Utility Rates in California

	CleanPowerSF		Lancaster Choice Energy		Marin Clean Energy		Sonoma Clean Power	
Charges	PG&E (30% RE)	Green (40% RE)	SCE (25% RE)	Clear Choice (35% RE)	PG&E (30% RE)	Light Green (50% RE)	PG&E (30% RE)	Clean Start (36% RE)
Electric Generation	$27.55	$19.14	$50.54	$43.09	$43.78	$32.04	$49.33	$36.21
PG&E Electric Delivery	$43.51	$43.51	$85.64	$81.93	$61.75	$61.75	$71.03	$71.03
Additional Charges including exit fees)	$4.66	$13.00		$10.16		$13.25		$12.16
Total	$75.72	$75.65	$136.19	$135.18	$105.53	$107.04	$120.36	$119.40
Key Assumptions	280 kWh on E-1 rate		676 kWh on Schedule D Rate		445 kWh on E-1 Rate		510 kWh on E-1 Rate	

Sources: San Francisco Water Power Sewer 2017, Lancaster Choice Energy 2017, Pacific Gas & Electric and MCE, 2017, and Sonoma Clean Power, 2017

CCAs may need to actively market benefits other than cost savings if their rates reach or exceed utility rates in order to retain customers. One marketable benefit could be fostering economic development through procuring local renewable generation. In 2017, Marin Clean Energy launched a new local solar option, Local Sol, in addition to its Light (50% renewable) and Deep Green (100% renewable) offerings (MCE 2017a). In this program, interested customers can purchase 100% renewable electricity from a solar project located within Marin Clean Energy's territory at about a 30% cost premium to that of the Deep Green program. Marin Clean Energy markets the program as a local, green economic development tool that also offers guaranteed long-term rates the same as their other programs do (MCE 2017b). The performance of this and similar programs may be of interest to other CCAs.

Illinois

Illinois remains the state leader of green power CCA sales and participation. Sixty-two Illinois communities procured green power for over two million customers through CCAs by the end of 2015. Participation increased from 2015 to 2016, though many of these new customers are enrolled in CCAs with 50% or lower renewable energy content products. Further, despite an initial surge in green power sales around 2013, CCA green power sales have been stagnant in Illinois for the past several years. Slow movement of CCA green power sales is driven in part by communities allowing green power contracts to expire without renewal. Figure 25 illustrates changes in program status over time for Illinois CCAs. Of 98 communities that procured green power through CCAs at the beginning of 2014, only 45 communities maintained their green power programs through the end of 2016, 50 CCAs canceled their green power procurement and three programs reduced their green power procurement level from 100% to 50% or a customer opt-in. Over the same timeframe, only 14 communities formed new CCAs with green power

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products. These trends are mostly associated with the changing economics of green power options. Illinois CCAs initially offered highly competitive rates (2011–2013), contributing to the rapid expansion of CCAs in the state and allowing many CCAs to successfully market green power products. However, CCA rates became less competitive over time (2014–2015), undermining the value proposition of CCAs and reducing the attractiveness of green power options (Lean Energy U.S. 2017).

Illinois green power CCAs appear to show some spatial trends. For example, green power CCAs are popular around Chicago and Peoria but relatively absent in other metropolitan areas such as Rockford and Champaign.

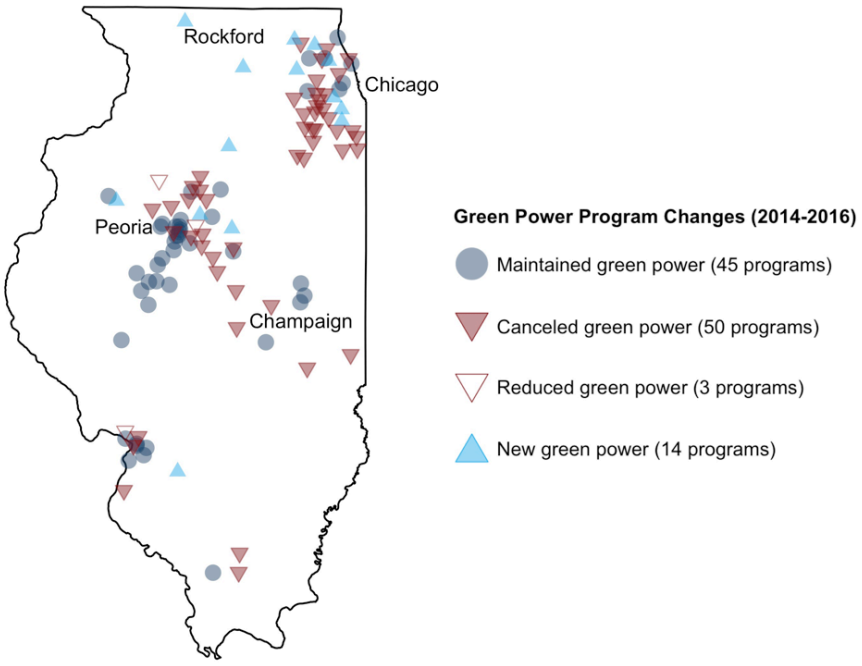

Figure 25. Changes to Illinois Green Power Programs from 2014 to 2016

The figure is based on data from Dynegy 2017 and ICC 2017.

Massachusetts

Customers in 37 Massachusetts cities and towns can procure green power through CCAs. Sixteen separate communities have aggregated, while the Cape Light Compact acts as a single aggregator on behalf of 21 towns in southeastern Massachusetts (Figure 26). The City of Lowell is the largest CCA in Massachusetts, procuring over 200,000 MWh of green power in 2016.

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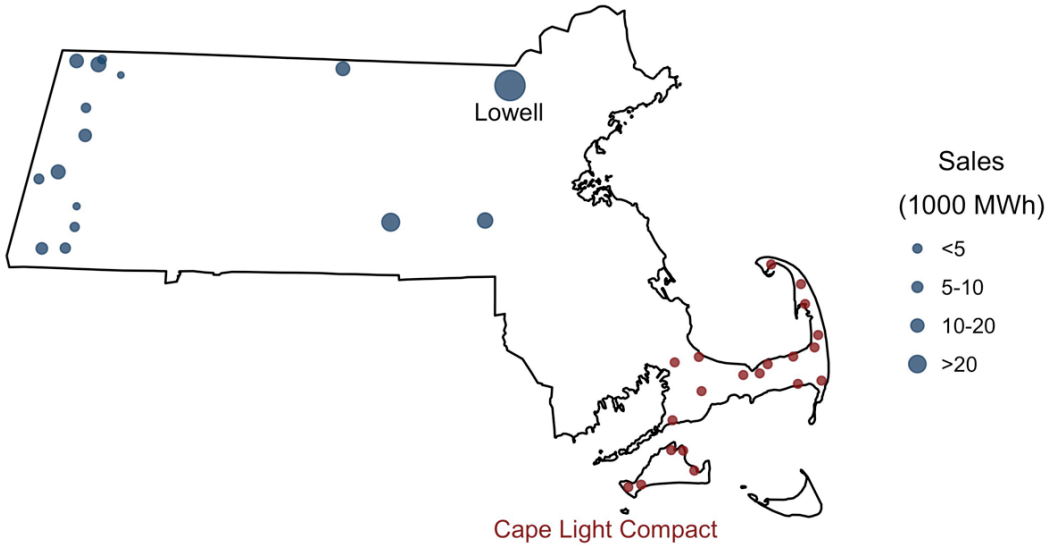

Figure 26. Massachusetts CCAs

CCA participation and sales in Massachusetts may increase going forward. In 2017, Arlington, Brookline, Gloucester, Somerville, Sudbury, and Winchester all launched new CCA programs that provide at least 5% more renewable energy than required by state law.[10] These municipalities are members of the Metropolitan Area Planning Council, which is the regional planning agency for 101 cities and towns of metropolitan Boston. The council has selected Good Energy to help member municipalities procure their own energy resources (Un 2017). Other member municipalities, including Bedford, Hamilton, Stoneham, and Woburn are working with Good Energy to potentially launch their own programs (Mass Energy Consumers Alliance 2017).

However, similar to trends in Illinois, some municipal programs have stopped participating in green power CCAs. For instance, after launching in 2016, Melrose, Massachusetts returned customers to utility service in 2017, when capacity charges in their load zone increased (Grover 2017). The city determined that utility rates would be more cost-effective, because National Grid had the ability to blend capacity charges across Massachusetts' three load zones in their rate structures. Melrose could provide a green power CCA option in the future, but this may depend on the potential net savings to customers. Similar to Illinois, this illustrates that the competitiveness of CCA rates is important for fostering green power CCA participation.

[10] See program details for each municipality: "Municipal Aggregation," Commonwealth of Massachusetts, http://www.mass.gov/eea/energy-utilities-clean-tech/electric-power/electric-market-info/approved-municipal-aggregation-programs.html. Gloucester's program is not finalized, but it is expected to provide a default green option (Mass Energy Consumers Alliance 2017).

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New York

Westchester Power—New York's first and only CCA –serves over 100,000 customers across 20 municipalities. The 100% renewable option is $1–$2/month over the CCA's basic option. Fourteen of Westchester Power's municipalities have selected this option (Westchester Power 2017). Though the green option is more than the basic rate, it is still lower than average utility rates. Other New York municipalities are considering CCAs, including the Town of Oneonta, which voted to explore aggregation in 2016 (MEGA 2016; Richardson 2017). In 2016, the New York Public Service Commission published a decision in Case 14-M-0224 that was designed to make it easier for communities to form CCAs, and the full impacts of this decision are not yet known.

Ohio

Though over 200 communities work through the Northeast Ohio Public Energy Council (NOPEC 2017) to negotiate lower rates for electricity, only a few communities such as Cleveland and Cincinnati offer green power options. Participation has decreased over the past two years. One reason for this may be that both of Cleveland's green power options (50% and 100% renewable) are at a price premium to their basic service (Constellation 2017). At the same time, green power sales have increased in the state. This may be a result of developments in Cincinnati's program. Cincinnati offers a 100% renewable energy product supported by nationally sourced, unbundled RECs. Unlike Cleveland's program, the Cincinnati CCA provides a net savings to customers over utility rates (City of Cincinnati 2017). Other factors likely influence participation and sales from year-to-year, but rate savings volatility may influence this CCA market.

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8 Power Purchase Agreements

In a power purchase agreement (PPA), an electricity customer enters into a long-term contract with a generator to buy electricity. PPAs have been used, mostly by large non-residential customers to buy electricity from renewable energy projects located on the customers' premises (on-site projects) and remote from the customer (off-site). The analysis in this section is limited to off-site PPAs (Figure 27, below).

PPAs have two primary forms. In a physical PPA, the customer enters into a contract to buy electricity at a negotiated PPA rate. The purchased electricity is credited toward the customer's electric demand such that, from a billing perspective, the customer uses the electricity (regardless of whether the electricity is physically delivered to the customer's site). In a financial PPA, the customer enters into a contract for differences for electricity at a negotiated PPA rate. The generator sells electricity into the local grid at the local wholesale rate. The customer and generator are financially obligated to settle differences between the PPA rate and the wholesale rate; the customer pays the generator the difference when the wholesale rate is less than the PPA rate, and the generator pays the customer the difference when the wholesale rate is greater than the PPA rate. The generator's output is not credited toward the customer's electricity use. In a financial PPA, RECs are effectively unbundled from output and sold to the offtaker.

PPA sales and participation estimates in this report are based on data from BNEF (2017).

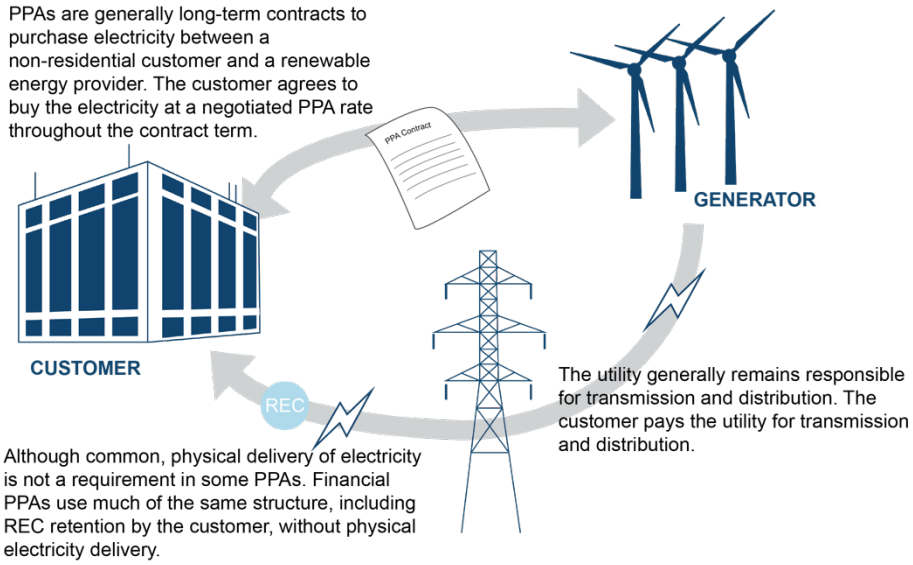

Figure 27. How power purchase agreements work

The figure provides a simplified schematic for visualization purposes. Specific contract structures may vary.

8.1 Status of PPAs

In 2016, 7.9 million MWh of green power were consumed through 210 PPAs; these results reflect projects commissioned by the end of 2016 where the customer purchases the RECs for voluntary purposes (Figure 28). Sales grew 19% while the number of projects increased by 8%, from 2015 to 2016. Sales in 2017 have not grown much from end of year 2016 because projects

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signed in 2017 have yet to come online. An additional 15.5 million MWh of PPAs were contracted for but not yet commissioned.

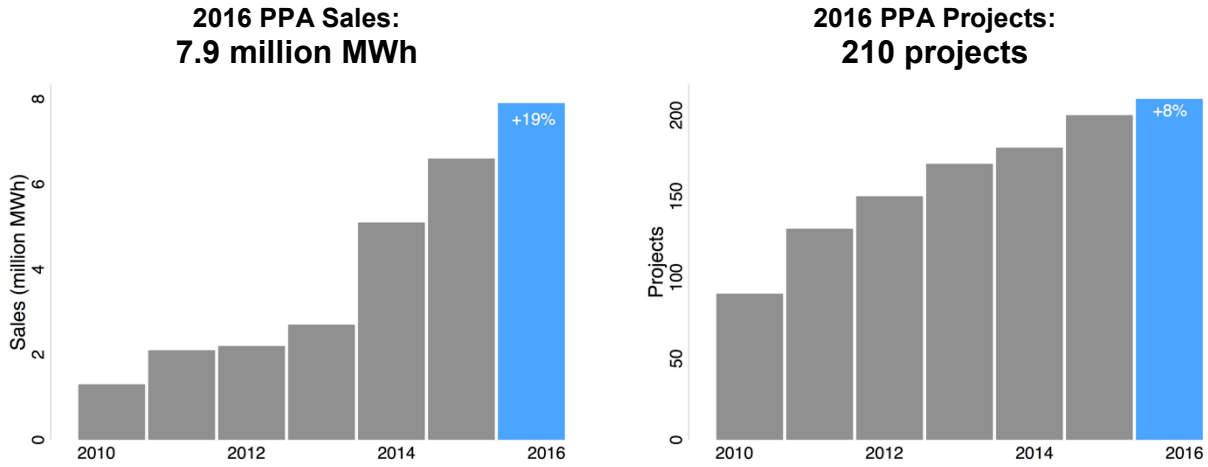

Figure 28. PPA sales and participation from 2010 to 2016

8.2 Trends in PPAs

Consistent with 2015, a large number of PPAs were signed in 2016, but the majority of projects signed in 2016 have yet to be commissioned (Figure 29). Signed capacity (with and without RECs passing to customers) peaked in 2015 at 3,684 MW. About 75% (2,779 MW) of those projects have not yet been commissioned. Cumulatively, 10,214 MW have been signed, with 4,356 MW commissioned, as of July 2017.

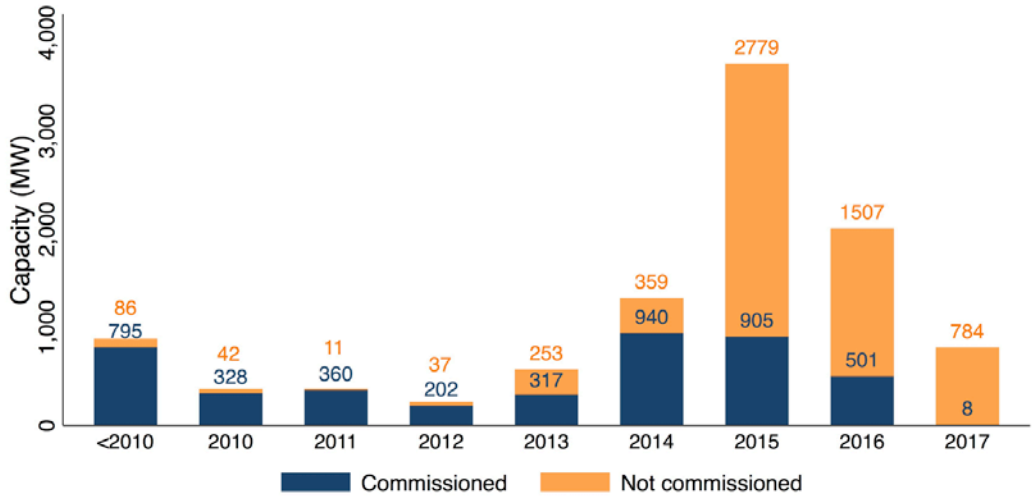

Figure 29. Project status of corporate PPAs, with and without RECs, through July 2017

In addition to growth trends, we summarize leading sectors and companies using PPAs, evidence of market expansion, and regional trends in PPAs.

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Tech Sector Continues to Lead the PPA Segment

In 2016, the tech sector continued to lead the PPA market, though contracts signed lagged behind 2015 (Figure 30). Purchasers in 2015 were likely increasing procurement in 2015, given uncertainty over federal tax incentives.

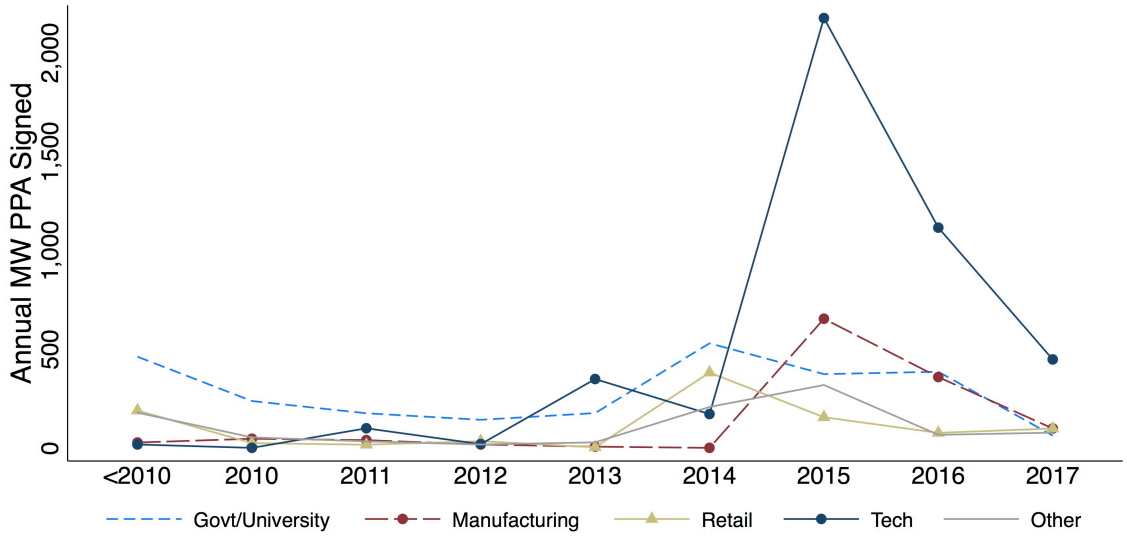

Figure 30. PPA capacity (MW) signed by sector by year, through July 2017

The largest five purchasers through July 2017 were Google (1,210 MW), Amazon (979 MW), U.S. Department of Defense (624 MW), Apple (439 MW) and Microsoft (433 MW). Non-tech companies, including government, retail, and manufacturing round out the rest of the top 15 PPA purchasers (Figure 31).

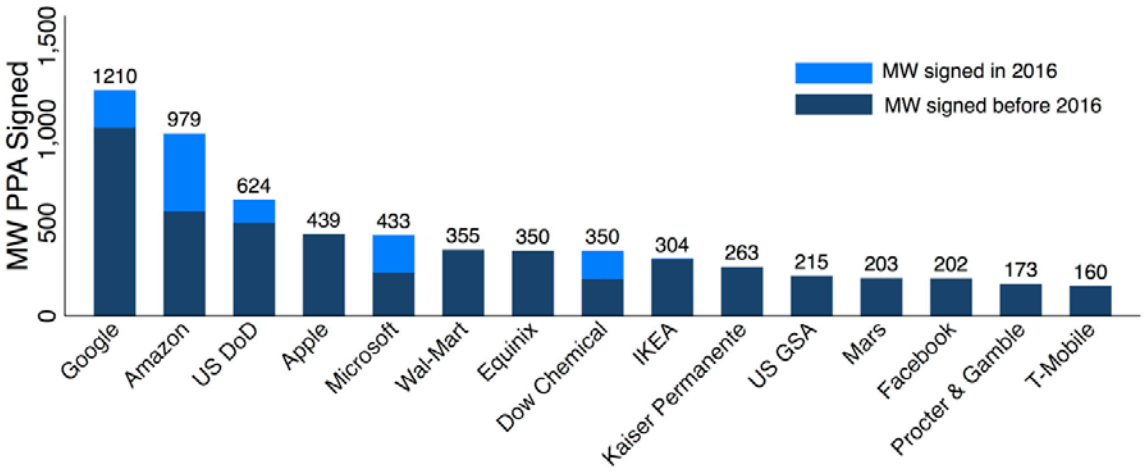

Figure 31. Leading institutions signing PPAs, through July 2017

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Focusing on 2016, other top purchasers included 3M (120 MW), Johnson & Johnson (100 MW), and the University of California (80 MW). 2016 also saw the signing of an aggregate PPA for 60 MW of solar by the Massachusetts Institute of Technology, the Boston Medical Center, and the Post Office Square Redevelopment Corporation.[11] While large institutions continue to dominate the PPA market, the aggregate PPA signed by these institutions demonstrates that there is appetite from smaller institutions to achieve the benefits of signing a long-term PPA.

New Companies are Continuing to Sign Off-Site PPAs

The market for off-site PPAs continues to expand to new companies.[12] In every year from 2010 to 2017, new companies have outnumbered companies that had previously signed PPAs (Figure 32). In 2016, 65% of the companies that had signed PPAs were first-time PPA signers. This figure has been fairly consistent since 2012, ranging from 60% to 70% annually between 2012 and July 2017. This consistency indicates the market for PPAs is expanding (i.e., it is not simply the same companies signing new PPAs year after year).

Figure 32. New companies signing off-site PPAs, through July 2017

Most PPA Capacity is Located in Texas and the Southwest

The Electric Reliability Council of Texas (ERCOT) and the Southwest Power Pool (SPP) dominated PPA capacity in 2016, as they have in recent years (Figure 33). In 2016, ERCOT accounted for 57% of signed PPA capacity, while SPP accounted for 29%. PPAs in these regions have been for large-scale wind facilities. PJM has seen the third-largest capacity of PPAs in 2016, with a mix of large wind deals in Ohio and Pennsylvania, but also solar projects in Maryland, New Jersey, and Virginia.

[11] See Heeter, Cook, and Bird (2017) for details.
[12] We focus on off-site PPAs here, as data on these purchases is more complete than it is for on-site PPAs.

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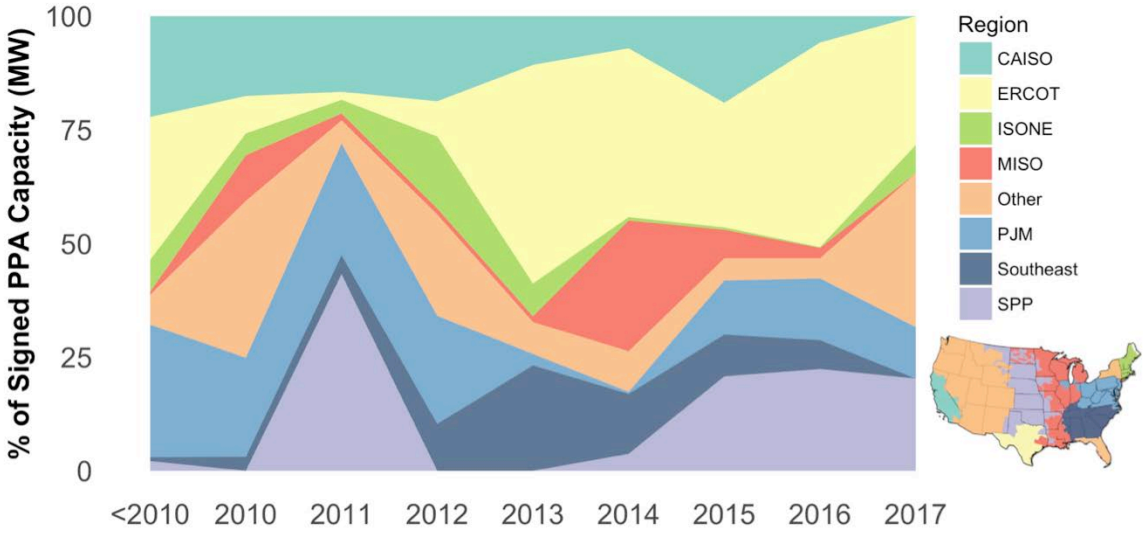

Figure 33. Share of signed PPAs by region (based on location of generator)

CAISO = California Independent System Operator
ISONE = Independent System Operator of New England
MISO = Midwest Independent System Operator
PJM = Pennsylvania, Jersey, Maryland Power Pool

The lack of PPAs in some regions of the country is due both to a lack of a wholesale market for generators to sell into, which restricts the use of a financial PPA option, and to less favorable economics for renewable generators. Most of the western and southeastern states lack a wholesale market (Figure 34). In those regions, some green tariff options are emerging to address the needs of large commercial customers (Section 4).

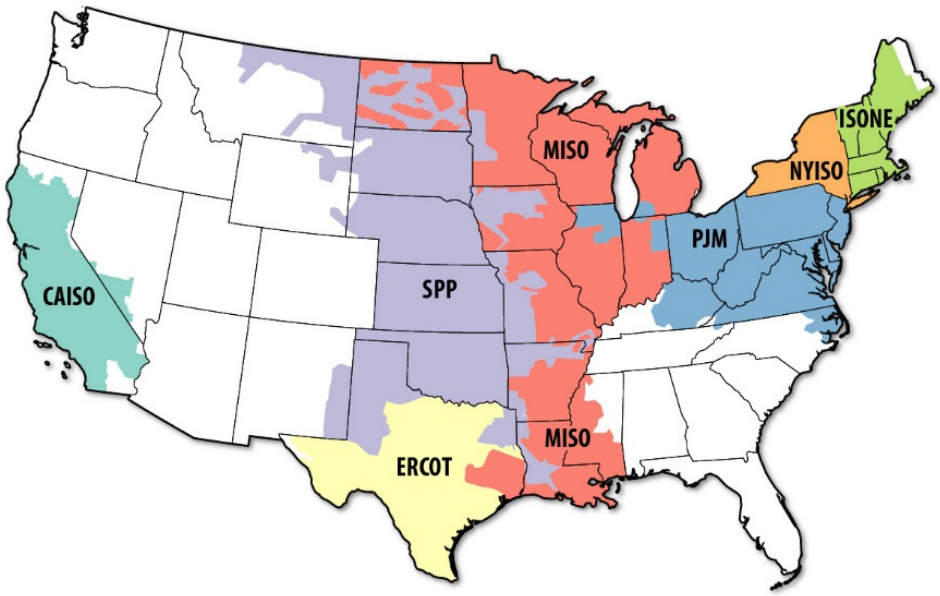

Figure 34. Map of regional transmission organizations and independent system operators

Source: Billy Roberts, NREL

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9 Community Solar

In a community solar program, a utility or third-party project developer develops a solar project and sells the output to multiple subscribers (Figure 35). Community solar subscribers are generally compensated through utility bill credits that are proportional to the size of their subscription, though some programs are structured as a bill premium similar to a green pricing program.

To date, the vast majority of community solar customers have not received the RECs associated with their energy subscriptions. Community solar output is often used by utilities to meet RPS compliance obligations. For this reason, community solar sales outside of PG&E's Solar Choice program have been excluded from our total estimates for the overall green power market because of double-counting concerns.

Community solar sales and participation data are based on an NREL data set of community solar projects compiled from various sources, including CEC (2017), IREC (2014), CERT (2017), and PG&E (2017).

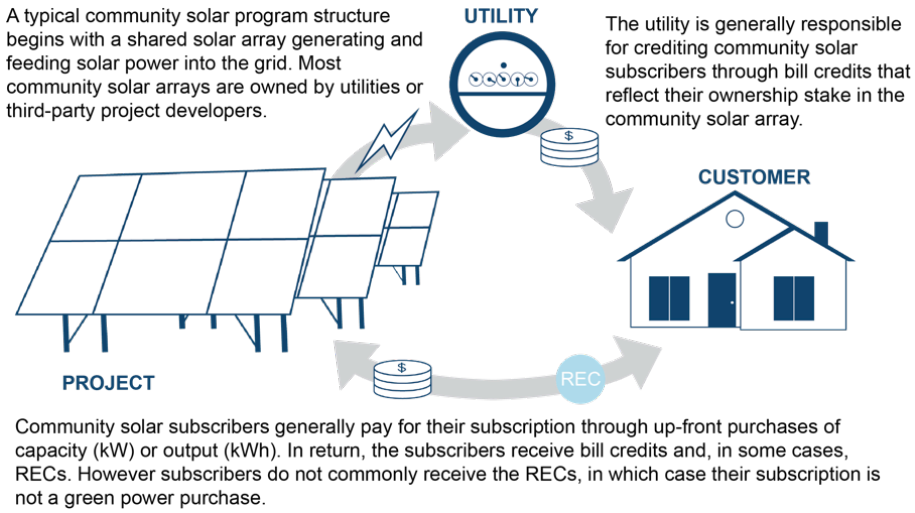

Figure 35. How community solar works

The figure provides a simplified schematic for visualization purposes. Specific program structures vary.

9.1 Status of Community Solar

In 2016, about 23,000 customers purchased 258,000 MWh of community solar output (Figure 36). Of these customers, at least 4,800 customers purchased about 32,000 MWh of green power through PG&E's Solar Choice program,[13] in which community solar subscribers retain RECs by program design (PG&E 2017).

[13] PG&E reported 14.6 MW of capacity had been subscribed through the project. Generation was estimated based on solar capacity factor for California, and the number of customers was estimated based on average electricity use per account in California.

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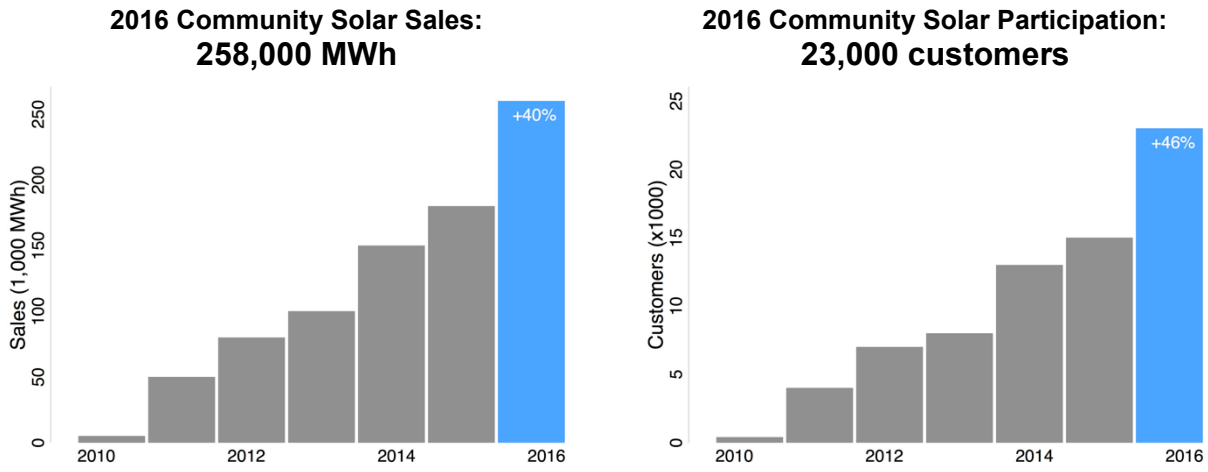

Figure 36. Community solar sales and participation from 2010 to 2016

9.2 Trends in Community Solar

As of September 2017, 223 community solar projects with a total of at least 278 MW of capacity were operational in the United States. Community solar continues to show significant growth, adding about 37 MW of capacity from 28 new projects in 2016. Nonetheless community solar has generally lagged early industry projections, in part because of regulatory uncertainty in Minnesota. We present three key trends from 2016: the geographic expansion of community solar continues, enabling legislation remains important to community solar growth, and Minnesota's and Wisconsin's community solar projects experience explosive growth.

The Geographic Expansion of Community Solar and Enabling Legislation

Fourteen states and Washington, D.C. have some form of legislation enabling community solar deployment (Figure 37). Enabling legislation can take many forms, including requirements for utilities to purchase community solar output (e.g., Colorado and Minnesota) and policies that explicitly allow virtual net metering (e.g., Massachusetts). About 77% of community solar projects have been developed in a state that had enabling legislation. However, the majority of states with community solar projects do not have legislation that explicitly enables community solar, and more than 73 MW of community solar have been deployed without the support of enabling legislation. Community solar deployment in these states is typically led by utilities. In addition, enabling legislation appears to have no effect on project size or whether a project sells out of subscriptions.

Although it is clear that enabling legislation is not a prerequisite for community solar, supportive policies may be foundational for large-scale community solar deployment. All states with more than 10 community solar projects have enabling legislation in place (Figure 37).

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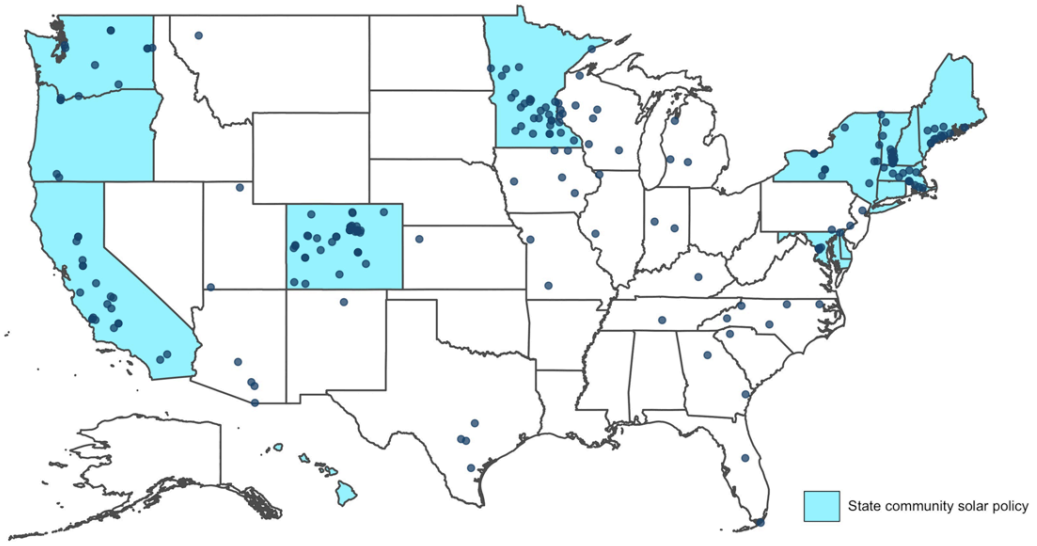

Figure 37. Active community solar projects and states with community solar policies

Minnesota's and Wisconsin's Community Solar Boom

In 2016 alone, Minnesota brought online 17 MW of community solar projects, led mostly by Xcel Energy. The launch of Xcel Energy's community solar program in 2014 and state legislation have allowed Minnesota to bring online 50 MW of community solar to date. The program had a slow start because of interconnection issues. The implementation of a more standardized interconnection process addressed this issue and has allowed construction of these projects to proceed. Xcel has committed to a total of 96 MW of community solar in and around the Minneapolis-Saint Paul metro area (Xcel Energy 2017). The majority of Xcel's community solar gardens have a completion date of late-2017 or 2018 (Figure 38).

Wisconsin has also shown community solar growth. As of September 2017, it has 2 MW of operational community solar projects installed, despite the absence of enabling legislation. Wisconsin has an additional 6 MW of community solar in the project queue that are pending approval or under construction. The state's public utilities and rural coops are the main drivers of the recent voluntary community solar push (Gulley 2017). Xcel Energy is responsible for two 1-MW projects in the state, one of which was experiencing permit delays but both of which are expected to be online in 2017 (Xcel Energy 2016). In 2015, Dairyland Power Cooperative issued a request for proposals for solar generation resources and in 2016 announced that agreements were in place for 15 new solar facilities in Wisconsin with 15 MW of capacity (Dairyland Power Cooperative 2016).

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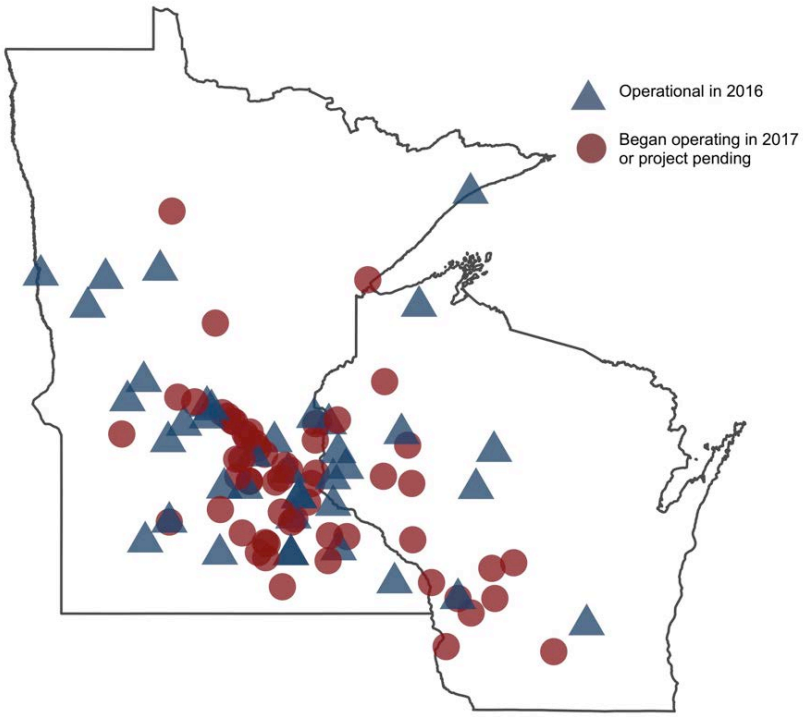

Figure 38. Active and pending community solar projects in Minnesota and Wisconsin

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10 The Geography of Green Power

In this section, we use available data to estimate the geography of green power demand and supply. Green power demand refers to the number of customers procuring green power within a state. Green power supply refers to the *state of origin* where the renewable energy is generated, regardless of where the green power is ultimately consumed. These state-level estimates are approximations based on the best available data and should be treated as such. The same data limitations that are discussed in Section 1 apply to the results presented in this section (Table 2).

The geography of green power is partially determined by the local availability of different green power mechanisms. Every electricity customer in the United States can buy green power through unbundled RECs and PPAs.[14] However, the availability of the remaining green power mechanisms varies by region, state, and utility. Figure 39 depicts the primary green power mechanism by state in terms of number of customers. It illustrates how state and utility policy dictates the availability of green power options. Competitive suppliers meet the green power requirements of customers in restructured electricity markets in the northeast and Texas, while utility green pricing programs serve the needs of customers in fully regulated markets in most of the rest of the country. CCAs have emerged as the dominant green power option in five of the seven states that allow CCAs. Where local options are unavailable, customers primarily procure green power through unbundled RECs.

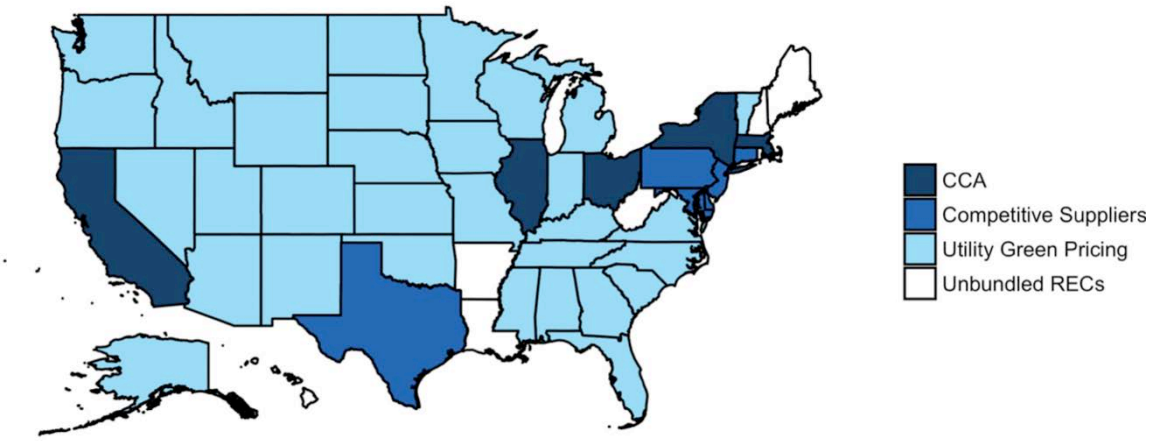

Figure 39. Primary form of green power demand (number of customers) by state

To illustrate how the local availability of green power products affects the geography of green power, Figure 40 depicts the number of green pricing program customers (left pane) and the state of origin (right pane) for green pricing programs by state (see the appendix for data tables). Led by Portland General Electric, Oregon is the state leader in terms of green pricing customers. Portland General Electric—and other Oregon programs—primarily source green power generation from within the region. As a result, generation for green pricing programs is concentrated in the Pacific Northwest and California, illustrating how green pricing programs tend to source local green power.

[14] Some states do not allow physical PPAs, though financial PPAs may be signed in any state.

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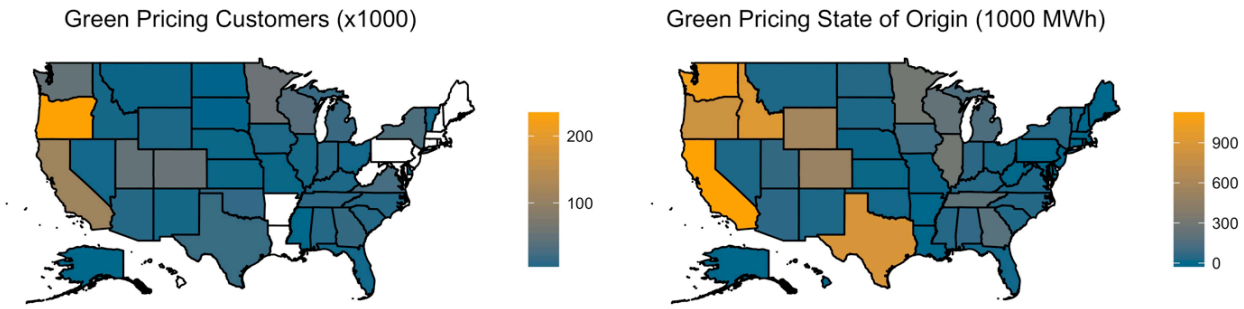

Figure 40. Utility green pricing program number of customers (left pane) and green power generation source (right pane) by state

States in white in left pane indicate no active green pricing programs in that state.

Differences between the left and right pane of Figure 40 illustrate how the location of green power customers does not necessarily overlap with the state of origin. For instance, Oregon has the largest number of green pricing program customers, but is the fifth largest state of origin for green pricing program generation.

Demand for unbundled RECs is more diffuse, given that unbundled RECs can be purchased anywhere in the country (Figure 41). Generation of unbundled RECs is similarly dispersed throughout the country, with more generation near customer bases such as California and the Northeast but also in resource-rich areas like the Midwest and Texas.

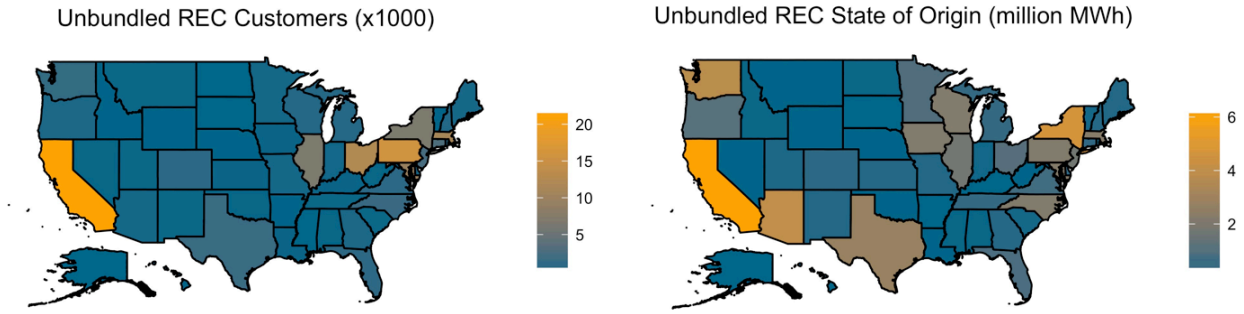

Figure 41. Unbundled RECs: Number of customers (left pane) and green power generation source (right pane) by state

To illustrate green power demand below the state level, Figure 42 illustrates zip code-level customer density based on data from the online energy services platform Arcadia Power. The data, a representative rather than comprehensive sample, show that the geography of green power demand generally corresponds with population centers, with higher demand in more densely populated metropolitan areas. At the same time, unbundled REC customers reside in all parts of the country, including rural areas.

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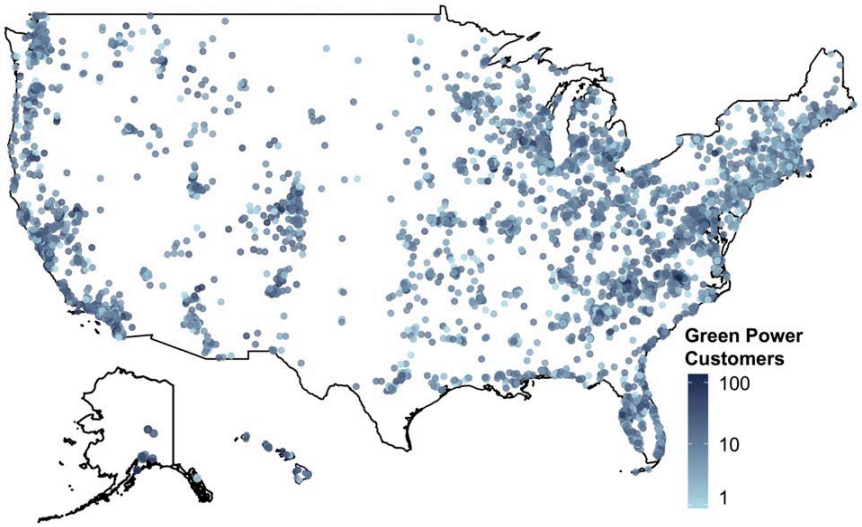

Figure 42. Geographic sample of residential and small commercial green power customers

Based on data from Arcadia 2017

Demand and generation for green power are more closely tied in PPAs than they are in other green power mechanisms (Figure 43). In physical PPAs, offtakers obtain green power from a resource located in their regional electric grid, often in the same state. Nonetheless, through financial PPAs, offtakers need not be located in the state of origin.

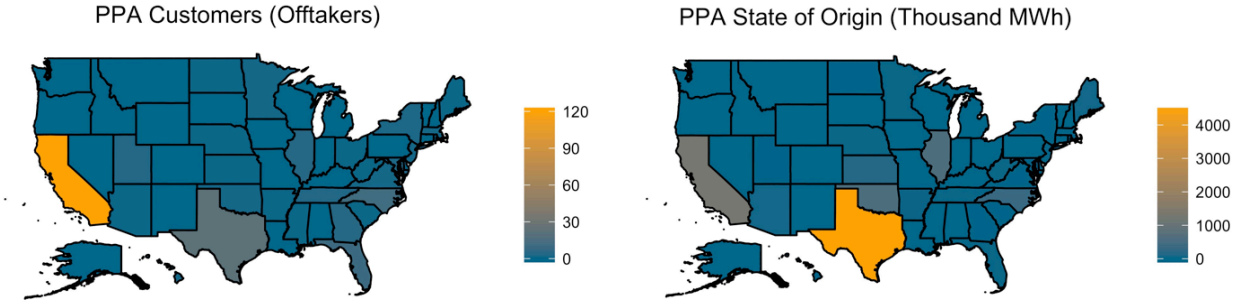

Figure 43. Number of PPAs (left pane) and generation (right pane) by state

Figure 44 depicts the geography of green power demand: the estimated sum of all green power customers from all green power mechanisms by state. The green power customer base is heavily concentrated in Illinois because of the large-scale participation of residential customers in CCAs in that state. Other states with large residential green power markets—such as Texas, Massachusetts, California, and New York—are among the other state leaders in terms of green power demand.

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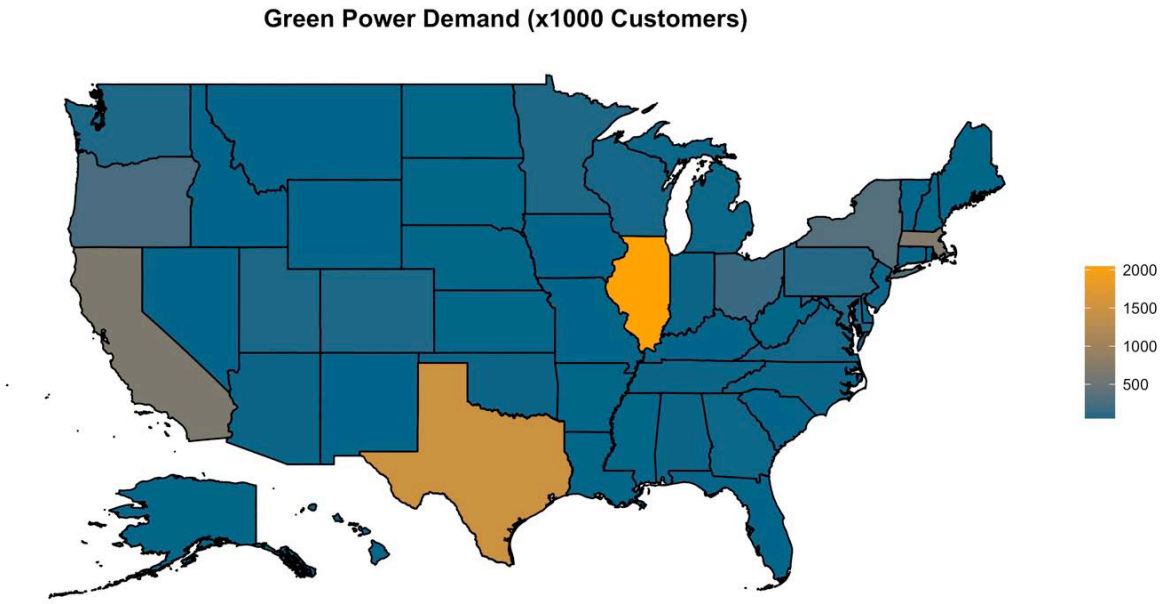

Figure 44. The geography of green power customer demand: Number of green power customers by state

Lastly, Figure 45 illustrates the geography of green power supply in terms of the MWh generated by state of origin. Texas, California, and Illinois—three states with strong wind resources—account for more than one third of the green power supply. Eighteen different states generated more than 1 million MWh of green power in 2016, and 42 states generated more than 100,000 MWh.

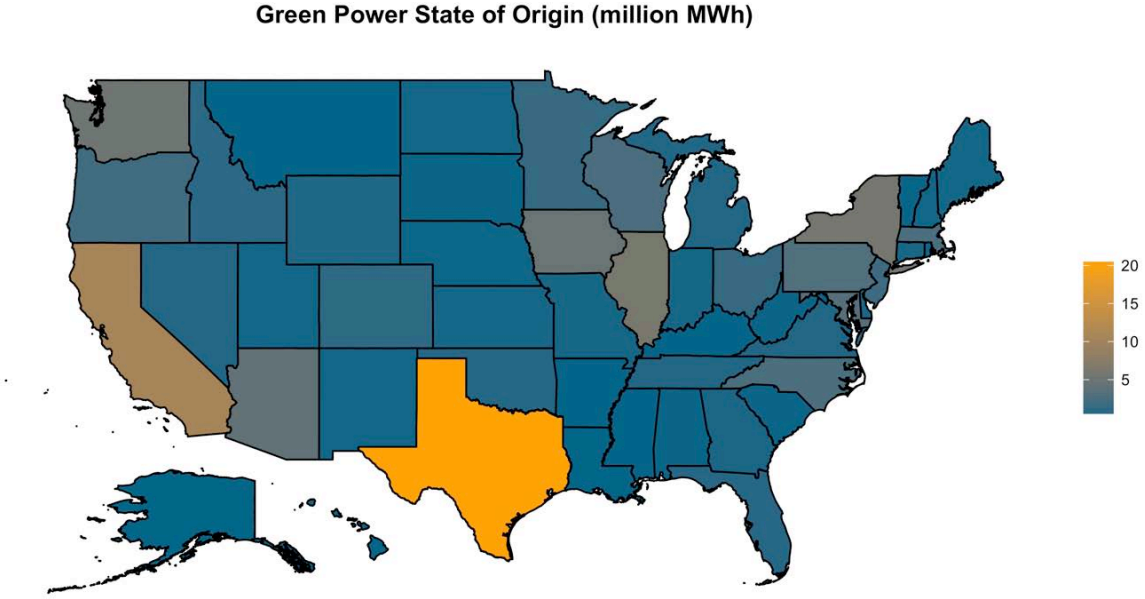

Figure 45. The geography of green power supply: Green power generation (million MWh) by state

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11 Conclusions and Observations

The U.S. voluntary green power market continues to grow. Green power sales increased by about 19% from 80 million MWh in 2015 to 95 million MWh in 2016. Participation in green power markets increased by 45% from 4,305,000 customers in 2015 to 6,257,000 customers in 2016. This market expansion is primarily attributable to increasing green power sales in unbundled RECs, CCAs, and PPAs.

- **Utility green pricing** sales grew by about 6% from 2015 to 2016. Consistent with previous years, this growth is primarily driven by the growth of a few large programs. However, the majority of green pricing programs showed declining sales from 2015 to 2016.
- **Utility renewable contracts** resulted in about 2.9 million MWh of green power generation in 2016 from 12 contracted projects. Utility renewable contracts are new green power mechanisms and several utilities are in the process of developing renewable contract programs.
- **Competitive supplier** trends are more difficult to assess because of data limitations. Based on available data, green power sales grew by 4% while participation grew by 34% increase in sales from 2015 to 2016.
- **Unbundled REC** sales grew by 22% and participation grew by 54% in 2016, primarily through increasing corporate renewable energy procurement.
- **CCA** green power sales grew by about 18% from 2015 to 2016, primarily as a result of program expansions in California and Massachusetts, as well as the implementation of the first CCA in New York. At the same time, CCA green power sales continue to stagnate in Illinois and Ohio.
- **PPA** sales grew by 19% from 2015 to 2016, with about 4,356 MW of commissioned projects and an additional 5,858 MW of capacity in the project pipeline. The tech sector continues to lead the expansion of PPAs.
- **Community solar** sales increased by about 40% from 2015 to 2016. However, green power sales, where customers retain the RECs, remain a small component of the community solar market.

A state-level geographic analysis of green power shows that green power demand is ubiquitous. Green power demand is higher in states such as Illinois, California, Texas, and Massachusetts where local green power options are available, but demand exists in every state and in both urban and rural areas. Demand for green power is likely to increase across the country as green power providers offer innovative new products and renewable energy prices continue to decline. Wind-rich states like Texas, California, and Illinois provide the majority of green power generation.

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Appendix. State-by-State Data Tables

This appendix provides state-level estimates of green power participation (Table A-1) and generation (Table A-2). These state-level estimates are approximations based on the best available data and should be treated as such.

Table A-1. Green Power Customers by State

State	Green Pricing	Renewable Contracts	Competitive Suppliers	Unbundled RECs	CCAs	PPAs	Community Solar	Total
AK	171	0	0	26	0	0	0	197
AL	7,787	0	0	98	0	0	0	7,885
AR	0	0	0	94	0	1	0	95
AZ	9,827	0	0	347	0	1	0	10,175
CA	111,186	0	1,212	21,267	527,696	120	4,800	666,280
CO	53,600	0	0	992	0	0	0	54,592
CT	0	0	4,842	2,974	0	0	0	7,816
DC	0	0	12,192	2,402	0	0	0	14,594
DE	339	0	3,571	323	0	0	0	4,233
FL	2,929	0	0	1,127	0	10	0	4,066
GA	16,040	0	0	522	0	5	0	16,567
HI	0	0	0	65	0	2	0	67
IA	5,282	2	0	169	0	0	0	5,453
ID	4,214	0	0	88	0	0	0	4,302
IL	3,533	0	150,715	6,685	1,909,997	5	0	2,070,936
IN	10,622	0	0	257	0	0	0	10,879
KS	1,416	0	0	162	0	1	0	1,579
KY	5,599	0	0	167	0	0	0	5,766
LA	0	0	0	149	0	0	0	149

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State	Green Pricing	Renewable Contracts	Competitive Suppliers	Unbundled RECs	CCAs	PPAs	Community Solar	Total
MA	0	0	26,631	11,290	672,940	2	0	710,863
MD	0	0	49,201	9,630	0	3	0	58,834
ME	0	0	230	411	0	1	0	642
MI	17,351	0	2	753	0	0	0	18,106
MN	55,891	0	0	368	0	2	0	56,261
MO	1,446	0	0	366	0	0	0	1,812
MS	141	0	0	32	0	1	0	174
MT	1,687	0	0	225	0	0	0	1,912
NC	8,399	3	0	1,595	0	12	0	10,009
ND	613	0	0	22	0	1	0	636
NE	1,374	1	0	42	0	1	0	1,418
NH	0	0	5	693	0	0	0	698
NJ	0	0	16,930	2,454	0	2	0	19,386
NM	3,473	0	0	203	0	0	0	3,676
NV	3,372	2	0	140	0	0	0	3,514
NY	31,849	0	186,697	6,647	106,473	3	0	331,669
OH	2,931	0	17,621	12,299	119,128	1	0	151,979
OK	13,822	1	0	107	0	2	0	13,932
OR	233,872	0	0	517	0	0	0	234,389
PA	0	0	62,873	15,898	0	0	0	78,771
RI	0	0	2	436	0	0	0	438
SC	7,106	0	0	192	0	1	0	7,299
SD	434	0	0	29	0	0	0	463
TN	10,887	0	0	205	0	4	0	11,096

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State	Green Pricing	Renewable Contracts	Competitive Suppliers	Unbundled RECs	CCAs	PPAs	Community Solar	Total
TX	18,110	0	1,478,304	1,742	0	22	0	1,498,178
UT	47,444	0	0	196	0	4	0	47,644
VA	26,099	0	0	1,017	0	2	0	27,118
VT	3,068	0	0	41	0	0	0	3,109
WA	51,696	0	0	1,409	0	0	0	53,105
WI	36,935	0	0	746	0	0	0	37,681
WV	0	0	0	100	0	1	0	101
WY	5,457	0	0	49	0	0	0	5,506

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Table A-2. Estimated Green Power Production (MWh) by State of Origin[a]

State	Green Pricing	Renewable Contracts	Competitive Suppliers	Unbundled RECs	CCAs	PPAs	Community Solar	Total
AK	781	0	0	92	0	0	0	873
AL	64,751	0	0	31,718	0	0	0	96,469
AR	0	0	0	3,360	0	27,200	0	30,560
AZ	55,869	0	0	4,089,326	0	54,141	0	4,199,336
CA	1,124,843	0	11,353	6,193,618	1,950,645	1,292,563	32,000	10,605,022
CO	498,963	0	0	320,964	260,791	0	0	1,080,718
CT	0	0	38,707	363,385	0	0	0	402,092
DC	0	0	399,284	3,771,132	0	0	0	4,170,416
DE	4,716	0	81,909	329,453	0	0	0	416,078
FL	13,350	0	0	772,966	0	22,245	0	808,561
GA	191,689	0	0	244,232	0	8,162	0	444,083
HI	0	0	0	3,819	0	5,335	0	9,154
IA	107,108	1,921,306	46,480	2,020,696	745,800	0	0	4,841,390
ID	903,483	0	0	47,200	25,744	0	0	976,427
IL	295,100	0	1,503,816	1,689,299	1,988,800	621,068	0	6,098,082
IN	59,006	0	0	86,415	248,600	0	0	394,021
KS	6,453	0	0	213,856	0	166,281	0	386,590
KY	35,024	0	0	2,383	0	0	0	37,407
LA	0	0	0	7,228	0	0	0	7,228
MA	0	0	128,589	2,257,226	193,567	10,044	0	2,589,426
MD	0	0	299,323	2,208,639	845,240	10,929	0	3,364,131
ME	0	0	1,139	184,851	64,522	61,653	0	312,166
MI	150,432	0	43,334	412,489	0	0	0	606,255

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State	Green Pricing	Renewable Contracts	Competitive Suppliers	Unbundled RECs	CCAs	PPAs	Community Solar	Total
MN	299,682	0	0	874,490	198,880	16,563	0	1,389,615
MO	6,593	0	0	194,956	198,880	0	0	400,429
MS	34,084	0	0	31,201	0	0	0	65,285
MT	27,749	0	0	9,621	0	0	0	37,370
NC	41,012	128,124	0	2,121,908	0	325,200	0	2,616,244
ND	33,337	0	0	52,202	198,880	5,662	0	290,081
NE	6,622	127,865	0	12,590	0	35,741	0	182,818
NH	0	0	3,324	225,784	51,618	0	0	280,726
NJ	0	0	96,748	1,706,384	0	21,550	0	1,824,682
NM	26,915	0	0	204,456	0	0	0	231,371
NV	26,443	573,666	0	16,359	0	0	0	616,468
NY	34,899	0	678,709	4,759,739	277,273	11,122	0	5,761,743
OH	16,532	0	142,686	1,011,735	248,600	3,637	0	1,423,189
OK	15,051	179,131	0	6,576	0	575,404	0	776,162
OR	810,352	0	0	1,060,159	112,423	0	0	1,982,934
PA	0	0	407,769	2,112,312	455,215	0	0	2,975,296
RI	0	0	31	62,627	51,618	0	0	114,276
SC	32,392	0	0	97,220	0	4,601	0	134,213
SD	32,531	0	0	2,253	49,720	0	0	84,504
TN	205,692	0	0	431,459	0	25,974	0	663,125
TX	892,304	0	12,040,844	2,743,490	167,230	4,527,170	0	20,371,038
UT	74,829	0	0	141,827	0	11,044	0	227,700
VA	28,629	0	0	635,559	0	4,380	0	668,568
VT	12,948	0	0	94,997	30,110	0	0	138,055

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State	Green Pricing	Renewable Contracts	Competitive Suppliers	Unbundled RECs	CCAs	PPAs	Community Solar	Total
WA	1,059,358	0	0	3,871,368	224,846	0	0	5,155,572
WI	226,730	0	94,383	2,129,816	99,440	0	0	2,550,369
WV	0	0	28,931	5,363	49,720	43,047	0	127,061
WY	555,747	0	0	14,533	0	0	0	570,280

[a] Sums across totals and states do not add to total green power sales because some green power is sourced from Canada

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STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter, on the Commission's own motion, regarding the regulatory reviews, revisions, determinations, and/or approvals necessary for **DTE Electric Company** to fully comply with Public Act 295 OF 2008	)))))	Case No. U-18232

QUALIFICATIONS

AND

DIRECT TESTIMONY

OF

TERRI L. SCHROEDER

Line No.

be reflected accordingly in subsequent REP filings. From the 2016 base, the exhibits project Plan information through August 2029.

Q. What is the total incremental cost of compliance forecasted within the Company's amended REP?

A. The total incremental cost of compliance forecasted in the Company's amended REP for years 2017 through August of 2029 is approximately $102.5 million (Exhibit A-2 sum of line 35). Line 35 of Exhibit A-2 summarizes the incremental costs of compliance within the Company's amended REP. The incremental cost of compliance is supported by Witness Lacey and by Exhibit A-16.

Q. What are the Renewable Energy Plan Surcharge (REPS) revenues forecasted within the Company's amended REP?

A. Lines 42-45 of Exhibit A-2 summarize planned REPS revenues within the Company's REP. Given the current REPS is zero and the Company is not proposing to change that, the REPS revenue is forecasted to be zero.

Q. Has the Company modeled any assets attributable to a voluntary green pricing (VGP) program in its filing?

A. Yes. In Case No. U-18111, the Company included the assets for the MIGreenPower program in the REP. Subscribed portions of the assets attributable to MIGreenPower have been subtracted from the REP and the revenue from those subscriptions as shown on line 34 of Exhibit A-2. Additionally, the Company has received interest in a new large customer VGP program, and the Company is currently examining the potential for such a program. Approximately 300 MW of new wind capacity has

Line No.

been modeled in this plan to meet the needs of such a program. The wind capacity is contemplated to commence operation in late 2020 to take advantage of 100% PTCs. Revenue from the subscribed assets is shown in the incremental cost of compliance as one of the costs recovered to offset the revenue requirement. These costs are calculated based on the actual or projected subscription fee for the VGP program.

Q. Do the subscribed portions of the VGP programs count toward the 15% compliance?

A. No. Subscribed portions of the VGP programs are incremental to the REP and the associated RECs are retired on behalf of subscribers.

Q. How is the new large customer VGP program planned to be priced?

A. At this time, pricing of the large customer VGP program is planned to be based on the levelized cost of energy from the assets in the program. The revenues from these programs will offset the project costs in the REP as reflected in line 14 of Exhibit A-16. The program credit is based off generation weighted LMP forecast for the energy portion of the credit and the forecasted auction clearing price for capacity in zone 7 for the capacity portion of the credit. The credit payment is reflected in line 15 of Exhibit A-16. It is offset in a PSCR reduction noted in line 16 of Exhibit A-17.

Q. How will the new large customer VGP program be sized?

A. The Company is currently assessing the interest level in a large customer program. If the Company files a tariff for such a VGP program, the Company will have estimated the demand for such a program and will size the actual wind assets appropriately.

STATE OF MICHIGAN

MICHIGAN PUBLIC SERVICE COMMISSION

In the matter on the Commission's own motion, regarding the regulatory reviews, revisions, determinations and/or approvals necessary for **DTE ELECTRIC COMPANY** to comply with Section 61 of 2016 PA 342.	Case N$^{o.}$ U-18352 ALJ Martin D. Snider

PROOF OF SERVICE

On the date below, an electronic copy of **the PUBLIC Direct Testimony of Douglas Jester on behalf of Michigan Environmental Council including Exhibits MEC-1 – MEC-13** was served on the following:

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The statements above are true to the best of my knowledge, information and belief.

OLSON, BZDOK & HOWARD, P.C.
Counsel for MEC

Date: April 23, 2018

By: Marcia Randazzo Digitally signed by Marcia Randazzo Date: 2018.04.23 17:48:24 -04'00'

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