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BEFORE THE ARIZONA CORPORATION COMMISSION

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BOB BURNS
TOM FORESE
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IN THE MATTER OF THE APPLICATION OF
TUCSON ELECTRIC POWER COMPANY
FOR APPROVAL OF ITS 2016 RENEWABLE
ENERGY STANDARD IMPLEMENTATION
PLAN.

DOCKET NO. E-01933A-15-0239

**STAFF'S NOTICE OF FILING DIRECT
TESTIMONY**

Staff of the Arizona Corporation Commission ("Staff") hereby files the Direct Testimony of
Robert G. Gray in the above docket.

RESPECTFULLY SUBMITTED this 11th day of March 2016.

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Arizona Corporation Commission

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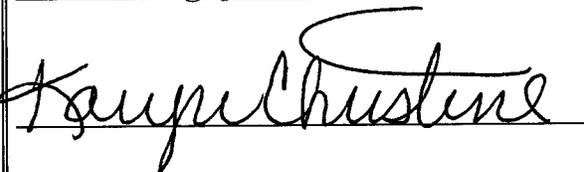
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BEFORE THE ARIZONA CORPORATION COMMISSION

DOUG LITTLE
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BOB STUMP
Commissioner
BOB BURNS
Commissioner
TOM FORESE
Commissioner
ANDY TOBIN
Commissioner

IN THE MATTER OF THE APPLICATION OF)
TUCSON ELECTRIC POWER COMPANY FOR)
APPROVAL OF ITS 2016 RENEWABLE)
ENERGY STANDARD IMPLEMENTATION)
PROGRAM.)
_____)

DOCKET NO. E-01933A-15-0239

DIRECT
TESTIMONY
OF
ROBERT G. GRAY
EXECUTIVE CONSULTANT III
UTILITIES DIVISION
ARIZONA CORPORATION COMMISSION

MARCH 11, 2016

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EXECUTIVE SUMMARY
TUCSON ELECTRIC POWER COMPANY
DOCKET NO. E-01933A-15-0239

My testimony addresses Tucson Electric Power's ("TEP" or "Company") proposed 2016 Renewable Energy Standard and Tariff ("REST") plan. Exhibit RGG-2 contains Staff's review of the 2016 REST plan, including the energy storage proposal, with the exception of the two programs, the TEP-Owned Residential Solar program ("TORS"), the Residential Community Solar program ("RCS") and several related issues. These programs and several related issues are addressed in the body of my testimony. Staff is making the following recommendations:

1. Staff recommends that the Commission deny Tucson Electric Power's request for approval of an expansion of the TORS program by \$15 million and up to 1,000 additional customers.
2. Staff recommends that the advisory group requirement in Decision No. 74884 on p. 21, line 21 through p.22, line 2, be revised to allow Tucson Electric Power to fulfil it via the Arizona Public Service Company advisory group, while still meeting the goals identified in Decision No. 74884. This includes setting a defined set of research goals, having review of the direction of the project and feedback on program design from the group, and public reporting of program results and research findings.
3. Staff further recommends that the Commission consider approval of Tucson Electric Power's proposed RCS program in Tucson Electric Power's on-going rate proceeding in Docket Number E-01933A-15-0322.
4. Staff further recommends that the Commission make a finding that Tucson Electric Power's proposed Rider-17 community solar program, if approved, be deemed eligible to be considered residential Distributed Generation ("DG") for the purpose of REST compliance.
5. Staff further recommends that the Commission approve the Staff budget option for the 2016 REST plan, reflecting a REST surcharge of \$0.01300 per kWh, and related caps of \$4.76 for the residential class, \$130.00 for the small general service class, \$1,300.00 for the large general service class, \$15,000.00 for the industrial and mining class, and \$130.00 for the lighting class. This includes total spending of \$56,645,849 and a total amount to be recovered through the REST surcharge of \$47,836,529.
6. Staff further recommends approval, as a pilot program, of the proposed energy storage facilities, and recovery of prudently incurred costs through the Purchased Power and Fuel Adjustment Clause.
7. Staff further recommends that Tucson Electric Power file a revised Purchased Power and Fuel Adjustment Clause Plan of Administration consistent with the Decision in this case, in Docket Control, within 30 days of the effective date of the Decision. The Plan of Administration should list the appropriate Federal Energy Regulatory

Commission account(s) in which the various energy storage-related costs would be included.

8. Staff further recommends approval of the waiver requested by Tucson Electric Power for the 2016 increment for the residential DG requirement in the REST rules.
9. Staff further recommends that, Tucson Electric Power file its annual REST compliance reports in a docket to be opened by Staff.
10. Staff further recommends that Tucson Electric Power file the REST-TS1, consistent with the Decision in this case, within 15 days of the effective date of the Decision.

1 **INTRODUCTION**

2 **Q. Please state your name, occupation, and business address.**

3 A. My name is Robert G. Gray. I am a Public Utilities Manager employed by the Arizona
4 Corporation Commission (“ACC” or “Commission”) in the Utilities Division (“Staff”). My
5 business address is 1200 West Washington Street, Phoenix, Arizona 85007.

6
7 **Q. Briefly describe your responsibilities as a Public Utilities Manager.**

8 A. In my capacity as a Public Utilities Manager, I conduct analysis and provide recommendations
9 to the Commission on a variety of electricity, natural gas, and water/wastewater matters as
10 supervisory responsibilities. A copy of my resume is attached as Exhibit RGG-1.

11
12 **Q. What is the scope of your testimony in this case?**

13 A. I will address Tucson Electric Power Company’s (“TEP”) proposed 2016 Renewable Energy
14 Standard and Tariff (“REST”) plan filing. This includes all the regular REST matters that are
15 addressed in a Staff Report on the REST filing, TEP’s proposed energy storage projects, as
16 well as the two programs for which a hearing was requested by the Energy Freedom Coalition
17 of America (“EFCA”), the Utility-Owned Distributed Generation program (now referred to
18 by TEP as the TORS program), and the Residential Community Solar Program.

19
20 **Q. Have you reviewed filings by TEP, EFCA and the Residential Utility Consumer**
21 **Office (“RUCO”) in this proceeding?**

22 A. Yes. I have reviewed TEP’s initial filing in this proceeding as well as other filings in late 2015
23 from TEP, EFCA, and RUCO. I have also reviewed the testimony of TEP Witnesses
24 Carmine Tilghman and Craig Jones filed February 12, 2016.

25

1 **Q. How is your direct testimony organized?**

2 A. First, my testimony addresses the balance of the proposed 2016 REST plan, apart from the
3 TORS and RCS programs for which EFCA requested a hearing. Attached as RGG-2 is a
4 staff report addressing all aspects of the proposed 2016 REST plan other than these two
5 programs. These two programs have no impact on the proposed 2016 REST budget or other
6 aspects of the 2016 REST plan. The latter part of my testimony addresses the TORS and
7 RCS programs.

8

9 **BALANCE OF THE PROPOSED 2016 TEP REST PLAN**

10 **Q. Please summarize Staff's recommendations regarding TEP's proposed 2016 REST**
11 **plan, excepting the two disputed programs.**

12 A. Staff is supportive of TEP's energy storage proposal and recommends approval of the
13 proposal. Staff recommends approval of TEP's request for a waiver of its incremental 2016
14 residential Distributed Generation ("DG") requirement. Staff supports TEP's proposed 2016
15 REST budget. Staff recommends approval of the same REST surcharge level as TEP
16 proposed, \$0.013 per kWh, but Staff makes some adjustments to TEP's proposed customer
17 class caps. Staff recommends a finding be made that TEP has not used any renewable energy
18 credits ("RECs") not owned by the utility to demonstrate compliance with the Commission's
19 REST rules for 2014. Staff recommends that TEP begin filing its REST compliance reports
20 in a docket to be opened by Staff. More detailed explanations of Staff's recommendations on
21 the balance of the proposed 2016 REST plan are contained in Exhibit RGG-2.

22

1 **NEED FOR UTILITY-OWNED DISTRIBUTED GENERATION AND/OR**
2 **COMMUNITY SOLAR RENEWABLE ENERGY CREDITS FOR RESIDENTIAL DG**
3 **COMPLIANCE OR GENERAL REST COMPLIANCE**

4 **Q. How does the need for RECs for REST compliance relate to the two disputed**
5 **programs?**

6 A. TEP's existing utility-owned rooftop solar program (TEP refers to this as the TEP-Owned
7 Residential Solar program ("TORS")), and the proposed Residential Community Solar
8 program ("RCS") result in utility-owned assets from which TEP would derive RECs. These
9 RECs could be used by TEP for compliance purposes under the REST rules, as residential
10 DG and/or toward the overall REST requirement. If REST compliance is one of the
11 primary purposes of these programs, then the Commission should consider whether these
12 programs are the most cost-effective means for addressing compliance toward the REST
13 rules.

14
15 **Q. Does TEP believe that it will currently be able to achieve compliance with the**
16 **residential DG component of the REST rules for 2016?**

17 A. No. TEP's initial REST plan filing indicated that TEP does not expect to achieve REST
18 compliance for residential DG in 2016. The main cause of this is that TEP has not received
19 RECs from residential DG installations since up-front incentives stopped being offered for
20 new rooftop installations. For example, TEP indicated that as of the end of 2014 it had
21 62,947 MWh of residential DG RECs and that it expects the 2016 residential DG compliance
22 requirement to be approximately 81,600 MWh of residential DG RECs. TEP's only new,
23 albeit limited, source of new RECs is from the 600 installations undertaken in the pilot TORS
24 program, but those installations do not nearly provide the necessary RECs to bring TEP into
25 compliance for residential DG in 2016. TEP's compliance status and request for a waiver are
26 discussed in further detail in Exhibit RGG-2. Staff is recommending approval of TEP's

1 request for a waiver of the 2016 increment of the residential DG requirement under the
2 REST rules.

3
4 **Q. Does Staff believe that the TORS and RCS programs are the most cost-effective**
5 **means of addressing REST compliance for TEP?**

6 A. No. Staff does not believe that these programs are the most cost-effective means for TEP to
7 address REST compliance requirements. In the Commission's track and record proceeding
8 (Docket Nos. E-01345A-10-0394, E-01345A-12-0290, E-01933A-12-0296, and E-04204A-
9 12-0297) and the resulting REST rulemaking process (RE-00000C-14-0112) the Commission
10 sent a clear indication that requesting a waiver of some portion of REST requirements was a
11 viable option for a utility who would not otherwise be able to demonstrate compliance with
12 the REST rules, with the added benefit that a waiver would not require any further ratepayer
13 funding. Thus, the TORS and RCS programs are not required for TEP to address any
14 compliance needs. Further, even in the absence of a waiver, TEP could, for example, request
15 approval of a small up-front incentive, such as \$0.10 per watt, for a segment, such as
16 residential DG, where the Company believed it would not achieve compliance via existing
17 RECs it owned. However, offering an up-front incentive would involve some additional cost,
18 unlike the granting of a waiver. By comparison, if a \$0.10 per watt incentive was offered to
19 the number of customers, 600, contemplated under the TORS program's pilot stage
20 approved by the Commission, at the 5.53 kW size cited by TEP, that would be a total cost for
21 up-front incentives of \$331,800, a small fraction of the estimated cost of the TORS or RCS
22 programs. Thus the cost of funding such an incentive would be much less than funding the
23 TORS and/or RCS programs for compliance purposes. Further, during the track and record
24 and REST rulemaking process, the Commission made indications that it preferred to not
25 spend ratepayer dollars for a company to address compliance if it was not necessary to do so.

1 **Q. What is Staff's perspective on RECs from the TORS and RCS programs and their use**
2 **for REST compliance?**

3 A. TEP receiving RECs from these programs is a benefit to the Company and could be used
4 toward achieving compliance. However, TEP could either seek a waiver at no cost or offer a
5 small up-front incentive at a lower cost to address REST compliance. Therefore, Staff does
6 not believe that REST compliance should be a significant factor to consider in whether to
7 approve an expansion of the TORS program or initial implementation of the RCS program.
8 Simply put, for REST compliance purposes, Staff believes TEP should primarily focus its
9 efforts on no cost or least cost options.

10
11 **THE DEFINITION OF DISTRIBUTED GENERATION IN THE REST RULES AND**
12 **ITS IMPLICATIONS FOR THE PROPOSED RESIDENTIAL COMMUNITY SOLAR**
13 **PROGRAM**

14 **Q. What issue does TEP raise in its REST plan application regarding how DG is defined**
15 **in the REST rules and its relationship to the proposed RCS program?**

16 A. TEP's application includes a discussion of the way DG is defined in the REST rules and its
17 implications for TEP's proposed community solar program. TEP's application notes that in
18 a number of places the current REST rules define DG in a way that requires it to be located
19 at a customer's premises. The community solar facility would not be located on customer
20 premises. TEP argues that a community solar program or similar installation, which is
21 connected to the distribution system, can provide most or all of the same benefits as the same
22 installation that is placed on a customer premises. Although TEP's application does not
23 specifically request a waiver of provisions in the REST rules that limit DG to customer
24 premises, TEP has indicated that it does wish to have such a waiver for the purpose of
25 undertaking the community solar program.

1 **Q. What is Staff's perspective on TEP's request for a waiver, such that the community**
2 **solar facility would qualify as DG for REST compliance purposes?**

3 A. Staff believes that TEP's discussion has merit and that limiting all DG to only customer
4 premises may foreclose opportunities to install renewable resources at the least cost while
5 providing the most benefit. If a renewable generation facility is connected to the distribution
6 system, but simply is not on a given customer premise, Staff believes that not allowing such
7 facilities to be considered distributed generation would be arbitrary. Additionally, Staff's
8 understanding is that a circumstance such as a community solar facility connecting to the
9 distribution grid was not contemplated when the REST rules were initially promulgated and
10 the definition of distributed generation was created.

11
12 Further, there is precedent for granting such a waiver. The Commission, in Decision No.
13 72736 (January 13, 2012) granted TEP's request to count installations under its Bright Roofs
14 program, which involved the installation of non-residential DG systems on leased rooftops of
15 commercial entities, as DG for compliance purposes. While Staff is recommending approval
16 of the RCS program in TEP's general rate proceeding, as discussed below, Staff is supportive
17 of TEP's discussion regarding the treatment of renewable facilities that are connected to the
18 distribution system but are not on a given customer(s) premise(s) as distributed generation.
19 Staff recommends that the Commission make a finding that TEP's proposed Rider-17
20 community solar program, if approved, be deemed eligible to be considered residential DG
21 for the purpose of REST compliance. Staff would encourage TEP, in its rebuttal testimony,
22 to provide a clear definition of what it believes is and is not part of its distribution system,
23 such as kV level. Such a definition is necessary to avoid possible confusion regarding what
24 would or would not be considered a generation resource at the distribution level of the grid.

1 **TEP-OWNED RESIDENTIAL SOLAR PROGRAM**

2 **Q. What is the TORS program?**

3 A. TEP's application seeks Commission approval of an expansion of the TORS program which
4 the Commission approved in Decision Number 74884. Under this pilot program approved
5 as part of TEP's 2015 REST plan, TEP would install utility-owned rooftop solar on
6 approximately 600 residences with a cost of up to \$10 million. This would result in
7 approximately 3.5 MW of residential DG systems being installed and customers would pay a
8 fixed amount each month for 25 years, subject to possible adjustment if the customer's
9 energy usage varies by more than 15 percent. TEP reported that the response to the program
10 was overwhelming, with much more response than there was room for in the program's first
11 year. TEP had previously indicated that approximately 3,400 customers are on a list of
12 interested customers. In its direct testimony, the Company indicated that 5,164 customers
13 had signed up on the program interest list.

14
15 TEP's RFP for this program in 2015 ended up selecting three local solar PV installers. TEP
16 has indicated that the installations under the program are moving forward and that they will
17 be completed by approximately August 2016. TEP has further indicated that given this stage
18 in the program's implementation, there is nothing substantive to report regarding how the
19 program is operating, the benefits, etc.

20
21 TEP's 2016 REST plan filing requests approval to expand the program by expending a
22 further \$15 million to increase participation by up to 1,000 customers. Mr. Tilghman
23 indicated on page 18, line 24 of his Direct Testimony that TEP expects the average installed
24 cost of the initial 600 installations under the pilot program to cost \$2.18 per watt. Given this
25 information TEP's actual likely cost for an additional 1,000 customers is likely close to \$12
26 million or even less if costs go down further. TEP indicated to Staff that the Company's

1 rationale for expanding the program in 2016 was to meet customer desires to participate in
2 the program. TEP also cites a reduced cost shift from solar customers to non-solar
3 customers under the TORS program model as a further reason to expand the program. The
4 alleged cost shift is not a straight forward calculation since the non-solar customers may
5 ultimately pay for a portion of the program.

6
7 **Q. Did the Commission place a variety of requirements on TEP regarding the initial**
8 **pilot program approval of the TORS program?**

9 A. Yes. Decision Number 74884 included a number of things TEP was supposed to do in
10 regard to the pilot TORS program. These requirements include:

- 11
12 1. “TEP should form an advisory committee that should advise the Company on a
13 defined set of research goals. This advisory committee would be convened by TEP
14 and include representatives involved in technological and operational aspects of
15 rooftop solar and supporting infrastructure. This group of stakeholders should
16 include, but not be limited to: Commission Staff, the Electric Power Research
17 Institute (“EPRI”), the Residential Utility Consumer Office (“RUCO”), other Arizona
18 electrical utility system operators or engineers, a rooftop solar industry representative,
19 an inverter manufacturer representative, and university power systems engineering
20 departments. The group should review the direction of the project and provide
21 feedback on program design. Reports on the program results as well as any research
22 findings should be made public.” (p. 21, line 21 through p. 22, line 2)
23
24 2. “Tucson Electric Power Company, as part of its 2016 REST plan filing, shall include
25 a report on the feasibility, costs, benefits, and other aspects of larger scale distributed
26 generation options, either company-owned or through purchased power agreements,

1 and if Tucson Electric Power Company wishes, an implementation proposal, as part
2 of their REST activities. Tucson Electric Power Company's analysis should include a
3 comparison of these options with company-owned and customer-owned distributed
4 generation options." (p. 22, lines 9-14)
5

- 6 3. "Tucson Electric Power Company include a discussion of the utility-owned residential
7 distributed generation program in its annual REST plan filings, beginning with the
8 2016 REST plan to be filed in July 2015, as long as the program continues to exist.
9 This discussion shall include a cost/benefit analysis and shall fully report on all
10 aspects of the program." (p. 22, lines 15-18)
11

12 **Q. Has TEP met these requirements?**

13 A. No. Several of the requirements reflect the reporting of program results, costs/benefits, etc.
14 Given that the program is still under implementation at this time, such studies cannot yet
15 reasonably be expected to be completed and published. Such a circumstance was always the
16 likely case when the Commission put such requirements on this program. Staff is not faulting
17 TEP for not having provided such analysis, given the status of the program. But, given that
18 the Commission approved the TORS program as a pilot program, Staff believes that it is
19 reasonable for TEP to provide such reporting and analysis prior to expansion of the program.
20

21 Another factor is that the program has taken longer to implement than initially expected.
22 When Staff was preparing its Staff Report on this matter in the fall of 2015, TEP indicated
23 that it expected 600 installations to be completed by the end of the first quarter of 2016.
24 Now in TEP's direct testimony Mr. Tilghman estimates the Company will hit the installation
25 cap in August 2016.
26

1 **Q. Has TEP formed an advisory group as required by the Commission?**

2 A. While TEP has not formed its own advisory group, it has participated in Arizona Public
3 Service Company's ("APS") advisory group that was formed from a similar requirement that
4 was placed on APS. TEP has made presentations to the advisory group regarding its program
5 and has participated in advisory group discussions. Thus, TEP has not formed its own
6 advisory group as required by the Commission. Having said that, in hindsight Staff believes
7 that having APS and TEP form separate advisory groups for a similar purpose might be
8 duplicative and unnecessarily burdensome on advisory group participants, particularly those
9 who travel from outside Arizona for such meetings, such as EPRI, the National Renewable
10 Energy Laboratory, and others. It is unclear whether TEP would even be able to form a
11 separate advisory group and achieve participation from the parties that are already
12 participating in the APS advisory group. Staff has participated in the APS advisory group
13 meetings, where TEP has participated and discussed aspects of its TORS program. Staff
14 believes that the APS advisory group is beneficial and that TEP's participation in the APS
15 advisory group is useful.

16
17 **Q. Regarding the advisory group requirement, does Staff believe there is a reasonable**
18 **solution to the issues discussed above?**

19 A. Yes. Staff recommends that this particular requirement on TEP should be revised to allow
20 TEP to fulfil it via participation in the APS advisory group, with TEP playing a substantive
21 role in the advisory group activities and ensuring that TEP's program is fully addressed in
22 advisory group efforts. Specifically, TEP should still meet the stated goals of the TEP
23 ordering paragraph on its advisory group, including setting its own defined set of research
24 goals, having review of the direction of the project and feedback on program design from the
25 group, and public reporting of program results and research findings. Such a revised
26 requirement would provide TEP and others with the benefits of a TEP advisory group

1 without having two separate advisory groups at TEP and APS that would be undertaking
2 similar efforts and the resulting burdens. However, TEP would need to provide its own
3 information and materials to the advisory group and obtain the required reviews and provide
4 required reports as opposed to merely participating in the APS review.
5

6 **Q. Does Staff have any other concerns regarding expansion of the TORS program at this**
7 **time?**

8 A. Yes. In Mr. Tilghman's direct testimony he noted that its proposed RCS program is expected
9 to be approximately 40 percent cheaper than a third party rooftop solar installation and 25
10 percent cheaper than its own TORS program while providing almost the same or even more
11 benefits than a similar amount of rooftop solar. Thus TEP's own filing indicates that the
12 Company believes that rooftop solar is a significantly more expensive option than its own
13 proposed community solar program. TEP's 2015 TORS program was approved as a pilot
14 program. Staff does not believe that the Commission should provide approval of the TORS
15 program expansion TEP is proposing. TEP has not met some of the requirements the
16 Commission placed on the initial pilot TORS program, has not demonstrated that the
17 proposed expansion is necessary for pilot program purposes and has indicated that its
18 proposed community solar program is significantly less expensive while providing even
19 greater benefits than rooftop solar. Recognizing that this program was already approved on a
20 pilot basis, Staff upon further reflection does also have some concern with the use of a
21 utility's tariffs to offer subsidized services that compete with third party service providers.
22 Staff's perspective reflects its on-going efforts in various other proceedings to reduce such
23 subsidies over time and to pursue cost-effective resources. Absent fulfilment of the pilot
24 program requirements and a demonstration that the rooftop program is cost competitive with
25 a similar community solar program or other similarly situated resources, Staff does not plan
26 to support an expansion of the TORS program in the future.

1 **Q. In summary, what are Staff's recommendations regarding TEP's proposed TORS**
2 **program?**

3 A. Staff recommends that the Commission not approve the proposed expansion of the TORS
4 program. Staff further recommends that the requirement for TEP to form an advisory group
5 be adjusted to allow TEP to meet the requirement via participation in the APS advisory
6 group, while still meeting the goals of the initial requirement on TEP in Decision Number
7 74884.

8
9 **Q. What about TEP's interested customer list for the TORS program?**

10 A. Customers on the interested customer list for the TORS program could be advised of and
11 participate in the community solar program if they wish to do so.
12

13 **RESIDENTIAL COMMUNITY SOLAR PROGRAM**

14 **Q. Please discuss how TEP's proposed RCS program came before the Commission?**

15 A. In Decision Number 74884, the Commission ordered TEP to provide a report on the
16 "feasibility, costs, benefits, and other aspects of larger scale distributed generation options,
17 either company-owned or through purchased power agreements and if Tucson Electric
18 Power Company wishes, an implementation proposal, as part of their REST activities."
19 TEP's proposed 2016 REST plan includes a proposal to create a new community solar
20 program, including a new Rider-17, Residential Community Solar tariff ("Rider-17").
21

22 **Q. What is community solar?**

23 A. The National Renewable Energy Laboratory ("NREL")'s Guide to Community Solar defines
24 community solar as "a solar-electric system that provides power and/or financial benefit to
25 multiple community members." Community solar projects can be owned by the local utility
26 company or some other third party. Community solar programs are becoming increasingly

1 popular across the United States in recent years. For example, in discussing community solar
2 GTM Research (see Exhibit RGG-2) has “pegged it as the most significant solar growth
3 market for the United States.” Similarly, a 2015 blog posting by SolarCity touts certain
4 benefits of community solar and growth in the community solar marketplace (see Exhibit
5 RGG-2).

6
7 Potential benefits of community solar include lower costs than rooftop solar, economies of
8 scale in construction and operation, ability for participation by customers who may not be
9 able to have a rooftop installation, and avoidance of possible maintenance and other issues
10 related to having systems mounted on the rooftops of private residences.

11
12 **Q. What is TEP proposing in regard to its RCS program?**

13 A. In this case, TEP is proposing to build an approximately 5 MW community solar facility, at a
14 cost of up to \$10 million, or up to \$2.00 per watt, at a place where it would interconnect with
15 TEP’s distribution system. TEP estimates that at its expectation of approximately \$1.60 per
16 watt, a 5 MW system would cost approximately \$8 million. TEP would manage construction
17 of the facility but would contract out specific engineering and construction services via
18 competitive bid. TEP has indicated that the facility would be expected to be operational
19 sometime in the third quarter of 2016 if it was approved by the Commission by December
20 2015, or about a nine month lead time. To the extent capacity is not fully subscribed, TEP
21 would use the balance of the facility to meet its system power needs. TEP would own the
22 RECs from the facility. TEP has indicated that it believes that the community solar program
23 also helps address the Company’s concern that rooftop solar customers are being subsidized
24 by non-rooftop solar customers. Customers under the RCS program would pay a \$17.50 per
25 kW fee, slightly higher than the \$16.50 for the TORS program. TEP has also indicated to
26 Staff that with the per kW fee being \$1.00 higher, TEP could be expected to recover more

1 revenue from RCS customers than those customers are currently paying TEP. However,
2 TEP also indicated to Staff that if the per kW fee was reduced to \$16.50, the RCS program
3 would be expected to be revenue neutral for TEP, as the TORS program was expected to be
4 with the same fee. The term revenue neutral as used here means that TEP would not be
5 expected to take in significantly more or less revenue from customers taking service under
6 this program than the customers had paid TEP under their previously applicable tariff(s).
7 Revenue neutrality does not speak to the issue of full cost recovery under the tariff.
8 Customers would enter into a ten-year agreement with TEP under the RCS program.

9
10 **Q. Approximately how many customers would participate in the community solar**
11 **program?**

12 A. Given the 5 MW facility size and the 5.53 kW system size cited by TEP Witness Craig Jones
13 (Direct Testimony, p. 4, line 7), there would be roughly 900 participants in the program if it is
14 fully subscribed.

15
16 **Q. Please discuss the significance of the cost difference cited by TEP between**
17 **community solar and TORS rooftop solar?**

18 A. Staff recognizes that TEP's cost estimates for community solar are much lower than for a
19 similar amount of rooftop solar under TORS. Staff further believes that the non-cost
20 benefits of community solar over rooftop solar cited by TEP, including economies of scale in
21 construction and operation and avoidance of possible issues related to placing DG systems
22 on rooftops, may outweigh non-cost benefits from rooftop solar, including avoidance of a
23 small amount of distribution system line loss. Thus community solar would seem to be an
24 important development in the distributed generation market, and Staff is generally supportive
25 of its development and implementation in the Arizona marketplace.

1 **Q. Does TEP already have a community solar tariff?**

2 A. Yes. TEP's Rider R-5, Electric Service Solar Rider (Bright Tucson Community Solar) tariff
3 allows customers taking service under the R-01, GS-10, and LGS-13 rate schedules to
4 purchase blocks of 150 kWh of solar power at a \$0.02 per kWh premium. Funding to build
5 generation facilities to service Rider R-5 customers has been approved via TEP's REST plans
6 for a number of years, though TEP has recently indicated it will no longer seek such approval
7 through the REST process. TEP's proposed RCS in essence fixes a customer's total bill at its
8 current level (adjusting for changes in usage greater than 15 percent), while Rider R-5 allows
9 customers to purchase blocks of solar power at a premium.

10

11 **Q. What reason(s) does TEP cite for offering this program?**

12 A. On page 23, lines 13-21, of Mr. Tilghman's testimony he cites giving customers more solar
13 options and providing customers who cannot directly have rooftop solar installed on their
14 residence with an option to go solar.

15

16 **Q. Does the issue of REST compliance, discussed earlier in your testimony, factor into
17 the community solar program discussion?**

18 A. As discussed earlier, Staff does not believe REST compliance should be a significant factor in
19 considering whether to approve the community solar program, given that Staff believes that
20 TEP has other lesser cost options for addressing DG REST compliance at this time.
21 However, if the Commission approves the RCS program, RECs from the program could help
22 TEP achieve compliance.

23

1 **Q. Please discuss how community solar would provide access to distribution level**
2 **customers who may not be able to undertake rooftop solar?**

3 A. Staff believes that greater access is an important aspect of community solar. There are a
4 number of inherent reasons why it is either impossible or very difficult for many utility
5 customers to undertake rooftop solar. These include lack of home ownership, rooftop
6 availability, rooftop orientation, rooftop condition, plant shading, low credit scores, and other
7 factors. The general nature of this situation is illustrated in a slide, contained in Exhibit
8 RGG-4, presented by GTM Research at the 2015 Solar Summit (April 15, 2015) that of
9 approximately 113 million United States households, only approximately 9 million are
10 available for rooftop solar. Similarly, a National Renewable Energy Laboratory technical
11 report¹ references Navigant Consulting data that estimates residential rooftop availability at
12 22 to 27 percent of total residential rooftop area. Community solar programs can provide
13 access to many customers who may not be able to undertake rooftop solar. However,
14 customers residing in rental properties would not be eligible under the proposed Rider R-17
15 due to the 10-year commitment. Renters are eligible under Rider R-5. In summary, Staff
16 believes that the potential expansion of access to distributed generation resources offered by
17 community solar programs is a significant consideration.

18
19 **Q. Is community solar limited to a utility ownership model?**

20 A. No. While TEP's proposal entails utility ownership, community solar projects can involve
21 other ownership models involving some sort of third party ownership, such as a solar
22 developer or some form of cooperative ownership.

23

¹ **Supply Curves for Rooftop Solar PV-Generated Electricity for the United States**, Paul Denholm and Robert Margolis, November 2008, National Renewable Energy Laboratory Technical Report NREL/TP-6A0-44073, page 4.

1 **Q. Is Staff recommending approval of the proposed RCS program?**

2 A. Yes, but in a general rate proceeding. TEP has a general rate proceeding currently underway
3 in Docket Number E-01933A-15-0322. Staff recommends that the community solar
4 program be considered within the current general rate proceeding in Docket Number E-
5 01933A-15-0322 wherein Staff will recommend approval of TEP's proposed community
6 solar program. Staff will also recommend in TEP's general rate proceeding that the
7 community solar tariff charge(s) be cost-of-service based.

8
9 **Q. Should TEP's RCS program be open to non-utility ownership models?**

10 A. Yes. While TEP's initial proposal is for a utility-owned RCS facility, Staff believes that the
11 program should also be open to non-utility owned community solar programs. A method to
12 achieve this would be to require TEP to solicit non-utility owned community solar
13 installations of at least an equal number of MWs, as TEP contemplates installing utility-
14 owned community solar facilities in the future. There are likely other ways non-utility owned
15 community solar projects could be included by TEP and Staff encourages interested parties
16 and TEP to consider such options. Specifically, Staff will recommend in TEP's general rate
17 case that TEP either solicit non-utility owned community solar installations of at least an
18 equal number of MWs, as TEP contemplates installing utility-owned community solar
19 facilities in the future, or propose another method to meaningfully include non-utility owned
20 community solar projects in its future community solar efforts.

21
22 **Q. Would TEP need Commission approval of the construction of community solar**
23 **facilities such as discussed in this proceeding apart from the aspect of the program**
24 **where customers are served under a Commission-approved tariff?**

25 A. No. TEP could undertake construction and operation of community solar facilities without
26 any prior Commission action. The program approval is needed to offer Rider R-17 to

1 specific customers. In fact TEP has signaled through their REST plan filings that they will no
2 longer seek Commission approval of funding for facilities being built for their existing
3 community solar program, Bright Tucson Community Solar, via the REST process, but rather
4 will construct them and then seek inclusion of them in rate base during a future rate
5 proceeding as they would do so for other traditional generation facilities that are constructed.
6 TEP has a well-developed least cost integrated resource planning process in which it
7 considers resource additions.

8
9 **Q. Does Staff believe there may be other ways to structure a community solar program?**

10 A. Yes. While Staff is supportive of TEP's proposed program, Staff believes that it would be
11 useful for TEP to explore other options for customer participation in a community solar
12 program. For example, because a customer is not having to host a rooftop solar system and
13 be compensated for hosting such a system, whether by fixing their cost for a period of time
14 as in the TORS program or via a monthly payment as is used by Arizona Public Service
15 Company's Solar Partner Program, perhaps a customer could stay on their otherwise
16 applicable tariff and take community solar power, rather than creating a new tariff as is now
17 the case.

18
19 **LIST OF RECOMMENDATIONS**

20 **Q. Please list all of your recommendations in this proceeding?**

21 A. Staff makes the following recommendations:

- 22
23 1. Staff recommends that the Commission deny Tucson Electric Power's request for
24 approval of an expansion of the TORS program by \$15 million and up to 1,000
25 additional customers.
26

- 1 2. Staff recommends that the advisory group requirement in Decision No. 74884 on p.
2 21, line 21 through p.22, line 2, be revised to allow Tucson Electric Power to fulfil it
3 via the Arizona Public Service Company advisory group, while still meeting the goals
4 identified in Decision No. 74884. This includes setting a defined set of research goals,
5 having review of the direction of the project and feedback on program design from
6 the group, and public reporting of program results and research findings.
7
- 8 3. Staff further recommends that the Commission consider approval of Tucson Electric
9 Power's proposed RCS program in Tucson Electric Power's on-going rate proceeding
10 in Docket Number E-01933A-15-0322.
11
- 12 4. Staff further recommends that the Commission make a finding that Tucson Electric
13 Power's proposed Rider-17 community solar program, if approved, be deemed
14 eligible to be considered residential Distributed Generation ("DG") for the purpose
15 of REST compliance.
16
- 17 5. Staff further recommends that the Commission approve the Staff budget option for
18 the 2016 REST plan, reflecting a REST surcharge of \$0.01300 per kWh, and related
19 caps of \$4.76 for the residential class, \$130.00 for the small general service class,
20 \$1,300.00 for the large general service class, \$15,000.00 for the industrial and mining
21 class, and \$130.00 for the lighting class. This includes total spending of \$56,645,849
22 and a total amount to be recovered through the REST surcharge of \$47,836,529.
23
- 24 6. Staff further recommends approval, as a pilot program, of the proposed energy
25 storage facilities, and recovery of prudently incurred costs through the Purchased
26 Power and Fuel Adjustment Clause.
27

- 1 7. Staff further recommends that Tucson Electric Power file a revised Purchased Power
2 and Fuel Adjustment Clause Plan of Administration consistent with the Decision in
3 this case, in Docket Control, within 30 days of the effective date of the Decision. The
4 Plan of Administration should list the appropriate Federal Energy Regulatory
5 Commission account(s) in which the various energy storage-related costs would be
6 included.
7
- 8 8. Staff further recommends approval of the waiver requested by Tucson Electric Power
9 for the 2016 increment for the residential DG requirement in the REST rules.
10
- 11 9. Staff further recommends that, Tucson Electric Power file its annual REST
12 compliance reports in a docket to be opened by Staff.
13
- 14 10. Staff further recommends that Tucson Electric Power file the REST-TS1, consistent
15 with the Decision in this case, within 15 days of the effective date of the Decision.
16

17 **Q. Does this conclude your direct testimony?**

18 **A. Yes, it does.**

RESUME

ROBERT G. GRAY

Employment History

Arizona Corporation Commission, Utilities Division, Phoenix, Arizona: Public Utility Manager (February 2016 – present), Executive Consultant, Manager (December 2015 – February 2016), Executive Consultant III (November 2007 – December 2015), Public Utility Analyst V (October 2001 – November 2007), Senior Economist (August 1997 – October 2001), Economist II (June 1991 - July 1997), Economist I (June 1990 - June 1991). Conduct economic and policy analyses on a variety of natural gas issues in Arizona, including gas procurement, rate design, interstate pipeline issues, revenue decoupling, energy conservation, low income issues, customer services issues, special contracts, various tariff matters, and other natural gas issues. Conduct economic and policy analyses on a variety of electricity issues in Arizona, including power plant and transmission line siting cases, energy efficiency, renewable energy standards, rate design, time-of-use service, and low income issues. Conduct economic and policy analysis on water and wastewater issues. Supervise assigned Staff to ensure timely completion of assigned tasks. Prepare recommendations and present written and oral testimony before the Commission and organize workshops and other proceedings on various utility industry issues. Represent the ACC in natural gas and electric proceedings at various state of Arizona proceedings, the Federal Energy Regulatory Commission, the North American Energy Standards Board, and on the National Association of Regulatory Utility Commissioners' Staff Subcommittee on Gas, including serving as a past Vice-Chair and Chair of the NARUC Staff Subcommittee on Gas.

Testimony

Resource Planning for Electric Utilities, (Docket No. 0000-90-088), Arizona Corporation Commission, 1990.

Citizens Utilities Company, Electric Rate Case (Docket No. E-1032-92-073), Arizona Corporation Commission, 1993.

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Arizona Public Service Company, Rate Settlement (Docket No. E-1345-94-120), Arizona Corporation Commission, 1994.

U S West Communications, Rate Case (Docket No. E-1051-93-183), Arizona Corporation Commission, 1995.

- Citizens Utilities Company, Electric Rate Case (Docket No. E-1032-95-433), Arizona Corporation Commission, 1996.
- Resource Planning for Electric Utilities (Docket No. U-000-95-506), Arizona Corporation Commission, 1996.
- Southwest Gas Corporation, Natural Gas Rate Case (Docket No. U-1551-96-596), Arizona Corporation Commission, 1997.
- Black Mountain Gas Company - Northern States Power Company, Merger (Docket Nos. G-03493A-98-0017, G-01970A-98-0017), Arizona Corporation Commission, 1998.
- Black Mountain Gas Company – Page Division Rate Case (Docket Nos. G-03493A-98-0695, G-03493A-98-0705), Arizona Corporation Commission, 1999.
- Graham County Utilities Company Rate Case (Docket No. G-02527A-00-0378), Arizona Corporation Commission, 2000.
- Black Mountain Gas Company – Cave Creek Division Rate Case (Docket No. G-03703A-00-0283), Arizona Corporation Commission, 2000.
- Southwest Gas Corporation, Natural Gas Rate Case (Docket No. G-01551A-00-0309), Arizona Corporation Commission, 2000.
- Black Mountain Gas Company – Page Division Rate Case (Docket Nos. G-03493A-01-0263), Arizona Corporation Commission, 2001.
- Duncan Rural Services – Natural Gas Rate Case (Docket No. G-02528A-01-0561), Arizona Corporation Commission, 2001.
- Toltec Generating Facility Application Before the Arizona Power Plant and Line Siting Committee (Docket No. L-00000Y-01-0112), September 2001.
- Lap Paz Generating Facility Application Before the Arizona Power Plant and Line Siting Committee (Docket No. L-00000AA-01-0116), December 2001.
- Bowie Generating Facility Application Before the Arizona Power Plant and Line Siting Committee (Docket No. L-00000BB-01-0118), December 2001.
- Southwest Gas Corporation, Acquisition of Black Mountain Gas Company (Docket No. G-01551A-02-0425), Arizona Corporation Commission, 2002.
- Wellton-Mohawk Generating Facility Application Before the Arizona Power Plant and Line Siting Committee (Docket No. L-00000Z-01-0114), February 2003.

Arizona Public Service Company, Rate Proceeding (Docket No. E-01345A-03-0437), Arizona Corporation Commission, 2004.

Graham County Utilities Company Rate Case (Docket No. G-02527A-04-0301), Arizona Corporation Commission, 2004.

Southwest Gas Corporation, Rate Proceeding (Docket No. G-01551A-04-0876), Arizona Corporation Commission, 2004.

Southern California Edison, Devers – Palo Verde 2 Transmission Line Application before the Arizona Power Plant and Line Siting Committee, (L-00000A-06-0295-00130), 2006.

Semstream Arizona Propane Acquisition of Energy West (Docket G-02696A-06-0515), Arizona Corporation Commission, 2006.

UNS Gas Inc., Rate Proceeding (Docket No. G-04204A-06-0463), Arizona Corporation Commission, 2007.

Semstream Arizona Propane Acquisition of Black Mountain Gas Company – Page Division (Docket G-03703A-06-0694), Arizona Corporation Commission, 2007.

Northern Arizona Energy, LLC, Northern Arizona Energy Project Application before the Arizona Power Plant and Line Siting Committee, (L-00000FF-07-0134-00133), 2007.

Arizona Public Service, Palo Verde Hub to North Gila 500 kV Transmission Lint Project Application before the Arizona Power Plant and Line Siting Committee, (L-00000D-07-0566-00135), 2007.

Southwest Gas Corporation, Rate Proceeding (Docket No. G-01551A-07-0504), Arizona Corporation Commission, 2008.

Arizona Solar One, LLC, Solana Generating Station and Gen-Tie Application before the Arizona Power Plant and Line Siting Committee, (L-00000GG-08-0407-00139 and L-00000GG-08-0408-00140), 2008.

Coolidge Power Corporation, Coolidge Power Project Application before the Arizona Power Plant and Line Siting Committee, (L-00000HH-08-0422-00141), 2008.

UNS Gas Inc., Rate Proceeding (Docket No. G-04204A-08-0571), Arizona Corporation Commission, 2009.

El Paso Natural Gas Company, Rate Proceeding (Docket No. RP08-426), Federal Energy Regulatory Commission, 2009.

Arizona Water/Global Water CC&N Extension/Acquisition Proceeding (Docket Nos. W-01445A-06-0199, etc.), Arizona Corporation Commission, 2009.

Graham County Utilities Company Rate Proceeding (Docket No. G-02527A-09-0088), Arizona Corporation Commission, 2009.

Southwest Gas Corporation Rate Proceeding (Docket No. G-01551A-10-0458), Arizona Corporation Commission, 2010.

UNS Gas Inc., Rate Proceeding (Docket No. G-04204A-11-0158), Arizona Corporation Commission, 2011.

Semstream Arizona Propane, LLC Rate Proceeding, (Docket No. G-20471A-11-0150), Arizona Corporation Commission, 2011.

El Paso Natural Gas Company, Rate Proceeding, (Docket No. RP10-1398), Federal Energy Regulatory Commission, 2011.

Graham County Utilities Company Rate Proceeding (Docket No. G-02527A-12-0321), Arizona Corporation Commission, 2013.

ACC Track and Record Renewable Energy Proceeding (Docket Nos. E-01345A-10-0394, E-01345A-12-0290, E-01933A-12-0296, and E-04204A-12-0297), Arizona Corporation Commission, 2013.

Johnson Utilities Application for Approval of the Sale and Transfer of Assets and Conditional Cancellation of its Certificate of Convenience and Necessity (Docket No. WS-02987-13-0477), Arizona Corporation Commission, 2014.

Richard Gayer, Complainant V. Southwest Gas Corporation, Respondent (Docket No. G-01551A-13-0327), Arizona Corporation Commission, 2014.

Epcor Water Arizona, Inc. Application for Approval of a Certificate of Convenience and Necessity to Provide Wastewater Utility Service in Maricopa County, Arizona (Docket No. WS-01303A-15-0018), Arizona Corporation Commission, 2015.

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(with Prem Bahl) "Transmission Access Issues: Present and Future," October, 1991.

(with David Berry) Substitution of Photovoltaics for Line Extensions: Creating Consumer Choices. Arizona Corporation Commission, 1992.

(with Barbara Keene and Kim Clark) Report of the Task Force on the Feasibility of Implementing Sliding Scale Hookup Fees, December, 1992.

(with Mike Kuby) "The Hub and Network Design Problem With Stopovers and Feeders: The Case of Federal Express," Transportation Research A, Vol. 27A, 1993, pp. 1-12.

(with David Berry) Staff Guidelines on Photovoltaics Versus Line Extensions. Arizona Corporation Commission, January 28, 1993.

(with Ray Williamson, Robert Hammond, Frank Mancini, and James Arwood) The Solar Electric Option (Instead of Power Line Extension). A joint publication of the Arizona Corporation Commission and the Arizona Department of Commerce Energy Office, August, 1993.

(with David Berry, Kim Clark, Barbara Keene, Jesse Tsao, Ray Williamson, Randall Sable, Roni Washington, Wilfred Shand, and Prem Bahl) Staff Report on Resource Planning. (Docket No. U-0000-93-052) Arizona Corporation Commission, 1993.

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(with David Berry, Kim Clark, Barbara Keene, Glenn Shippee, Julia Tsao, and Ray Williamson) Staff Report on Resource Planning. (Docket No. U-000-95-506) Arizona Corporation Commission, 1996.

(with Barbara Keene) "Customer Selection Issues," NRRI Quarterly Bulletin, Vol. 19, No. 1, Spring 1998, National Regulatory Research Institute.
Staff Report on Purchased Gas Adjustor Mechanisms, (Docket No. G-00000C-98-0568) Arizona Corporation Commission, October 19, 1998.

Staff Report on the Rolling Average PGA Mechanism, (Docket No. G-00000C-98-0568), Arizona Corporation Commission, September 6, 2000.

Staff Report on the Use of a Circuit-Breaker in Adjustor Mechanisms, Arizona Corporation Commission, September 3, 2003.

Staff Report on Southwest Gas Filing for Pre-Approval of Cost Recovery for Participation in the Kinder Morgan Silver Canyon Pipeline Project, (Docket No. G-01551A-04-0192), Arizona Corporation Commission, June 2, 2004.

Staff Report on Arizona Public Service Company Filing for Pre-Approval of Cost Recovery for Participation in the Kinder Morgan Silver Canyon Pipeline Project, (Docket No. E-01345A-04-0273), Arizona Corporation Commission, August 16, 2004.

Staff Report on Arizona Public Service Company Filing for Pre-Approval of Cost Recovery for Participation in the Transwestern Pipeline Phoenix Project, (Docket No. E-01345A-05-0895), Arizona Corporation Commission, March 2, 2006.

Staff Report on Southwest Gas Filing for Pre-Approval of Cost Recovery for Participation in the Transwestern Pipeline Phoenix Project, (Docket No. G-01551A-06-0107), Arizona Corporation Commission, May 16, 2006.

Staff Report on UNS Gas Filing for Pre-Approval of Cost Recovery for Participation in the Transwestern Pipeline Phoenix Project, (Docket No. G-04204A-06-0627), Arizona Corporation Commission, January 30, 2007.

Staff Review of UNS Electric 2008 Renewable Energy Standard Tariff and Implementation Plan, (Docket No. E-04204A-07-0593), Arizona Corporation Commission, March 25, 2008.

Staff Report on Semstream Arizona Propane, Payson Division Bankruptcy, Reorganization, and other issues, Arizona Corporation Commission, June 6, 2008.

Staff Review of UNS Electric 2009 Renewable Energy Standard Tariff and Implementation Plan, (Docket No. E-04204A-07-0593), Arizona Corporation Commission, November 26, 2008.

Staff Review of Tucson Electric Power 2009 Renewable Energy Standard Tariff and Implementation Plan, (Docket No. E-01933A-07-0594), Arizona Corporation Commission, November 26, 2008.

Staff Report for Arizona Water Company and Global Water Resources LLC's Consolidated Docket Addressing Numerous Requests for Extensions of Certificates of Convenience and Necessity for Water and Wastewater Service as Well as the Transfer of Assets, (Docket No. W01445A-06-0199, etc.), Arizona Corporation Commission, May 10, 2009.

Staff Review of UNS Electric 2010 Renewable Energy Standard Tariff and Implementation Plan, (Docket No. E-04204A-09-0347), Arizona Corporation Commission, January 5, 2010.

Staff Review of Tucson Electric Power 2010 Renewable Energy Standard Tariff and Implementation Plan, (Docket No. E-01933A-09-0340), Arizona Corporation Commission, January 5, 2010.

Staff Review of UNS Electric 2011 Renewable Energy Standard Tariff and Implementation Plan, (Docket No. E-04204A-10-0265), Arizona Corporation Commission, November 8, 2010.

Staff Review of Tucson Electric Power 2011 Renewable Energy Standard Tariff and Implementation Plan, (Docket No. E-01933A-10-0266), Arizona Corporation Commission, November 9, 2010.

Staff Review of UNS Electric 2012 Renewable Energy Standard Tariff and Implementation Plan, (Docket No. E-04204A-11-0267), Arizona Corporation Commission, October 25, 2011.

Staff Review of Tucson Electric Power 2012 Renewable Energy Standard Tariff and Implementation Plan, (Docket No. E-01933A-11-0269), Arizona Corporation Commission, October 25, 2011.

Staff Review of UNS Electric 2013 Renewable Energy Standard Tariff and Implementation Plan, (Docket No. E-04204A-12-0297), Arizona Corporation Commission, October 18, 2012.

Staff Review of Tucson Electric Power 2013 Renewable Energy Standard Tariff and Implementation Plan, (Docket No. E-01933A-12-0296), Arizona Corporation Commission, October 18, 2012.

Staff Review of UNS Electric 2014 Renewable Energy Standard Tariff and Implementation Plan, (Docket No. E-04204A-13-0225), Arizona Corporation Commission, September 30, 2013.

Staff Review of Tucson Electric Power 2014 Renewable Energy Standard Tariff and Implementation Plan, (Docket No. E-01933A-13-0224), Arizona Corporation Commission, September 30, 2013.

Staff Review of UNS Electric 2015 Renewable Energy Standard Tariff and Implementation Plan, (Docket No. E-04204A-14-0249), November 3, 2014.

Staff Review of Tucson Electric Power 2015 Renewable Energy Standard Tariff and Implementation Plan, (Docket No. E-01933A-14-0248), November 3, 2014.

Renewable Energy Standard and Tariff Rulemaking (Docket No. RE-00000C-14-0112), Arizona Corporation Commission, 2014.

(with other Staff members) Arizona Corporation Commission Comments on the Draft Clean Power Plan, United States Environmental Protection Agency, (EPA Docket Number EPA-HQ-OAR-2013-0602), December 1, 2014.

Staff Review of UNS Electric 2016 Renewable Energy Standard Tariff and Implementation Plan, (Docket No. E-04204A-15-0233), November 24, 2015.

(with other Staff members) Arizona Corporation Commission Comments on the Clean Power Plan Federal Plan, Model Rules, and Clean Energy Incentive Program, United States Environmental Protection Agency, (EPA Docket Number EPA-HQ-OAR-2015-0199), January 21, 2016.

Education

B.A. Geography, University of Minnesota-Duluth (1988)

M.A. Geography, Arizona State University (1990) Thesis: *A Model for Optimizing the Federal Express Overnight Delivery Aircraft Network.*

Additional Training

1990	Seminars on Regulatory Economics
1993	PURTI course on Public Utilities and the Environment
1996	Center for Public Utilities Workshop on Gas Unbundling and Retail Competition
1997, 1998	NARUC Annual Natural Gas Conference
1998	Local Distribution Company Restructuring and Retail Access and Competition Conference
1999 – 2007, 2010, 2012	NARUC Summer Committee Meetings
2001	Center for Public Utilities Workshop on Risk Management in Gas Purchasing
2003-2008	NARUC Winter Committee Meetings
2004-2007	NARUC Annual Convention

Memberships

NARUC – Staff Subcommittee on Gas – member, 1998 - present
 NARUC – Staff Subcommittee on Gas – Vice-Chair - 2002 - 2004
 NARUC – Staff Subcommittee on Gas – Chair - 2005 - 2007
 Michigan State Institute for Public Utilities – NARUC Advisory Committee – 2005-2007
 NARUC – North American Energy Standards Board Advisory Council – 2006 - present
 NARUC – DOE LNG Partnership – 2003 – present
 North American Energy Standards Board – Board of Directors – 2014 - present
 North American Energy Standards Board – Executive Committee, Retail Energy Quadrant, Retail Electric End Users/Public Agencies Segment – 2014 - present

OPEN MEETING MEMORANDUM

TO: THE COMMISSION

FROM: Utilities Division

DATE: March 11, 2016

RE: TUCSON ELECTRIC POWER COMPANY. - APPLICATION FOR APPROVAL OF ITS 2016 RENEWABLE ENERGY STANDARD AND TARIFF IMPLEMENTATION PLAN (DOCKET NO. E-01933A-15-0239)

On July 1, 2015, Tucson Electric Power Company ("TEP" or "Company") filed for Arizona Corporation Commission ("Commission") approval of its 2016 Renewable Energy Standard and Tariff ("REST") Implementation Plan. On September 16, 2015, TEP filed a supplement to its application reporting the results of its energy storage system solicitation and evaluation.

TEP's initial filing requests approval of various REST plan components, including a budget, customer class caps, various program details, continuation of a Company-owned rooftop solar program, introduction of a community solar program, approval of energy storage projects, waiver of the 2016 residential DG REST requirement, and compliance matters.

TEP's Five Year Projection of Energy, Capacity, and Costs

The table below shows TEP's forecast for energy and costs for its annual REST plans from 2016 through 2020.

TEP Energy, Capacity, and Cost Forecast					
	2016	2017	2018	2019	2020
Forecast Retail Sales MWh	9,063,742	9,113,176	9,189,984	9,381,001	9,846,004
% Renewable Energy Required	6.0%	7.0%	8.0%	9.0%	10.0%
Overall Renewable Requirement MWh	543,825	637,922	735,199	844,290	984,600
Utility Scale Requirement MWh	380,677	446,546	514,639	591,003	689,220
DG Requirement MWh	163,147	191,377	220,560	253,287	295,380

RES DG Requirement MWh	81,574	95,688	110,280	126,644	147,690
Non-Res DG Requirement MWh	81,574	95,688	110,280	126,644	147,690
Total Program Cost	\$47,836,529	\$47,790,347	\$45,638,929	\$43,868,828	\$41,224,021

TEP REST Experience Under 2015 REST Plan

The Commission-approved implementation plan for 2015 contemplated total spending of \$40,118,385 and total recoveries through the REST surcharge of \$33,291,969.

Regarding installations and reservations, the table below summarizes installations and reservations for installations through June 30, 2015 by TEP.

Residential	Photovoltaics		Solar Hot Water	
	Number of Systems	kW (kWh)	Number of Systems	kWh
2015 Installations	1,577	11,420 (3,984,159)	9	24,750
Reservations	2,293	12,590 (23,921,000)	NA	NA

Commercial	Photovoltaics		Solar Hot Water	
	Number of Systems	kW (kWh)	Number of Systems	kWh
2015 Installations	36	7,150 (594,709)	NA	NA
Reservations	165	36,450 (69,255,000)	NA	NA

Systems That Do Not Take a Utility Incentive

The following table shows the number, kW, and kWh of systems that have been installed in TEP's service territory that have not taken an incentive from TEP and thus TEP has not used the associated renewable energy credits ("RECs") to achieve compliance under the REST rules.

Residential	Number of Projects	kW	kWh
2012	2	4	7,465
2013	52	401	702,048
2014	1,875	13,461	21,743,879
2015	1,834	13,290	21,153,414

Non-Residential			
2012	3	179	321,894
2013	8	5,011	9,020,250
2014	37	8,000	14,399,640
2015	39	8,250	14,850,135

Leased Versus Non-Leased Systems

TEP indicates that a significant majority of residential systems are leased in 2014 and into August 2015 (2701 leased systems versus 1008 non-leased systems). TEP indicates that all 37 non-residential systems are non-leased in 2014 and all 39 non-residential systems so far in 2015 are non-leased.

Bright Tucson Solar Buildout Plan

In recent years the Commission has approved continuation of TEP's buildout program at a rate of up to \$28 million annually. However, TEP has indicated that it will no longer seek approval of Bright Tucson Solar Buildout Plan funding through the REST plan. Instead TEP will invest in renewable energy projects and seek recovery of related costs via traditional methods, such as in a general rate proceeding. Thus, TEP's buildout plan related costs the Company is seeking to recover through the REST budget are costs related to projects from past years' REST plans that are not yet being recovered through base rates.

Line Item	2016	2017	2018	2019
Carrying Costs	\$4,085,866	\$531,329	\$475,422	\$310,061
Book Depreciation	\$4,388,532	\$600,000	\$600,000	\$600,000
Property Tax Expense	\$392,960			\$65,013
Operations and Maintenance	\$498,667	\$69,525	\$71,611	\$73,759
Total	\$9,366,025	\$1,200,854	\$1,147,033	\$1,048,833

Energy Storage Solicitation

In TEP's 2015 REST plan filing with the Commission on July 1, 2014, TEP sought Commission guidance as to how costs for a potential energy storage project could be recovered, in anticipation of an upcoming solicitation TEP would hold for a 10 MW energy storage system ("ESS"). In Decision Number 74884, the Commission indicated that its preference at the time was for TEP to recover such costs through TEP's Purchased Power and Fuel Adjustment Clause ("PPFAC"). TEP's proposed 2016 REST plan filing indicated that TEP would update it with information on the ESS solicitation when it was completed. TEP filed this update in its September 16, 2015 supplement to its proposed 2016 REST plan.

TEP's supplemental filing indicates that TEP selected two 10 MW storage projects. TEP indicated that the responses to the solicitation exceeded its expectations and that it would be able to do the two 10 MW projects for less cost than it expected to do the one 10 MW project it discussed in its 2015 REST plan filing. The storage projects would involve two lithium battery variations, with one including a 2 MW solar facility. TEP would contract with outside companies for the two storage facilities for ten years of service from the facilities. TEP would pay fees to the two companies totaling \$1,520,000 annually, or a total of \$15,200,000 over the ten year life of the agreements with the outside companies.

TEP has indicated that the benefits of the project include providing frequency response at pre-determined set points, voltage and VAR support, ramp rate control, and energy storage as required. TEP has also cited that the storage projects will help TEP avoid possible North American Electric Reliability Corporation ("NERC") penalties. TEP has indicated in discussions with Staff that pursuit of storage projects such as these is necessitated by the increasing deployment of renewable energy facilities on its grid and the concomitant grid support needs. Of note, TEP also indicated to Staff that different renewable energy technologies require different type(s) of grid support, so, for example, the grid support requirements of wind would be different than the grid support requirements of solar.

TEP's agreements with the two proposed storage projects include protection for ratepayers by requiring the storage facilities to demonstrate on a quarterly basis that their facilities can perform up to the requirements of their contracts with TEP. Regarding the 2 MW solar facility, TEP would own the associated RECs and be able to count them toward compliance.

Regarding cost recovery, Staff does not see a reason to change the guidance that was provided to TEP in Decision Number 74884 regarding the potential recovery of ESS related costs through the PPFAC. Staff recommends that TEP file a revised PPFAC Plan of Administration consistent with the Decision in this case, in Docket Control, within 30 days of the effective date of the Decision. The Plan of Administration should list the appropriate FERC account(s) in which the various storage-related costs would be included.

Energy storage is often cited as one of the key expected developments in the electric utility industry in the coming years and deployment of these facilities on TEP's electric grid will provide TEP with valuable experience in understanding the benefits and challenges of having storage assets within its electric supply portfolio. Staff recommends approval, as a pilot program, of the proposed energy storage facilities and recovery of prudently incurred costs through the PPFAC.

Residential DG Waiver Request

TEP is requesting in its proposed 2016 REST plan to be granted a prospective annual waiver of the 2016 residential DG REST incremental requirement. TEP has indicated that it projects that it will not have enough RECs to demonstrate compliance with its residential DG requirement in 2016 given that it is not counting toward REST compliance any residential DG installations that it does not give an incentive to. In support of TEP's request TEP cited the following information in communications with Staff:

- In 2014, TEP installed or reserved 20.83 MW of non-incentivized residential solar PV of capacity.
- Through August 28, 2015, TEP has installed or reserved 21.042 MW of non-incentivized residential solar PV of capacity.
- Cumulatively, this additional 41.872 MW of residential solar capacity will produce, on average, an additional 78,510,000 kWh annually (based on 1,875 kWh per kW). Although TEP does not own title to these REC's, nor can TEP claim these kWh or REC's for RPS compliance purposes, they represent more than double the 62,947,000 kWh the Company retired for compliance in 2014. Combined these values represent more than 1.5% of TEP's annual retail sales – the equivalent of the Company's projected compliance requirement for the year 2020.
- TEP indicated that as of the end of 2014 it had 62,947 MWh of residential DG RECs and that it expects the 2016 residential DG compliance requirement to be approximately 81,600 MWh of residential DG RECs.

If the 600 installations, with an average system size of 6 kW and generating 1,800 kWh/kW, the total production of those installations for an entire year would be a little over 6,000 MWh. Thus the RECs from this program would not nearly fill the roughly 20,000 MWh gap TEP has identified.

In essence TEP is citing a high level of non-incentived market activity in its service territory in the past and present to justify the granting of a waiver. During the Commission's Track and Record proceeding and subsequent REST rulemaking dockets, market activity was a commonly cited possible way for a utility to demonstrate that the granting of a waiver is warranted. From the information provided by TEP, Staff believes that it is highly likely TEP will need a waiver of the 2016 increment of the residential DG portion of its REST requirement and that the high level of market activity in the past and present is an acceptable way to demonstrate the reasonableness of granting such a waiver. TEP has indicated that RECs it receives from the 600 installations under the initial pilot phase of the TORS program will not result in it achieving compliance in 2016. Further, given the delays in this proceeding, it appears unlikely that TEP would receive any RECs in 2016 from its proposed community solar program if it is ultimately approved by the Commission. This filing by TEP represents the first waiver request by TEP since the Commission's track and record proceeding concluded. Unlike typical REST plan filings which are acted on by the Commission late in the previous calendar year or slightly into the year the plan is applicable to, this REST plan is under consideration in a hearing process where TEP will not have an approved REST plan for 2016 until well into 2016. Staff believes given the circumstances in this case that an annual waiver of the 2016 increment of the residential DG compliance requirement under the REST rules is warranted and Staff recommends approval of such a waiver. Under such an annual waiver, it would be valid for the calendar year 2016, but TEP would have to seek a new waiver if it wanted this waiver continued or expanded into 2017.

2016 REST Budget Proposal

The TEP and Staff REST plan budget proposal will be discussed in the remainder of this document.

2014 Funds Carried Forward to 2016 REST Budget

TEP's filing reflects the carryforward of \$8,809,321 in unspent funds from TEP's 2014 REST budget. The table below accounts for what line items of TEP's 2014 REST budget those funds came from.

2014 Tariff Revenue	\$390,856
Lower Cost Purchased Renewable Energy	\$8,474,468
Customer Sited Distributed Renewable Energy	\$254,933
Labor and Administration	\$83,612
Metering	-\$393,981
Other Budget Items	-\$567
Total Unspent 2014 REST funds	\$8,809,321

The TEP and Staff REST budget proposal discussed herein reflects this carryforward of unspent 2014 REST funds which reduce the amount of money required to be recovered through the 2016 REST surcharge. This treatment is consistent with how the Commission has treated funds carried forward in the past.

Proposed TEP and Staff Budget

Staff has reviewed the budget proposal contained in TEP's proposed 2015 REST plan and agrees with TEP's proposed budget. The table below summarizes the budget being proposed by TEP and Staff.

Budget Components	2015 Approved Budget	2016 TEP and Staff Proposal
<i>Purchased Renewable Energy</i>		
Above market cost of conventional generation	\$22,971,774	\$38,002,919
TEP Owned	\$8,022,530	\$9,366,025
Subtotal	\$30,994,304	\$47,368,944
<i>Customer Sited Distributed Renewable Energy</i>		
Non-Residential PBI On-Going Commitments	\$7,214,196	\$7,192,720
Meter Reading	\$35,363	\$35,363
Customer Education and Outreach	\$100,000	\$100,000
Subtotal	\$7,349,559	\$7,328,083
<i>Internal and Contractor Training</i>		
Subtotal	\$85,000	\$85,000
<i>Information Systems</i>		
Subtotal	\$100,000	\$75,000
<i>Metering</i>		
Subtotal	\$501,680	\$697,975
<i>Labor and Administration</i>		
Internal Labor	\$468,442	\$556,944
External Labor	\$302,401	\$216,903
Materials, Fees, Supplies	\$60,000	\$60,000
AZ Solar Website	\$4,000	\$4,000

Subtotal	\$834,843	\$837,847
<i>Research and Development</i>		
Renewable Integration and Operations Study	\$38,000	\$38,000
Solar and Wind Forecast Integration Portal	\$100,000	\$100,000
Solar Test Yard	\$50,000	\$50,000
Field and Lab Degradation Analysis	\$50,000	\$50,000
Dues and Fees	\$15,000	\$15,000
Subtotal	\$253,000	\$253,000
Total Spending	\$40,118,386	\$56,645,849
Carryover of Previous Year's Funds	-\$6,826,417	-\$8,809,321
Total Amount for Recovery	\$33,291,969	\$47,836,529

Recovery of Funds Through 2016 REST Charge

TEP's proposed caps and per kWh charge are designed to recover TEP's proposed spending and recovery levels in 2016 and Staff's proposed caps and per kWh charge are designed to recover TEP and Staff's proposed budget of \$56.6 million and recovery level of \$47.8 million.

The table below shows the proposed surcharge per kWh for the TEP and Staff options as well as the proposed caps under each option, in comparison to what is currently in effect for 2015.

	2015 Approved	2016 TEP Proposal	2016 Staff Proposal
REST Charge (per kWh)	\$0.008	\$0.013	\$0.013
<i>Class Caps</i>			
Residential	\$3.83	\$4.56	\$4.76
Small General Service (Small Commercial)	\$100.00	\$150.00	\$130.00
Large General Service (Large Commercial)	\$1,015.00	\$1,500.00	\$1,300.00
Industrial and Mining	\$8,000.00	\$12,000.00	\$15,000.00
Lighting	\$100.00	\$150.00	\$130.00

Staff's proposal contains the same per kWh REST surcharge as TEP's proposal does, but adjusts the customer class caps differently than TEP did. Staff's proposed caps reduce the impact on the small general service and large general service customers, reflecting that these two customer classes contribute a much higher percentage of REST revenue than their share of TEP's MWH sales and even with Staff's proposal would continue to do so.

The cost recovery by customer class for the TEP and Staff options for the 2016 REST plan are shown in the table below. For comparison purposes, the table below also shows the projected MWH sales by customer class for 2016.

	2016 Projected Sales (MWH)	2016 TEP Proposal	2016 Staff Proposal
Residential	3,690,752 (40.7%)	\$18,677,315 (39.1%)	\$19,361,633 (40.5%)
Small General Service	2,166,759 (23.9%)	\$16,265,080 (34.0%)	\$15,397,114 (32.2%)
Large General Service	1,149,502 (12.7%)	\$8,646,389 (18.1%)	\$7,888,677 (16.5%)
Industrial and Mining	2,024,188 (22.3%)	\$3,813,236 (8.0%)	\$4,766,545 (10.0%)
Lighting	32,541 (0.4%)	\$423,386 (0.9%)	\$418,891 (0.9%)
Total	9,063,742	\$47,825,407	\$47,832,860

The table below shows the average REST charge by customer class as well as the percentage of customers at the cap for each customer class.

	2016 TEP Proposal	2016 Staff Proposal
Residential - Average Bill	\$4.02	\$4.17
Small Commercial - Average Bill	\$32.06	\$30.32
Large Commercial - Average Bill	\$1,200.02	\$1,092.76
Industrial and Mining - Average Bill	\$12,000	\$15,000
Lighting - Average Bill	\$19.05	\$18.85
Residential - Percent at Cap	75.1%	73.5%
Small Commercial - Percent at Cap	8.2%	9.3%
Large Commercial - Percent at Cap	50.6%	57.0%
Industrial and Mining - Percent at Cap	100.0%	100.0%
Lighting - Percent at Cap	0.7%	1.3%

Staff recommends approval of the Staff proposal.

Compliance Issues

Having reviewed the Company's compliance report filed with the Commission in April 2015, the proposed REST plan filed in July 2015, and other applicable information, Staff concludes that TEP has not used any RECs not owned by the utility to comply with the Commission's REST rules in 2014.

Per A.A.C. R14-2-1812, UNS is required to file an annual compliance report. Staff recommends that, TEP file its annual REST compliance reports in a docket to be opened by Staff.

Staff Recommendations

1. Staff recommends that the Commission approve the Staff budget option for the 2016 REST plan, reflecting a REST surcharge of \$0.01300 per kWh, and related caps of \$4.76 for the residential class, \$130.00 for the small general service class, \$1,300.00 for the large general service class, \$15,000.00 for the industrial and mining class, and \$130.00 for the lighting class. This includes total spending of \$56,645,849 and a total amount to be recovered through the REST surcharge of \$47,836,529.
2. Staff further recommends approval, as a pilot program, of the proposed energy storage facilities and recovery of prudently incurred costs through the Purchased Power and Fuel Adjustment Clause.
3. Staff further recommends that Tucson Electric Power file a revised Purchased Power and Fuel Adjustment Clause Plan of Administration consistent with the Decision in this case, in Docket Control, within 30 days of the effective date of the Decision. The Plan of Administration should list the appropriate Federal Energy Regulatory Commission account(s) in which the various storage-related costs would be included.
4. Staff further recommends approval of the waiver requested by Tucson Electric Power for the 2016 increment for the residential DG requirement in the REST rules.
5. Staff further recommends that Tucson Electric Power file its annual REST compliance reports in a docket to be opened by Staff.
6. Staff further recommends that Tucson Electric Power file the REST-TS1, consistent with the Decision in this case, within 15 days of the effective date of the Decision.

Thomas M. Broderick
Director
Utilities Division

TMB:RGG:red\BES

ORIGINATOR: Robert Gray

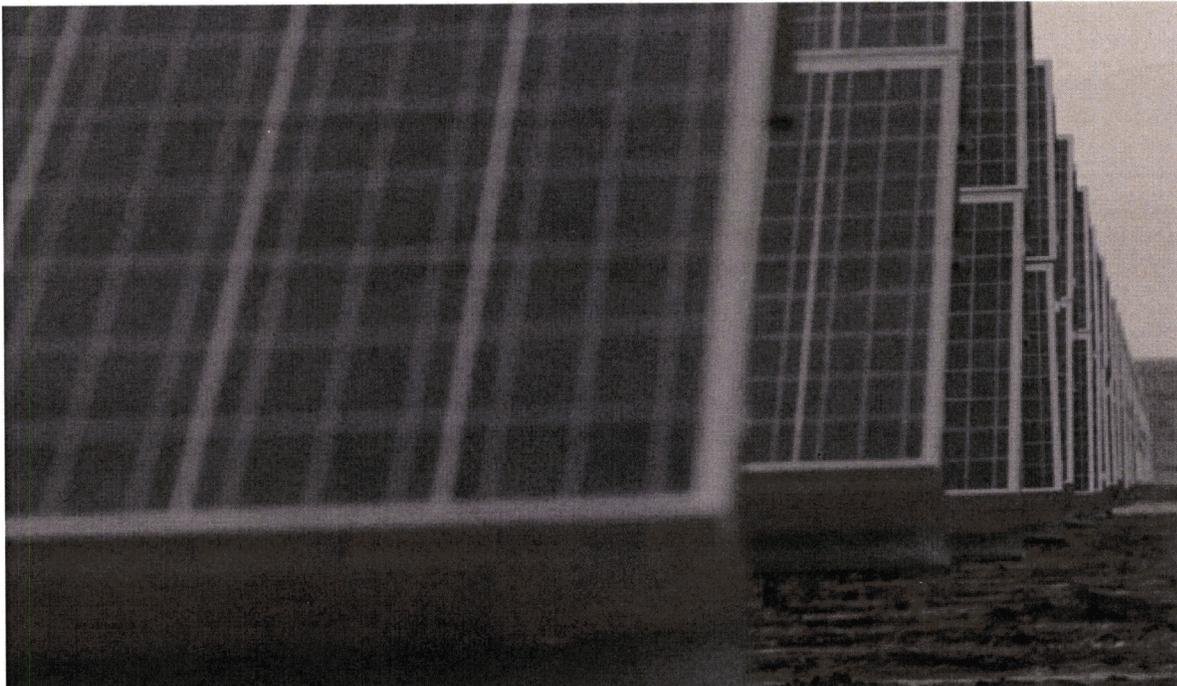
Exhibit RGG-3

Documents Regarding Community Solar Marketplace



The Benefits of Community Solar

By SolarCity | June 17, 2015



Poll after poll after poll has indicated that solar - an infinite power source that creates no pollution and requires no water to generate electricity - is the most popular energy choice in America. This rise in support is driven in large part by economics, and we believe is likely to increase as the cost of solar continues to fall. Now another barrier to solar's growth is being eliminated: the requirement of home ownership.

More people than ever can go solar

Thanks to community solar programs like the one SolarCity announced today, even renters can reap the benefits of affordable energy. These programs have

made clean, abundant energy accessible when installing solar panels isn't a viable option. Community solar, sometimes called "solar gardens," enables people to share solar when they are grid-connected. Subscribers to a community solar program can purchase a portion of the energy produced by the community solar project at a lower kWh rate than charged by their local utility, and in return, they receive a credit on their utility bill. Ask the 100 million renters in the United States if they'd switch to cleaner, more affordable energy given the choice, and the potential impact of community solar becomes clear.

Energy cost savings

Participating in a community solar project can have vast economic benefits for residents and municipalities alike. Minnesota's new community solar program is expected to be the largest in the nation when completed. Cologne, the first local government in the state to require that all of its city facilities' energy needs will be sourced from solar, is expected to save \$1.1 million over the next 25 years. A solar garden in Milton, New Hampshire is being built atop the town's capped landfill with the sole purpose of selling electricity back to the local utility company. Community members that participate in the solar garden will be eligible for annual rebates.

Cleaner, green energy

Solar offers significant positive environmental impact. SolarCity's average solar power system can offset 178 tons of CO₂ over 30 years - that's like saving the amount of fuel it takes to drive 390,375 miles. Public utility commissions are slowly recognizing this positive impact by supporting policies that enable solar companies to partner with local utility companies that mandate community solar gardens, resulting in a co-existence that offers consumers a choice in their source of power and allows utilities to better manage meeting their energy needs. In 2015, Pacific Gas & Electric (PG&E) received permission from state regulators to offer its customers a community solar option. In 2013, Minnesota enacted a statute requiring local utility companies to ensure that by 2020 at least 1.5% of their retail electricity sales in the state are produced from solar, and SolarCity is

proud to be contributing community solar installations in furtherance of that mandate.

For more info on our new community solar program, [click here](#).

This release contains forward-looking statements including, but not limited to, statements regarding adoption rates of solar energy, cost of solar energy systems, future project construction, environmental benefits of solar energy, and anticipated savings. Forward-looking statements should not be read as a guarantee of future performance or results, and will not necessarily be accurate indications of the times at, or by, which such performance or results will be achieved, if at all. Forward-looking statements are subject to risks and uncertainties that could cause actual performance or results to differ materially from those expressed in or suggested by the forward looking statements. You should read the section entitled "Risk Factors" in SolarCity's quarterly report on Form 10-Q, which has been filed with the Securities and Exchange Commission and identifies certain of these and additional risks and uncertainties. We do not undertake any obligation to publicly update or revise any forward-looking statement, whether as a result of new information, future developments or otherwise.

Laurie Garion 6/18/2015 5:14:52 AM

When will this be available in Florida?

☛ Reply to *Laurie Garion*

Brandon Murray 6/24/2015 6:01:09 AM

Looking forward!

☛ Reply to *Brandon Murray*

Kevin Franzen 6/24/2015 4:05:55 PM

Does a renter need to purchase a KW per say to get the rebates or just request usage of the solar power? Here in Utah where Solarcity sadly not doing residential homes yet there is a solar farm where people can choose to buy 1 to 2

kw systems and off set the bill but not many purchased at current time as it would not be worth the rebates.

☛ Reply to *Kevin Franzen*

solarcity 9/3/2015 1:54:09 PM

Hello Kevin,

Thank you for your interest in solar. While we don't have news about growth the Utah just yet, we hope to soon. Stay tuned.

Thanks!

☛ Reply to *solarcity*

First Name*

Last Name

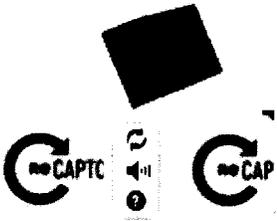
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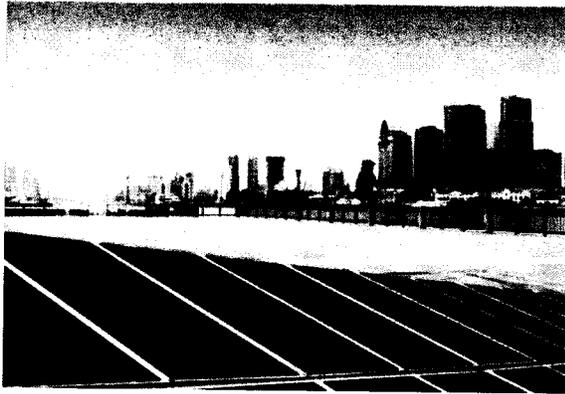
April 2014 (8)

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MARKETS & POLICY

US Community Solar Market to Grow Fivefold in 2015, Top 500MW in 2020



California, Minnesota, Colorado and Massachusetts will pave the way.

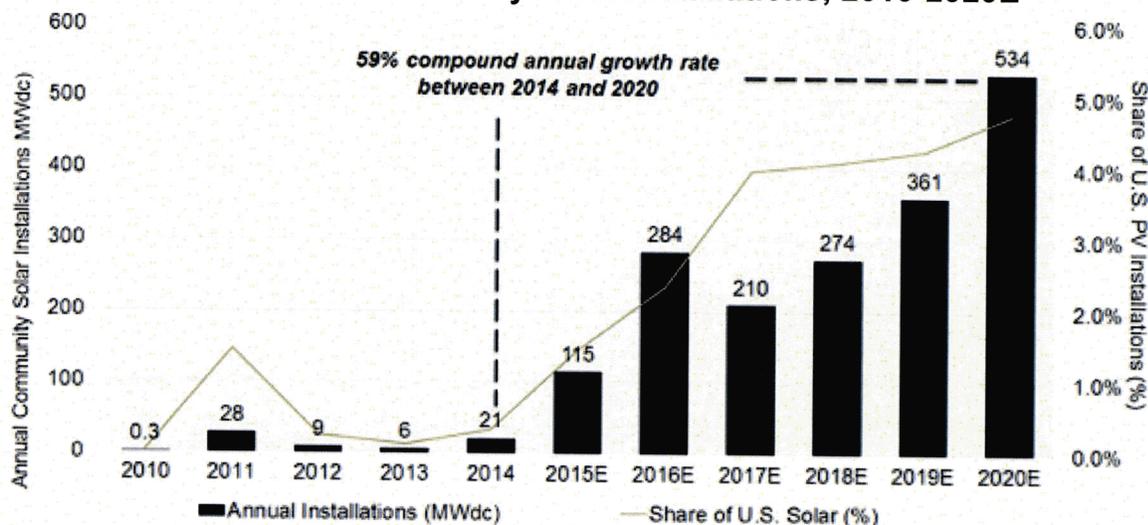
by Mike Munsell
June 23, 2015

Photo Credit: shutterstock.com

The U.S. community solar market is approaching a tipping point. In its latest report, *U.S. Community Solar Outlook 2015-2020* (<http://www.greentechmedia.com/research/report/us-community-solar-market-outlook-2015-2020>), GTM Research forecasts the market to grow fivefold this year, with 115 megawatts installed. By 2020, community solar in the United States will be an annual half-gigawatt opportunity.

With 66 cumulative megawatts installed through the end of 2014, the U.S. community solar market is just getting off the ground. However, GTM Research has pegged it as the most significant solar growth market for the United States. Between 2014 and 2020, GTM Research expects U.S. community solar to have a compound annual growth rate of 59 percent.

FIGURE: Annual U.S. Community Solar Installations, 2010-2020E



Source: GTM Research's U.S. Community Solar Outlook 2015-2020

(<http://www.greentechmedia.com/research/report/us-community-solar-market-outlook-2015-2020>)

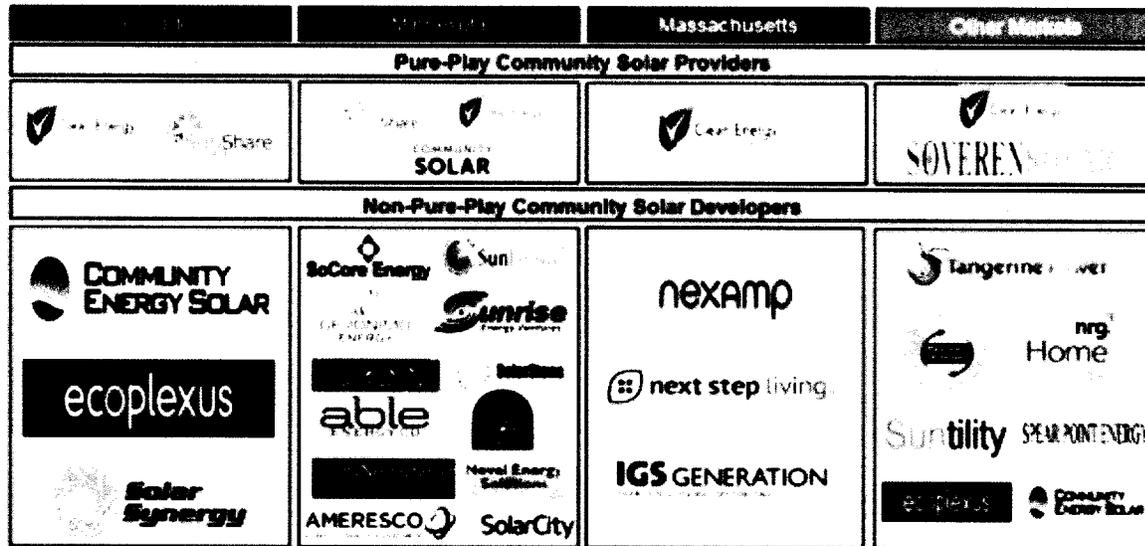
According to the report, there are 24 states with at least one community solar project on-line, and 20 states have or are in the process of enacting community solar legislation. However, it's four states -- California, Colorado, Massachusetts and Minnesota -- that will install the majority of community solar over the next two years.

In the near term, these four state markets will serve as the core drivers of demand, fueling more than 80 percent of installations over the next two years.

“Looking ahead to 2020,” said Senior Solar Analyst Cory Honeyman, “the community solar opportunity is poised to become more geographically diversified, as developers ramp up service offerings to utilities in states without community solar legislation in place and as national rooftop solar companies enter the community solar scene.”

The report identifies 29 developers that are actively working on community solar projects. Today, two companies, Clean Energy Collective and SunShare, together account for 32 percent of operating community solar capacity.

FIGURE: Community Solar Developer Landscape



Source: GTM Research [U.S. Community Solar Outlook 2015-2020](http://www.greentechmedia.com/research/report/us-community-solar-market-outlook-2015-2020)
 (<http://www.greentechmedia.com/research/report/us-community-solar-market-outlook-2015-2020>)

However, GTM Research expects a wave of market entry and expansion over the next five years, as rooftop solar companies including NRG, SunEdison, and SolarCity build out their community solar efforts.

The next five years will see the U.S. community solar market add an impressive 1.8 gigawatts, compared to just 66 megawatts through the end of 2014.

For more information, download the report brochure [here](http://www.greentechmedia.com/research/report/us-community-solar-market-outlook-2015-2020)
 (<http://www.greentechmedia.com/research/report/us-community-solar-market-outlook-2015-2020>).



Mike Munsell

Marketing Manager
 GTM Research

Mike Munsell is a Marketing Manager with GTM Research. Mike covers key findings from GTM Research's solar, grid edge and energy storage reports and data services. He also hosts GTM's weekly Energy News Quiz.

Exhibit RGG-4

Residential Solar's Limits Graph

Residential Solar's Limits

