AUSTIN ENERGY'S TARIFF PACKAGE: UPDATE OF THE 2009 COST OF SERVICE STUDY AND PROPOSAL TO CHANGE BASE ELECTRIC RATES	§ § § §	**BEFORE THE CITY OF AUSTIN IMPARTIAL HEARING EXAMINER**

DIRECT TESTIMONY

OF

LESLIE LIBBY

ON BEHALF OF PUBLIC CITIZEN AND SIERRA CLUB

May 27, 2016
(Supplementing Corrected Position Statement/Presentation on the Issues)

Q: PLEASE STATE YOUR NAME AND ADDRESS.

A: My name is Leslie Libby. My address is 1715 Nash Avenue, Austin, Texas 78704

Q: ON WHOSE BEHALF ARE YOU TESTIFYING?

A: I am testifying on behalf of Public Citizen and Sierra Club.

Q: DID YOU PREPARE THIS TESTIMONY?

A: Yes. This testimony was prepared by me or under my direct supervision.

Q: PLEASE DISCUSS YOUR EDUCATIONAL BACKGROUND, PROFESSIONAL EXPERIENCE, AND QUALIFICATIONS.

A: I have a Master's degree in Engineering from UT, Austin. For my Master's Thesis I investigated the potential for solar energy for a consortium of utilities in Texas called Central and Southwest Services. In 2015, after 24 years of service I retired from Austin Energy. During my tenure at Austin Energy I worked exclusively in the area of solar energy. I was responsible for the design and implementation of the Solar Explorer Program and for ten years managed that program. This was one of first community solar programs in the nation. As Project Manager for Austin Energy I designed and managed the Solar Rebate Program, Solar Performance Based Incentive Program and the Solar for Schools Program. Many of these programs have been recognized as the model for programs across the country. In 2012, I was a member of the team responsible for the design and implementation of the Value of Solar Tariff.

Currently I own Libby Solar, a solar energy consultancy and serve on the Board of Directors of Solar Austin, Texas Solar Energy Society and the Texas Renewable Energy Association.

Q: HAVE YOU PROVIDED AN ATTACHMENT THAT DETAILS YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE?

A: Yes. I provide this information in Exhibit LL-1 to my testimony.

Q: WHAT CHANGES TO AUSTIN ENERGY'S TARIFF PROPOSAL DO YOU RECOMMEND?

A: I recommend that Austin Energy's Value of Solar tariff be extended to commercial customers. I also recommend that a Value of Community Solar Tariff be established.

Q: DURING YOUR TIME AT AUSTIN ENERGY, WERE YOU INVOLVED IN THE DEVELOPMENT OF THE VALUE OF SOLAR TARIFF?

A: Yes. Vice President Karl Rábago was the lead and Tim Harvey and I assisted him. Together with our consultants from Clean Power Research we authored the paper titled " DESIGNING AUSTIN ENERGY'S SOLAR TARIFF: USING A DISTRIBUTED PV VALUE CALCULATOR." This paper is attached as Exhibit LL-2.

Q: PLEASE DESCRIBE THE PURPOSE OF DEVELOPING THE VALUE OF SOLAR TARIFF.

A: Austin Energy's residential solar rate was designed to reflect the value of local solar generation, create equity between high and low consuming solar customers, reduce cost-shifting between solar and non-solar customers, recover Austin Energy's fixed costs and encourage solar customers to engage in efficiency and conservation.

Q: WHAT VALUES ARE INCUDED IN THE VALUE OF SOLAR FORMULA?

A: Fuel Value - avoided cost of fuel to meet electric loads as well as transmission and distribution losses, based on the solar production profile. This is inferred from ERCOT market price data and future natural gas prices.

Plant O&M Value - avoided costs associated with natural gas plant operations and maintenance by meeting peak load through renewable sources.

Generation Capacity Value - avoided capital costs of generation by meeting peak load through renewable sources, inferred from ERCOT market price data.

Transmission and Distribution Capacity Value- savings in transmission costs resulting from the reduction in the peak load by renewable sources.

Environmental Compliance Value - avoided cost to comply with environmental regulations and local policy objectives.

Q: ARE ANY OF THE VALUES INCLUDED IN THE VALUE OF SOLAR FORMULA SPECIFIC TO RESIDENTIAL SOLAR INSTALLATIONS, AS OPPOSED TO COMMERCIAL SOLAR INSTALLATIONS?

A: No. All values are consistent for customer sited solar regardless of customer class.

Q: WHEN YOU WERE LAST WORKING AT AUSTIN ENERGY IN 2015, WAS THE ENERGY PRODUCED FROM BOTH DISTRIBUTED RESIDENTIAL AND COMMERCIAL SOLAR INSTALLATIONS INCORPORATED INTO THE VALUE OF SOLAR CALULATION?

A: Yes. All existing customer sited solar projects were included in the analysis.

Q: WHEN YOU WERE LAST WORKING AT AUSTIN ENERGY IN 2015, DID THE UTILITY HAVE A POLICY REGAURDING ASSESSING POSSIBLE TRANSFORMER AND OTHER LOCAL ENERGY INFRASTRUCTURE IMPACTS FROM PROPOSED DISTRIBUTED COMMERCIAL SOLAR INSTALLATIONS?

A: Yes. In accordance with the Distributed Generation Planning Application (DGPA) and Austin Energy Interconnection Guidelines all DG 50kW and over and all DG in the downtown Network requires a Systems Engineering review. As per section M of AE's Commercial Solar Photovoltaic Performance Based Incentive Program Guidelines, The DGPA "may reveal additional required PV installation costs, or restrictions, and must be completed and approved before any work begins." See Exhibits LL-3, LL-4, LL-5

Q: WOULD EXTENDING THE VALUE OF SOLAR TARIFF TO COMMERCIAL CUSTOMERS BE INCOMPATIBLE WITH MAINTAINING THAT POLICY ON EVALUATING AND ALLOCATING INFRASTUCTURE COSTS ASSOCIATED WITH COMMERCIAL SOLAR INSTALLATIONS?

A: No. Extending the Value of Solar Tariff to Commercial Customers would not in any way change current policy.

Q: WHY WAS THE VALUE OF SOLAR TARIFF ORIGININALLY MADE AVAILABLE TO RESIDENTIAL, BUT NOT COMMERCIAL CUSTOMERS?

A: The team was instructed to develop a solution to for fairly compensating solar owners that was compatible with 5-tiered residential rates. At this time Net Metering was available to both residential and commercial customers. With the new residential 5-tier rate structure high consuming residential customers would receive a higher value for their energy production than low consuming residential customers. In other words, residential solar customers that conserved energy would be compensated less because the lowest tier is the least cost. The VOST solved this problem by providing the same compensation for solar generated electricity and was no longer dependent on which tier the energy displaced. On the other hand, AE was satisfied with continuing to offer Net Metering through the Distributed Generation from Renewable Energy Rider to the Commercial Electric Tariff.

Q: HOW WOULD YOU CALCULATE A VALUE OF SOLAR TARIFF FOR COMMERCIAL CUSTOMERS?

A: The existing formula is appropriate for both residential and commercial customers.

Q: WOULD APPLYING THE VALUE OF SOLAR TARIFF TO COMMERCIAL SOLAR INSTALLATIONS HAVE ANY IMPACT ON DEMAND CHARGES FOR COMMERCIAL CUSTOMERS?

A: No. Commercial customers would be billed for all energy consumed on site and the demand charge would not be altered by the solar production. Commercial customers would be credited at the VOST for energy generated by solar.

Q: ARE YOU AWARE OF ANY EVIDENCE IN A DIFFERENCE IN VALUE, A PER KILOWATT-HOUR BASIS, BETWEEN ELECTRICITY PRODUCED FROM RESIDENTAIL VERUS COMMERCIAL SOLAR INSTALLATIONS?

A: No.

Q: IS THERE ANY REASON THAT THE ENVIRONMENTAL BENEFITS FROM COMMERCIAL SOLAR INSTALLATIONS WOULD BE ANY DIFFERENT THAN THE ENVIRONMENTAL BENEFITS FROM RESIDENTIAL SOLAR INSTALLATIONS?

A: No. The current methodology used for calculating the Environmental Compliance Value is consistent for commercial customers. Currently, the Environmental Compliance Value is based on the average premium paid in voluntary green power purchasing programs in Texas. Many commercial customers subscribe to such programs. In fact, a majority of Austin Energy's GreenChoice program is supported

by commercial customers. There is no reason that the method for establishing the Environmental Compliance value should be different for commercial customers than for residential customers.

Q: ARE YOU FAMILIAR WITH THE OPTIONS PUT FORTH BY AUSTIN ENERGY ON HOW TO STRUCTURE THE COMMUNITY SOLAR PROGRAM?

A: The proposal I am familiar with is a structure whereby program participants pay a monthly fee based on capacity and are in turn credited for the fractional energy generated by the project at the Value of Community Solar Rate.

Q: DO YOU HAVE AN OPINION AS TO WHETHER OR NOT A PROGRAM STRUCTURE WHICH RELIES ON ESTABLISHMENT OF A VALUE OF COMMUNITY SOLAR TARIFF WOULD BE FAIR AND ATTRACTIVE TO CUSTOMERS?

A: I believe the establishment of a Value of Community Solar Tariff (VOCST) could result in a fair and attractive program offering. However, a timely and transparent process is necessary to ensure program success. I believe it is fair because they would virtually "own" a portion of a project and get credited for energy produced by their portion which is similar to how residential customer sited projects are handled by AE today. It would be attractive to customers because it would allow customers to participate in solar without having to invest in a PV system on their roof.

Q: DO YOU BELIEVE IT IS APPROPRIATE FOR A VALUE OF COMMUNITY SOLAR TARIFF TO BE ADOPTED AS PART OF THIS RATE CASE?

A: Yes. This rate case affords transparency and is timely as the Community Solar Program is expected to launch this December.

Q: WHY IS EXPANDING THE VALUE OF SOLAR TARIFF TO COMMERCIAL CUSTOMERS AND ESTABLISHING A VALUE OF COMMERCIAL SOLAR TARIFF IMPORTANT?

A: This is an essential step in transitioning AE to solar energy and meeting the solar goals as adopted by City Council. Our community has a commitment to solar energy and has spoken through their City Council. Expanding solar energy in Austin has significant environmental and economic benefits to our community.

Leslie Libby

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Education

B.S. (1984), Mechanical Engineering, Montana State University
M.S. (1992), Mechanical Engineering, University of Texas at Austin

Experience in Higher Education

Graduate Research Assistant, University of Texas at Austin
1989 – 1991 Performed an assessment of the potential for centralized grid-connected photovoltaic systems for Central and South West Services, Inc. (CSWS).

Professional Experience

Owner, Libby Solar, 2015 to present
Provide solar energy consulting services to entities interested in having photovoltaics installed on the property.

Project Manager, Austin Energy, 1991-2015
Involved in the installation and maintenance of dozens of solar PV projects for Austin Energy including grid-connected and off-grid systems. Member of team responsible for the design of the Value of Solar Tariff. In 2003 managed the development of Austin Energy's solar incentive programs. Under Leslie's leadership (2004 – 2013), Austin Energy provided customers with $32.5 million in solar incentives which allowed 2100 participants to install 8.7 MW of solar on their rooftops. A study in 2012 found Austin Energy had the lowest cost residential solar projects in the country - $3.75 per watt. In addition during her tenure with the assistance of Department of Energy and State Energy Conservation Office grants she developed and implemented Austin Energy's Solar Rooftop Program, Solar Explorer Program and the award winning Solar for Schools Program.

Individual Honors and Awards

2007 Individual Member of the Year Award, Texas Renewable Energy Industry Association

Austin Energy Solar Awards

2012 Value of Solar, Interstate Renewable Energy Council
2012 Solar for Schools Program, Interstate Renewable Energy Council

Managed Austin Energy Grants

DOE, Solar Rooftop Chalange – Sunshot Initiative
DOE, Solar America Cities - Market Transformation, Solar for Schools
DOE, Solar America Cities - Solar for Schools, Solar Rooftop Assessment and Co-location of Wind and Solar in West Texas
State Energy Conservation Office, Solar for Schools
DOE, Million Solar Roofs
UPVG, Solar Explorer and Solar Rooftop Programs
EPA, Town Lake Center PV System
PVUSA, Convention Center PV System

Professional Activities

Solar Austin, Board Member
Texas Solar Energy Society, Board Member
Texas Renewable Energy Industry Association, Board Member
Solar Power International, Advisory Council for 2013 Solar Power International Conference
American Solar Energy Society, Member

Selected Publications

1. Designing Austin Energy's Solar Tariff using a Distributed PV Value Calculator, Karl R. Rábago, Leslie Libby, Tim Harvey, Benjamin L. Norris, Thomas E. Hoff, Proceedings of the 2012 Annual Meeting of the American Solar Energy Society, Denver, Colorado May 2012
2. *Co-locating Wind and Solar Resources in a Constrained Transmission Environmen,* Steve Wiese, Leslie Libby, Elisabeth Long, Ben Ryan, Proceedings of the 2010 Annual Meeting of the American Solar Energy Society, Pheonix, Arizona May 2010
3. *A Solar Rooftop Assessment for Austin,* Steve Wiese, Leslie Libby, Elisabeth Long, Ben Ryan, Proceedings of the 2010 Annual Meeting of the American Solar Energy Society, Pheonix, Arizona May 2010
4. *Comparison of Modeled NSRDB and Perez Solar Radiation Data with Measured University of Texas Solar Radiation Data*, L. Libby, Proceedings of the 1995 Annual Meeting of the American Solar Energy Society, Minneapolis, Minnesota, July 1995
5. *Photovoltaics vs. Utility Line Extension in Austin, Texas*, J. Hoffner, K. Ragsdale, L. Libby, Proceedings of the 23rd IEEE Photovoltaic Specialists Conference, May 1993

DESIGNING AUSTIN ENERGY'S SOLAR TARIFF USING A DISTRIBUTED PV VALUE CALCULATOR

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ABSTRACT

Austin Energy plans to offer residential customers a new solar net metering tariff based on the value of solar energy generated from distributed photovoltaic (PV) systems in the grid to the utility in place of traditional net metering. Austin Energy worked with Clean Power Research (CPR) to employ the algorithms from a utility value calculator to design the solar tariff. A rebate structure was also designed in order to ensure that customers still satisfy a key economic cost-effectiveness test and address first-cost barriers facing solar customers. These two revenue types – an ongoing credit for solar production, and a one-time rebate – begin a transition toward production-based incentives for residential customers based on actual value credits for solar generation and steadily declining up-front rebates.

1. INTRODUCTION

Austin Energy's solar energy incentive programs seek value parity between distributed solar PV options and so-called "conventional generation" options. Austin Energy's approach therefore differs significantly from the traditional "grid parity" objective of equivalent levelized cost of energy between solar and the average utility cost of energy from fully commercialized conventional resources. The goal for Austin Energy is parity in value, not just cost.

Beginning with the federal Public Utility Regulatory Act passed by Congress in 1978, utilities generally paid an "avoided cost" value for customer-generated energy, typically set at the marginal price of fuel for an incremental unit of energy. Many states implemented net metering policies as an improvement over traditional marginal avoided cost approaches for valuing distributed solar generation, in order to reflect the added value of energy generated at or near the point of consumption.

While net metering represents a significant improvement in reflecting the value of distributed solar energy compared to the avoided cost approach, problems remain. First, the retail price paid by the customer and credited for solar energy under net metering (the value of "spinning the meter backwards") does not necessarily represent and likely under-represents the full value of distributed solar generation.

Second, net metering induces two unintended consequences:

1. Solar customers size their solar systems against their baseload level of energy consumption because net metering systems typically pay the old avoided cost value for excess generation. This is a practical reflection of the fact that solar capacity is fairly expensive and that excess generation rewards the customer at a very low rate. Of course, most of a solar system's excess generation is delivered to the utility at a time when the value of that energy often greatly exceeds the avoided cost rate.
2. Net metering value is coupled with consumption. That is, the value to the customer for a kWh of solar energy that offsets a unit of energy consumption is much greater that the value of excess generation, which is only credited at the avoided cost rate. Austin Energy's experience is

that many solar customers recognize and respond to this signal to use more energy, based upon some sense that their consumption is "free" when a solar system is installed.

Austin Energy designed its new "value of solar" rate to address these unintended consequences and offer an improved, decoupled net metering approach.

Austin Energy worked with CPR to develop an approach for more accurately estimating the value of energy from distributed solar systems to the utility. The value of solar approach is still an avoided cost calculation at heart, but improves on that approach and net metering by calculating a unique, annually adjusted value for distributed solar energy.

Accurately computing a value of distributed solar energy is complicated. Difficulties inherent in accurate calculation include: modeling PV generation for locations without solar ground measurements; ensuring that the modeled outputs cover specific hours in which coincident electric loads have been measured by the utility; calculating marginal line loss savings during those same hours; forecasting fuel prices; determining the effective capacity of PV by calculating hourly loss of load probabilities; and applying principles of engineering economics. These requirements have historically made solar value studies technically difficult and thus cost-prohibitive for utilities and energy agencies alike.

2. DISTRIBUTED PV VALUE CALCULATOR

To address these issues, Austin Energy utilized algorithms developed by CPR for the purpose of streamlining value studies of this type. These algorithms underpin a web-based value calculator [1] that facilitates the entry of economic and technical assumptions and quickly performs study scenarios using previously published methodologies [2]. The tool is able calculates the following value components:

- Loss savings
- Energy savings
- Generation capacity savings
- Fuel price hedge value
- T&D capacity savings
- Environmental benefits

Taken together, these savings reflect the value of distributed solar energy to the utility—a "break-even" value for a specific kind of distributed generation resource, and a value at which the utility is economically neutral to whether it supplies such a unit of energy or obtains it from the customer.

Loss savings represent the benefits that distributed resources provide by reducing system losses by producing power in the same location where it is used. Loss savings increase the value of other benefits across generation, transmission, and distribution systems, and are computed differently depending upon benefit category. However, for all categories, loss savings are calculated hourly on the margin.

Energy savings are the benefits from distributed PV generation's offset of wholesale energy purchases. Energy value equals PV output plus loss savings times marginal energy cost. Marginal energy costs are based on fuel and O&M costs of the generator most likely operating on the margin (typically, a combined cycle gas turbine).

Generation capacity savings are the benefits of added capacity provided to the generation system by distributed PV. It is calculated as the product of the cost of capacity times PV's effective load carrying capability (ELCC), taking into account loss savings.

Fuel price hedge value represents the value of the fact that distributed PV generation has no fuel price uncertainty. It is calculated by determining how much it would cost to eliminate the fuel price uncertainty associated with natural gas generation through procurement of commodity futures.

T&D capacity savings are the benefits that distributed PV generation provides by reducing peak loading on the T&D system – delaying the need for capital investments in the T&D system. It equals the expected long-term T&D system capacity upgrade cost, divided by load growth, times financial term, times a factor that represents match between PV system output (adjusted for losses) and T&D system load.

Environmental benefits recognize the fact that the environmental footprint of PV is considerably smaller than that of fossil-based generation. Environmental value equals PV output times REC price—the incremental cost of offsetting a unit of conventional generation.

Austin Energy commissioned CPR to produce a customized version of the tool to incorporate the impacts of nodal pricing in the Electric Reliability Council of Texas (ERCOT) market.

3. AUSTIN ENERGY RESIDENTIAL SOLAR TARIFF

The calculation of the value of solar at Austin Energy required a modification to the standard value tool methods in order to incorporate Austin Energy's nodal hourly prices. These represent the direct generation costs to the utility on

an hourly basis, a major component of the value of solar calculation.

Fig. 1 presents the temporal relationship between nodal pricing (blue line in top part of figure) and PV output (red line in bottom part of figure) for a horizontal system on a sample day (July 30, 2011). PV generation was modeled using SolarAnywhere [3], a satellite-based data set of solar irradiance. Based on this sample day, PV output appears to correlate positively with price.

Fig. 2 presents nodal prices and PV output for seven different configurations on a transmission constrained day. The price jumps considerably on this day – peaking at about 50 times the peak price on the sample day. Consequently, this constrained day represents about 50 times the potential generation value relative to the sample day, and the PV profile match is more critical. West-facing systems are seen to be the best match with price, enabling them to capture more of this benefit by offsetting higher-priced wholesale energy.

The average nodal price fails to accurately represent solar generation value because of the relatively good correlation between price and PV output, and given that in some cases PV is available during critical peak periods. A "PV output weighted nodal price" captures the effects of price variations and choice of solar configuration.

The PV output weighted nodal price is calculated by the multiplying nodal market price by PV output factor for each hour, summing the total value for the year, then dividing by total annual PV energy production. The results are presented in Fig. 3.

The PV output weighted nodal prices range from 6.1 to 8.2¢ per kWh, compared the system average nodal price of 4.4¢ per kWh. Depending on configuration and orientation, the solar premium can nearly double the value of solar energy, relative to the average nodal price, which only reflects the average energy value for base load generation with a constant output over the year.

The PV output weighted nodal price was calculated for the near term (2 years) value of energy produced by a solar generator. For energy produced over the mid and long term—out to the 30 year expected life of the solar system—Austin Energy used CPR's value calculator methodology described above.

The combined calculation approach reflects the fact that ERCOT nodal prices only reflect energy and generation capacity value. Total benefits of distributed solar energy to Austin Energy include energy, generation capacity, fuel price hedge, T&D capacity deferrals, environment, and loss savings.

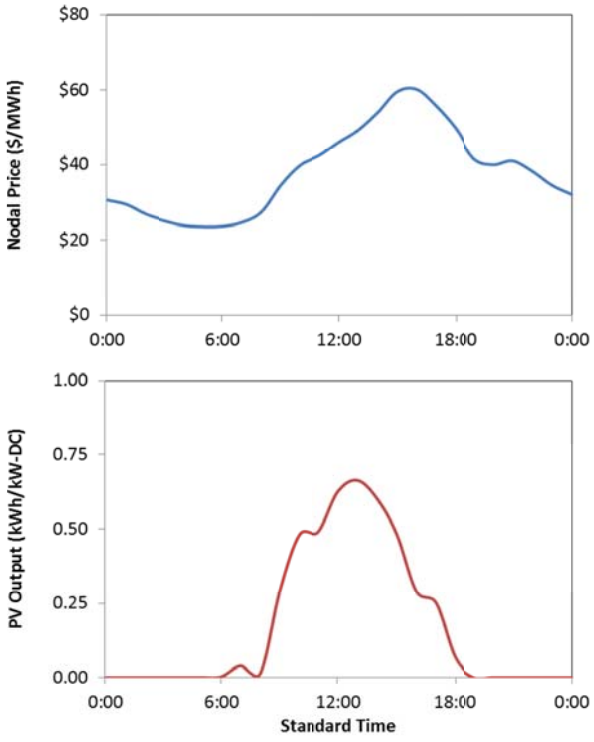


Fig. 1: Nodal price and PV output for July 30, 2011.

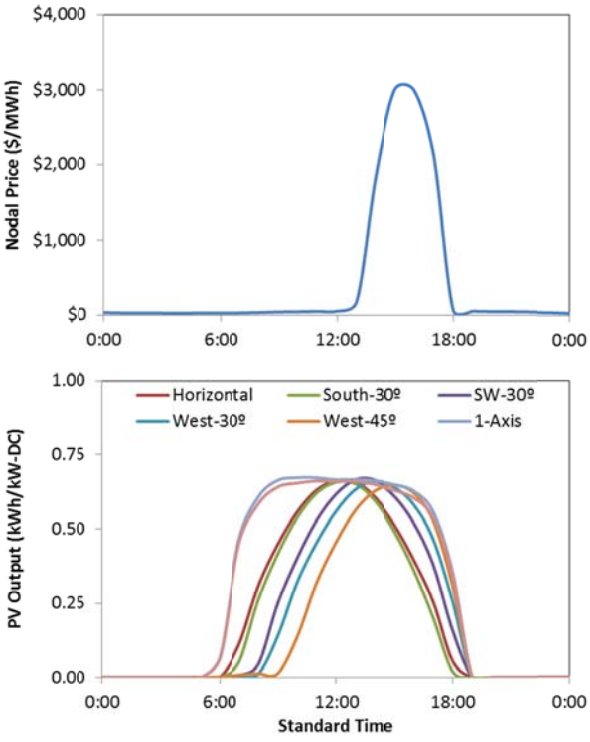


Fig.2: Nodal price and PV output for August 3, 2011.

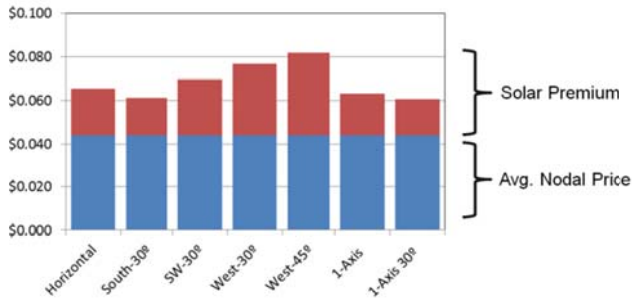


Fig. 3: Annual generation value and the solar premium.

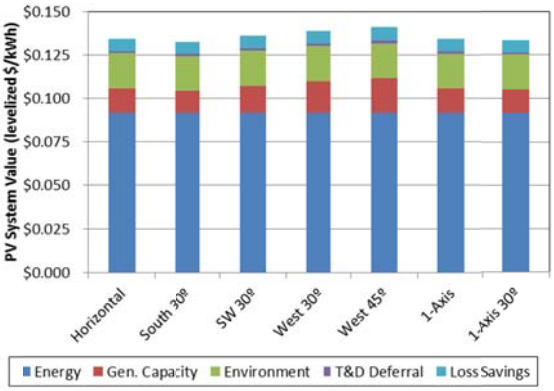


Fig. 4: PV value results by component and configuration.

The value results from the Distributed PV Value Calculator methodology are presented in Fig. 4. The fixed, south-facing PV system with a 30-degree tilt, the most common configuration and orientation in Austin Energy's service territory inventory of some 1,500 distributed solar systems, is taken as the reference system for the solar tariff. For this system, the levelized value of solar is calculated as 12.8¢ per kWh.

Austin Energy used the value of solar calculation to design a simple, improved residential solar rate. Under the new tariff, Austin Energy will calculate the residential customer's charges for electric service as if the customer had no solar PV system at their home, and then credit the customer's bill with an amount equal to the current value of solar times the total number of kWh produced by the solar system. The value of solar is recalculated each along with the utility's fuel charge, to reflect the current value of solar.

The new value of solar rate provides a more fair and accurate credit to the customer for solar generation than the traditionally calculated marginal avoided cost approach, and is more accurate than the traditional net metering approach of crediting the customer at the retail rate for solar generation offsetting consumption and a marginal avoided cost for excess generation. Furthermore, by more fairly crediting customers for installing a higher-value generation resource on the grid, the value of solar rate reduces the payback period for solar investments. And by decoupling the credit from the customer's consumption of energy, Austin Energy's proposed value of solar rate aligns the customer's incentives with a conservation ethic—each additional unit of saved energy earns the customer at least the retail rate, and if it produces a unit of excess solar generation, generates the customer a full value of solar credit.

Finally, the value of solar rate works to ensure that the utility charges for its full cost of serving the customer, even if the customer installs and operates a distributed generation system. This approach stands as a significant improvement over the approach many utilities are trying to take in setting a stand-alone distributed generation service rate aimed at recovering fixed costs associated with providing electric service and infrastructure to self-generating customers.

4. AUSTIN ENERGY REBATE

While the new solar tariff represents a more accurate and sophisticated calculation of the avoided costs to the utility, Austin Energy's rebate program is intended to provide a temporary, supplemental incentive to encourage customer investment in PV.

Since the solar tariff replaces bill savings from net metering as the primary revenue stream benefiting the customer, and generates greater value for the customer, the rebate has to be re-assessed to ensure that the amount represents an equivalent level of cost-effectiveness to the customer-investor.

The following rebate analysis is for the residential program (commercial rebates will be developed at a future date).

For program continuity, the revised rebate will continue to be calculated as it has been in the past:

$$RebateAmount\ (\$) = PVRating(kWdc - stc)\ x\ InverterEfficiency\ (\%)\ x\ RebateLevel\ (\$/kWdc)$$

The program design assumes an 8% per year drop in PV capital cost. Rebate levels reduce correspondingly at capacity-based steps until such time as the rebate is no longer necessary.

Simple payback is taken as the measure of cost-effectiveness (a different measure might be used for the commercial program), and the only other incentive available is the 30% federal tax credit, assumed to be available for all of the years of the study.

Other assumptions included in this example:

- PV capital cost is $4.25 per Wdc.
- PV capital cost reduction of 8% per year.
- Program should lead to 10 MW of new capacity by 2020.
- Rebate decreases to zero by 2020.
- Participation increases by 10% per year.
- Levelized value of solar is $0.128 per kWh.
- PV reference system is south facing, 30° tilt, located in Austin, with a 95.5% inverter efficiency.

Simply payback was calculated for a range of customers and system sizes. For example, by modeling a residential customer on an E01 rate schedule with an original annual electric bill of $1,600 per year, scaling an assumed residential load profile to correspond with this bill amount, modeling the hourly output of a 5 kWdc with the reference system location and orientation, calculating monthly retail bills and net metering carryover, the system would result in annual bill savings to the customer of $701. The reference PV system would produce a total of 6,785 kWh, so the effective economic benefit to the customer is $701 / 6,785 kWh = 10.3¢ per kWh. At this level and the current Austin Energy rebate, the bill savings of the reference PV system corresponds to a simple payback of about 9 years.

Under this structure, the 10 MW of capacity would be expected to be installed by the 2020 target date, and the total program cost may be calculated.

By holding all other values constant, Austin Energy can compare the payback period associated with a conventional net metering approach (value of solar set at residential energy rate) to that for the more comprehensively calculated value (currently $0.128/kWh).

Alternatively, the model can be used to adjust rebates to achieve a target payback period. At this time, Austin Energy is using the model to plan a multi-year rebate structure designed to accomplish a specific program capacity level—a MW goal.

A model was developed to calculate required rebates under an exponentially descending capital cost scenario and converted to capacity based steps using methods described previously [4]. The structure of the stepwise capacity-driven rebate is presented in Fig 5 (the y-axis is intentionally unspecified because the final rebate structrue is still in process).

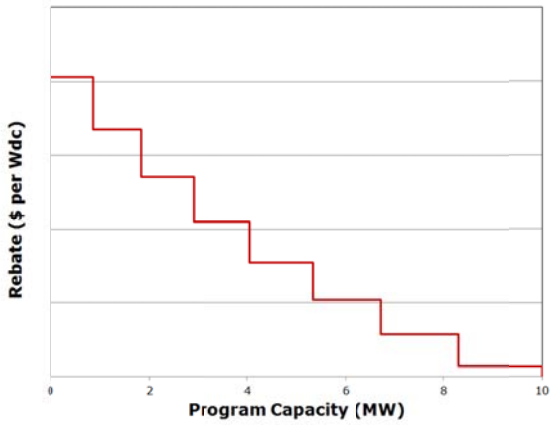


Fig. 5: Austin Energy rebate levels for residential cost-effectiveness.

6. CONCLUSIONS

Austin Energy and CPR have used a multi-factor value of the solar energy calculator to establish a new, proposed "value of solar" residential rate for retail customers. This exciting innovation in solar rate design uses a superior avoided cost calculation and simplified net metering charge and credit approach to more fairly credit customers for the value of their solar generation, align solar rates with energy conservation, and address utility distribution system costs. The more fair and accurate value of solar rate allows utilities to adjust rebates or other special incentives to focus more narrowly on correcting for first-cost and other investment hurdles faced by solar customers.

With the help of an additional cost-effectiveness model developed by CPR, Austin Energy is in the process of tuning its incentive programs to reach a specific program capacity goal while maintaining fidelity to cost-effectiveness criteria. The study demonstrated a model for structuring a stepped capacity-based rebate program. The model incorporates a declining PV price, a volumetric program goal, and a cost-effectiveness test selected as the most relevant for the customer-investor.

The value calculator methodologies were advanced under this study to provide a means for incorporating nodal pricing, specifically the prices system in place in the ERCOT system. This study illustrated the importance of calculating the generation value using properly time-synchronized solar output modeling because of the positive correlation between price and solar output. In the case of Austin Energy, this "solar premium" resulted in generation value of solar as high as twice the average annual price, depending upon configuration.

7. REFERENCES

(1) Distributed PV Value Calculator, 2012. Web-Based Service the Calculates Value of Solar from a Utility Perspective.

(2) Hoff, T., Perez, R., Norris, B., Utility PV Valuation Tool, presented at ASES, Raleigh, NC, 2011.

(3) Solar Anywhere, 2012. Web-Based Service that Provides Hourly, Satellite-Derived Solar Irradiance Data Forecasted 7 days ahead and Archival Data back to January 1, 1998. www.SolarAnywhere.com.

(4) Hoff, T., Photovoltaic Incentive Design Handbook, NREL, 2006.

Distribution Interconnection Guide for Customer Owned Power Production Facilities less than 10MW

Revision History

Revision	Date	Revised by	Comments
6.0	12/15/2015	Clayton Stice	Major revision- update for NEC2014, add references for energy storage, high leg systems, update metering and downtown network sections, change category limits, general updates.
5.0	12/19/2014	Brian Inocente	Minor revision-Added Appendix F - Emergency Response Service (ERS) Application
4.0	10/22/2013	Clayton Stice	Major revision-include all systems below 10 MW, reorganized sections to clarify process flow, added insurance requirements, confidentiality notice and updated requirements based on proposed discussions regarding pIEEE1547.8 and pIEEE1547a.
3.0	5/15/2012	Clayton Stice / Sharon Bickford	Minor Revision-update metering and code requirements and include updates to IEEE1547.4, 1547.6
2.0	9/15/2011	Clayton Stice Stanley Consultants TX - 174	Minor revision- Revised Interconnection Package and Forms; included references to Downtown Network Installations; consolidated/rearranged divisions and expanded complex metering section due to new ERCOT reporting requirements, expanded codes and references sections
1.0	10/7/2010	Clayton Stice Stanley Consultants TX - 174	Major revision- clarified scope of document for 50 kW to <10MW; Added Appendix A-Interconnection Package and Forms; included references to AE Design Criteria Guide and ESPA; added complex metering to meet ERCOT requirements, expanded definitions, codes and references sections; added hyperlinks to other web references; general rewrite and updates to all sections

AUSTIN ENERGY
INTERCONNECTION GUIDE FOR CUSTOMER-OWNED POWER PRODUCTION
FOR FACILITIES UP TO 10MW

TABLE OF CONTENTS

Introduction

The purpose of this guide is to outline the process for connecting a distributed generation (DG) facility as well as to define the minimum technical and financial requirements for safe integration of customer-owned power production facilities with the AE Distribution System (Note: the typical AE Distribution system is 12.47kV). This information is provided in an effort to maintain safe and reliable service to generating facilities and customers.

This guide covers most types of Distributed Generation in the AE service areas:

i. Inverter based systems- Predominantly Solar PV to date and also includes energy storage.
ii. Synchronous or Induction motor systems—Wind generation, standard fossil-fuel based motor generators.
iii. Other types will be reviewed as encountered.

This guide is intended to be consistent with the requirements of the current versions of IEEE Std 1547, "Standard for Interconnecting Distributed Resources with Electric Power Systems" as well as Federal, State and Local regulations, and accepted industry practices and standards.

Sections A and B review the application process. Sections C and D review the technical requirements for the installations. Section E outlines customer responsibilities, and sections F and G cover definitions and applicable codes and standards. The appendices provide additional reference material most commonly requested.

Since these standards change regularly as a result of the latest practices, it is the user's responsibility to verify that the most recent version of this document is being used.

The latest released version of this guide can be found on the AE website at:
http://www.austinenergy.com

- **Select the "Contractors" tab**
- **Select the "Electric Service Design & Planning Tab"**

A. Interconnection Classifications

There are four classifications of interconnections on the AE Distribution system that are defined by the following categories, and the first task is to refer to **Appendix A** of this guide (or section **1.12** of the **AE Design Criteria Manual)** to determine whether or not the proposed system will be sited in the **Downtown Network**.

Note—The size will be an aggregate of all systems combined, both existing and proposed and all values used in this guide are in alternating current (AC), not DC..

1. **Residential Systems (not on the Downtown Network) which are less than 10 kW.**

   Residential Systems less than 10 kW and **not** on the Downtown Network account for close to 90% of the Distributed Generation (DG) systems installed in the Austin Energy service area and the process is covered in **Section B.1** of this Interconnection guide.

2. **Systems (not on the Downtown Network) which are 10 kW to less than 500 kW**

   Systems from 10 kW to less than 500kW and not on the downtown network account for close to 10% of the DG systems installed in the AE Service Area, and the process is covered in section **B.2** of this interconnection Guide.

3. **Medium Systems (not on the Downtown Network) 500 kW to less than 10 MW**

   There are very few systems of this size and complexity in the AE service areas. Detailed procedures for interconnecting systems 500 kW to less than 10 MW are covered in **Section B.3** of this Interconnection guide.

4. **Large Systems (not on the Downtown Network) 10 MW or greater**

   Standards for a facility this large (10MW and up) are not set out in this document and are typically interconnected at the transmission level which is handled by the Manager of Transmission and Distribution Planning. Austin Energy and the customer may interconnect a facility using mutually agreed upon technical standards.
   Contact: James.armke@austinenergy.com

   a. Any entity proposing a total generation unit 10 MW or greater needs to follow the Generation Interconnection or Change Request Procedure. Details are available on the ERCOT website at: **http://www.ercot.com/gridinfo/generation**

   b. The "Austin Energy Facility Connection Requirements" document may also be referenced and is available on AE's website at:
   http://www.austinenergy.com
   - **Select the "Contractors" tab**
   - **Select the "Electric Service Design & Planning Tab"**

5. Any Commercial or Residential System on the Downtown Network

Detailed procedures for interconnecting systems of any size that are on the AE Downtown Network are covered in **Section B.3** of this Interconnection guide.

B. Processes for Distributed Generation Applications

The customer/contractor is required to obtain an electrical permit for construction of any generation facility interfaced to the AE system per Austin Electrical code section §25-12-111. This applies to all entities served by Austin Energy: residential, commercial, and government agencies.

All procedures for obtaining a COA electric permit apply, regardless if the system in installed within Austin or a separate ETJ.

AE offers many rebates and incentives for customers to install Solar PV.

Refer to the AE website for more information:
http://www.austinenergy.com/go/solar

1. Process for Residential Systems <10kW and NOT on the Downtown Network

Residential Systems less than 10 kW and **not** on the Downtown Network account for approximately 90% of the DG systems installed in the Austin Energy service area and the process has been streamlined.

Systems in this category are typically handled through the City of Austin Development Office at One Texas Center.

a. The customer is required to fill out a **DGPA (Distributed Generation Planning Application)** for any interconnection to the AE system, which can be found on the AE website at:
http://www.austinenergy.com
- **Select the "Contractors" tab**
- **Select the "Electric Service Design & Planning Tab"**
- Note that although the DGPA form is necessary, approval is NOT required for Residential Systems less than 10 kW.

b. The customer is then required to obtain an **electrical permit** from the City of Austin, and should provide the following data for obtaining the electrical permit:
   i. Physical layout drawing(s) clearly indicating the interconnection equipment shown in **Section C.**
   ii. Electrical one-line diagram, up to, and including, the interface to the AE system
   iii. List of major equipment: manufacturer's name, model number and information for inverter, overcurrent device, solar modules (if solar PV) ,
   iv. Copy of the inverter manufacturer's string sizing calculations from their website to verify that the system is sized appropriately (if Solar PV).
   v. Completed **DGPA**

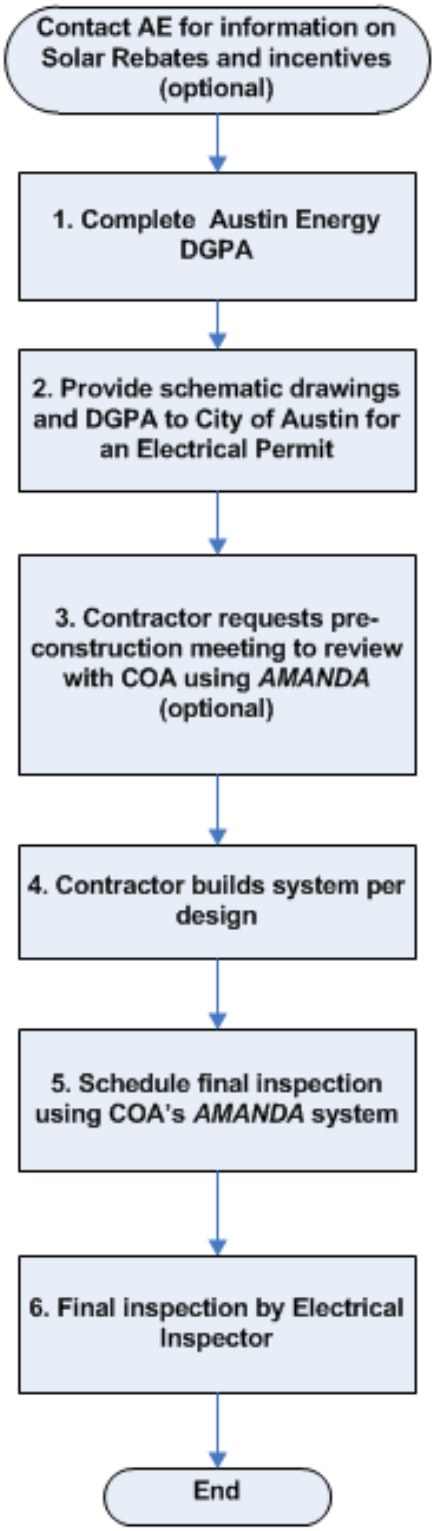
c. The customer is recommended to have a pre-construction review of their plans by contacting the City Electrical Inspector via *AMANDA*. This *review is entirely optional*.

d. Contractor builds system per plans submitted. Note: Any significant change in the design must be approved by the City Inspector's office.

e. After the system is installed, the customer/contractor shall request the final electrical inspections from the COA Electrical Inspection department via *AMANDA*.
   1. The customer shall not start up, test or operate electric generating equipment in parallel with the AE electric system until all inspections have been passed.

f. The customer's system and all equipment associated with the parallel operation of power production equipment will be inspected to verify that all work has been correctly performed and the system installation complies with all applicable codes and standards.
   i. Refer to **Appendix C** for the current inspection checklist.
   ii. The customer shall provide, at their expense, their contractor to demonstrate all protective functions for the inspector.

Distributed Generation Application Approval Process – Residential Systems <10kW and not on the Network



2. Process for Systems Typically 10 kW to <500kW and NOT on the Downtown Network

Systems from 10kW to less than 500 kW and **NOT** on the Downtown Network account for approximately 10% of the DG systems installed in the Austin Energy service area and the process for obtaining a permit are somewhat more complex. Systems in this category are typically handled through the AE Distribution Design groups which can be reached at:

One-stop shop: (512) 974-2632

2. The customer is required to submit a **DGPA** for review for any interconnection to the AE system, which can be found on the AE website at:
   http://www.austinenergy.com
   - **Select the "Contractors" tab**
   - **Select the "Electric Service Design & Planning Tab"**

3. The DGPA must be accompanied with a full set of drawings and specifications that have been sealed by a Professional Engineer licensed in the state of Texas. All drawings shall be in electronic files in either pdf or AutoCad 2008 .dwg formats. Files larger than 3 MB should be sent in a zipped or compressed format. Upon request, the customer shall submit to AE all technical data or additional information required to evaluate the proposed customer electrical generating facility, including but not limited to the following as required:

   i. Physical layout drawings, including dimensions and interconnection distance
   ii. Conductor sizes and length and technical parameters for circuit impedances
   iii. Schematic drawings up to, and including, the interface to the AE system indicating the interconnection equipment shown in **Section C**.
   iv. Electrical one-line and three-line diagrams, and schematic diagrams identifying continuous and fault current ratings of all equipment to verify compliance to NEC Article 110.10.
   v. System protection details
   vi. Integration of DG grounding system with AE distribution system per IEEE 1547, NEC article 250, and AE Design Criteria Manual.
   vii. Detailed list of equipment: manufacturer's name, model number and rating information.
   viii. Manufacturer's test data or certification indicating compliance with national codes concerned with radio noise, harmonic generation, and telephone interference factor
   ix. Lightning protection and grounding details indicating conformance to NFPA 780 if required.
   x. Coordination data such as: (Primary fed customers only 12.47kV)
      a. Functional and logic diagrams
      b. Control and meter diagrams
   xi. Any other data relevant to coordination of the customer system with the AE system

4. The customer is also **required to go through plan review for obtaining an electrical permit**, and the DGPA must be accompanied with a full set of drawings. Upon successful completion of the plan review, the contractor will receive an electrical permit.

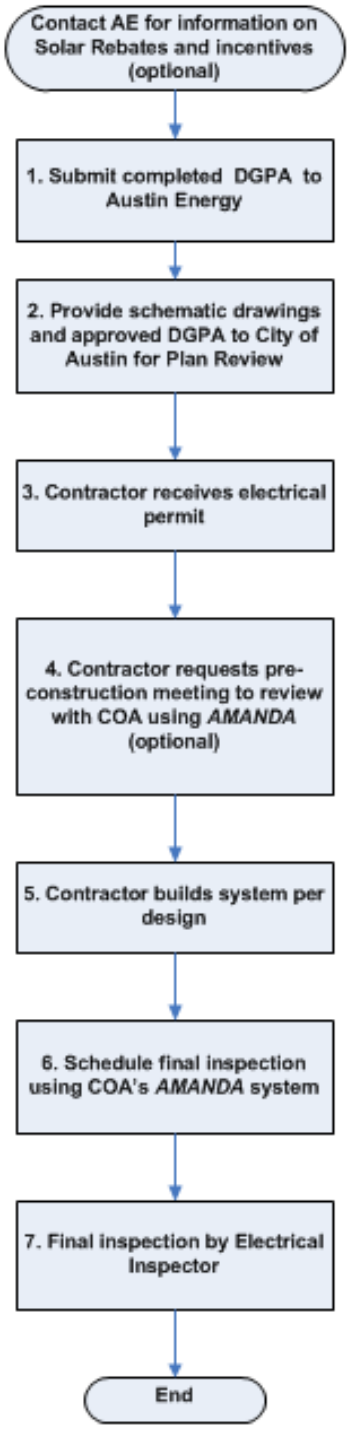
5. The customer is recommended to have a pre-construction review of their plans by contacting the City Electrical Inspector via *AMANDA*. This *review is entirely optional*.

6. Contractor builds system per plans submitted. Note: Any significant change in the design must go back through the plan review process.

7. After the system is installed, the customer/contractor shall request the final electrical inspection from the COA Electrical Inspection department via *AMANDA*.
   i. The customer shall not start up, test or operate electric generating equipment in parallel with the AE electric system until all inspections have been passed.

8. The customer's system and all equipment associated with the parallel operation of power production equipment will be inspected to verify that all work has been correctly performed and the system installation complies with all applicable codes and standards.
   i. Refer to **Appendix C** for the current inspection checklist.
   ii. The customer shall provide, at their expense, their contractor to demonstrate all protective functions for the inspector.

Distributed Generation Application Approval Process – Commercial/Multifamily Systems <500kW and not on the Network



3. Distributed Generation Application Process for Systems 500 kW to less than 10 MW OR on the Downtown Network

Due to the size and complexity of these systems, AE's **System Engineering group** is the single point of contact for processing these types of interconnection requests

System Engineering will be responsible for coordinating with Key Accounts, System Operations, Transmission and Distribution Planning, Distribution Design, Network Design, Regulatory Analysis, and Complex Metering regarding all technical issues associated with interconnecting to the AE distribution system and can be reached at:

systemengineeringadm@austinenergy.com

1. The customer is required to submit an **DGPA** along with the completed application for any interconnection to the AE system, which can be found on the AE website at:
   http://www.austinenergy.com
   - **Select the "Contractors" tab**
   - **Select the "Electric Service Design & Planning Tab"**

2. The customer will submit the completed application (**Appendix D**) to AE System Engineering containing all required Customer Data. Any installation 500 kW and up, or of **any** size on the **downtown network** must be accompanied with a full set of drawings and specifications that have been sealed by a Professional Engineer licensed in the state of Texas. All drawings shall be in electronic files in either pdf or AutoCad 2008 .dwg formats. Files larger than 3 MB should be sent in a zipped or compressed format. Upon request, the customer shall submit to AE all technical data or additional information required to evaluate the proposed customer electrical generating facility, including but not limited to the following as required:

   1. Physical layout drawings, including dimensions and interconnection distance
   2. Conductor sizes and length and technical parameters for circuit impedances
   3. Schematic drawings up to, and including, the interface to the AE system indicating the interconnection equipment shown in **Section C.**
   4. Electrical main one-line and three-line diagrams, and schematic diagrams identifying continuous and fault current ratings of all equipment to verify compliance to NEC Article 110.10.
   5. System protection details
   6. Integration of DG grounding system with AE distribution system per IEEE 1547, NEC article 250, and AE Design Criteria Manual.
   7. Detailed list of equipment: manufacturer's name, model number and rating information.
   8. Manufacturer's test data or certification indicating compliance with national codes concerned with radio noise, harmonic generation, and telephone interference factor

j. Lightning protection and grounding details indicating conformance to NFPA 780 if required.

k. Coordination data such as:
   i. Functional and logic diagrams
   ii. Control and meter diagrams
   iii. Any other data relevant to coordination of the customer system with the AE system
   iv. Systems over **500kW** or on the downtown network must also have a written sequence of operation including documented switching procedure(s)
   v. Synchronizing methods (if any)

l. Load Data (Downtown Network only)

m. Electrical load analysis based on previous 12 months customer data (where possible) to verify maximum sizing of array for minimum import relay requirements. Refer to **Appendix E** for an example of how to calculate system size from Load.

3. AE System Engineering will review and provide feedback on the proposed facility. An interconnection study may also be required to determine any mitigation procedures that may be required. Once the final design has been determined, AE System Engineering will issue a letter releasing the DGPA.

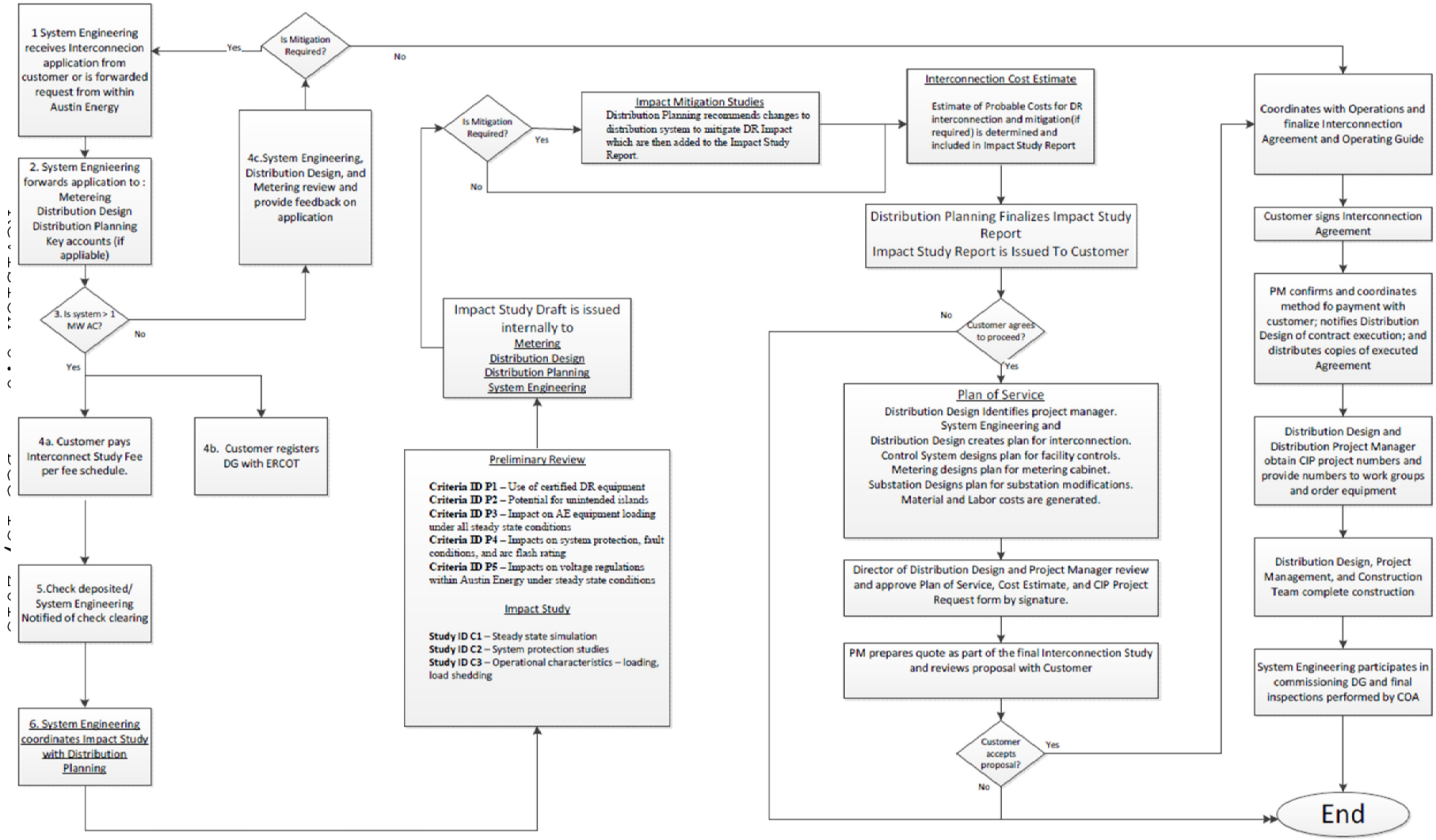
4. The customer is also **required to go through plan review for obtaining an electrical permit**, and the DGPA must be accompanied with a full set of drawings. Upon successful completion of the plan review, the contractor will receive an electrical permit.

5. The system shall be installed per the final design in the permit application. Any deviations from the final design (including field changes) shall be communicated to AE/City of Austin for further review. A more detailed commissioning test (if required by AE) shall be mutually agreed on as well, that verifies all protective functions per IEEE1547.

6. After the system is installed, the customer shall request the final electrical inspection from the COA Electrical Inspection department using the *AMANDA* system.
   i. The customer shall not start up, test or operate electric generating equipment in parallel with the AE electric system until final meter installation or written consent of AE.

7. The customer's facility and all equipment associated with the parallel operation of power production equipment will be inspected to verify that all work has been correctly performed and the system installation complies with all applicable codes and standards.
   i. Refer to **Appendix C** for the current inspection checklist.
   ii. The customer shall provide, at their expense, their contractor and any additional equipment (current sources, etc) required to demonstrate all protective functions for AE and perform any additional commissioning tests that may be required.

Interconnect Application Process (>500 kW)



C. GENERAL SYSTEM LAYOUT AND REQUIREMENTS

This section reviews general system layout and components for simple DG Systems <10kW and **Not** on the Network. Figures 1-4 represent simplified diagrams illustrating the key requirements for solar PV and/or energy storage systems. Other DG systems may require review by AE.

Larger DG systems contain similar overall requirements, and detailed requirements are shown in **Section D** for each system classification. AE shall review all customer-selected interconnection equipment and proposed configuration to verify it meets all requirements.

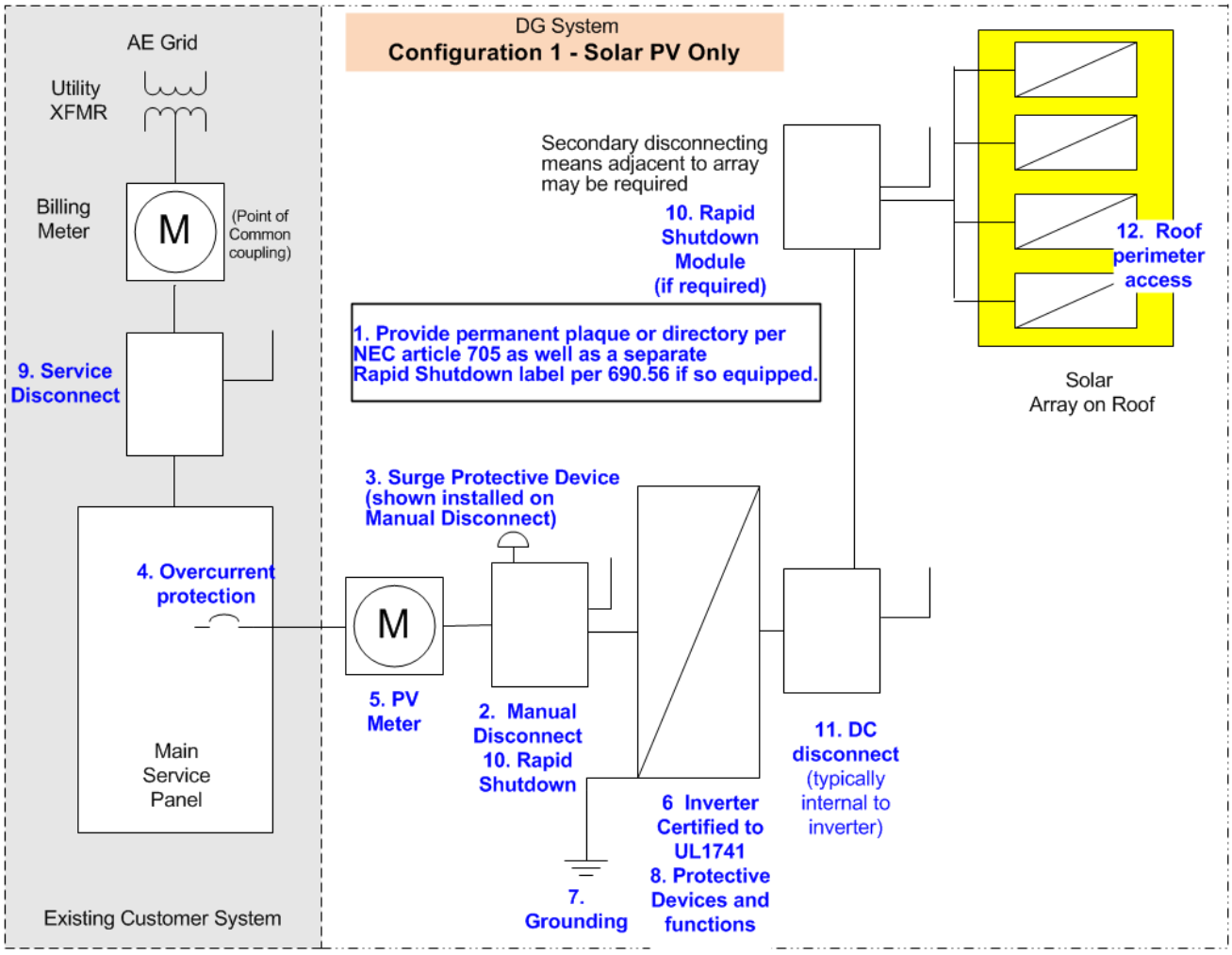


Figure 1. Simplified Diagram for Solar PV only
Residential Systems<10kW and Not on the Network

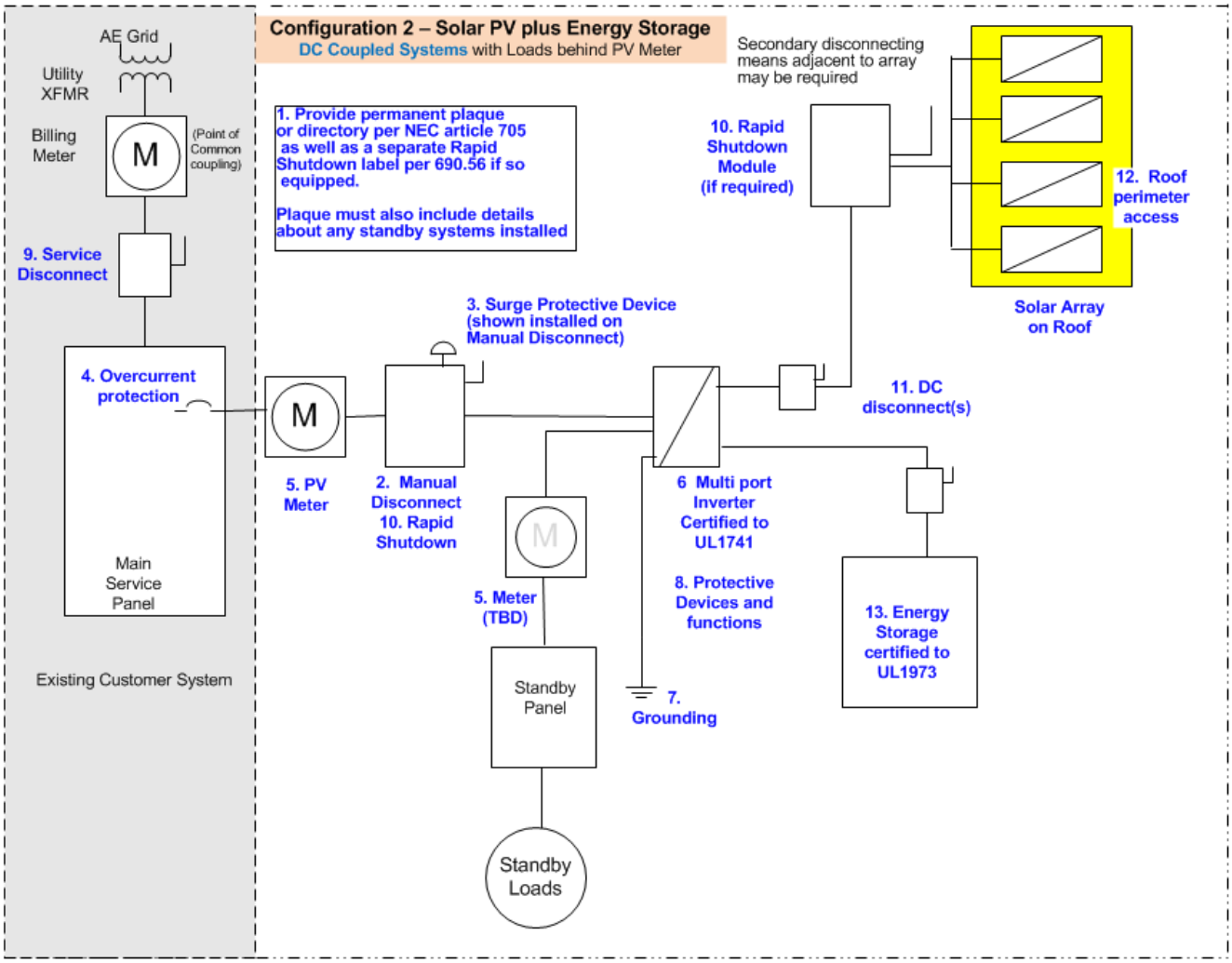


Figure 2. Simplified Diagram for DC coupled Residential Solar PV plus Energy Storage Residential Systems <10kW and Not on the Network

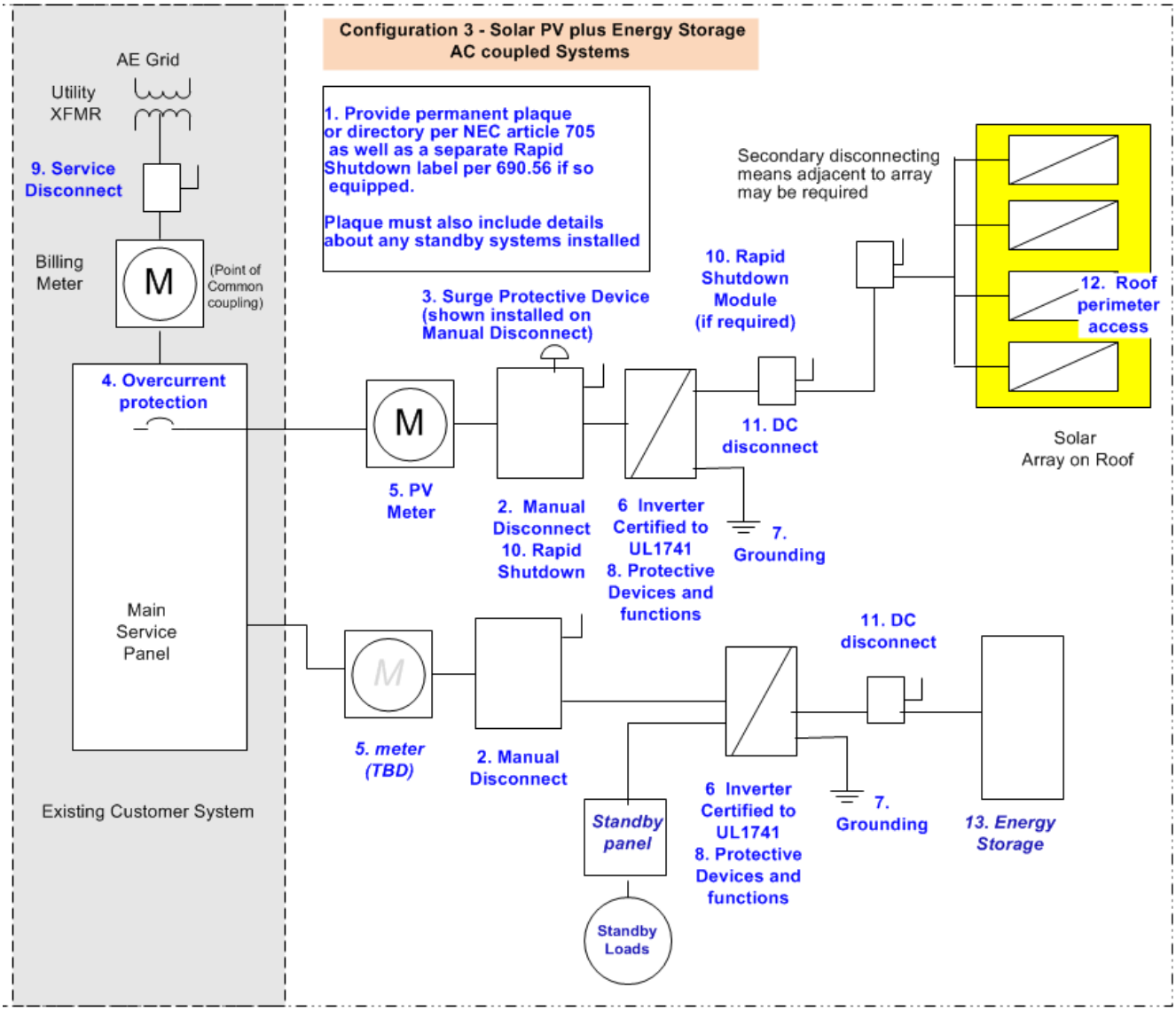


Figure 3. Simplified Diagram for AC coupled Residential Solar PV plus Energy Storage Residential Systems <10kW and Not on the Network

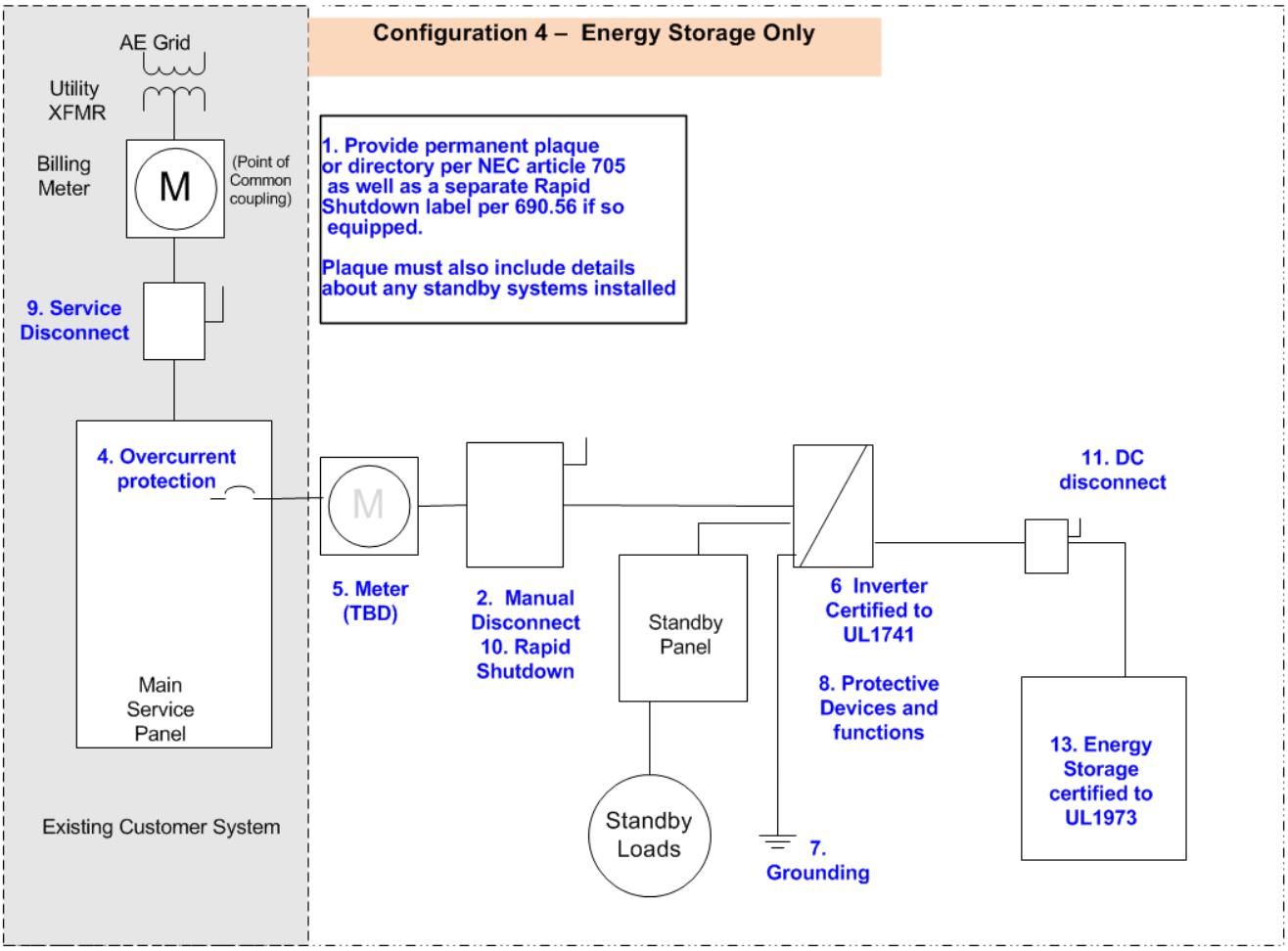


Figure 4. Simplified Diagram for Energy Storage only
Residential Systems <10kW and Not on the Network

Notes From Figures 1-4:

1. **Facility Identification:** A directory/plaque of all DG sources including contact information shall be provided as per NEC articles 690 and/or 705.
   a. The directory or plaque must be permanent - simple stick on labels are not allowed.
   b. A rapid shutdown label may also be required per section 690.56
   c. The plaque must also include information on any standby systems

2. **Manual Disconnect:** A manual load break disconnect switch with visible blades shall be provided at the customer's distributed generation service point to provide a separation point between the customer's electrical generation system and the AE electric utility system. Note that the solar PV system disconnect may also be integrated with the Rapid Shutdown

system. AE will coordinate and approve the location, and type of the disconnect switch(es) as shown in **Appendix B**.

a. The disconnect switch(es) shall be mounted (and grouped) in proximity to the metering equipment, as well as other switches per NEC article 690 and connected per NEC article 404.6

b. The switch shall readily accessible to AE personnel at all times, and capable of being locked in the open position with an AE padlock, and should not be locked by the owner.

c. AE reserves the right to open the disconnect switch isolating the customer's electrical generating system (which may or may not include the customer's load) from the AE system for the following reasons:
   i. To facilitate maintenance or repair of the AE electric system or of the distributed generation system
   ii. During AE electric system emergency conditions
   iii. When the customer's electrical generating system is determined to be operating in a hazardous or unsafe manner or adversely affecting AE's system
   iv. Failure of the customer to comply with applicable codes, regulations and standards in effect at that time
   v. Failure to abide by any contractual arrangement or operating agreement with AE

3. **Surge Protective Device:** (**Solar PV only**) The device shall be appropriately sized for the service entrance (Type 1 or 2) per NEC.

4. **Overcurrent Protection:** The type and size of the device shall be reviewed by AE depending upon the installation. Adequate test data or technical proof that the device meets the criteria specified in IEEE1547 and the NEC must be supplied by the customer to AE. Overcurrent protection for line-side taps must meet the requirements of NEC article 705.31.

5. **Metering:**

a. Installations <1.0 MW:

i. Contact **AE Complex Metering: (512) 505-7045**
ii. AE will provide the additional metering equipment necessary to measure capacity and energy delivered to, or received from, the customer's PV facility.
iii. Refer to Figure 1 for example of a simplified solar PV installation and **Appendix B** for standard configurations. Contact AE Complex metering for any clarification.
   a) Note: The PV meter shall be grouped with billing meter and disconnects.
iv. Contact AE Complex metering when installing systems shown in **Figures 2-4.**
   a) **For figures 2-4 involving energy storage, meters will be set once billing rates have been approved by AE.**
v. Refer to the AE website for detailed meter socket, meter hub, and CT specifications:
vi. **http://www.austinenergy.com**
- **Select the "Contractors" tab**
- **Select the "Electric Service Design & Planning Tab"**

   a) Facilities with <200amp current would typically use a self-contained meter

b) Facilities with >200amps current would typically use an instrument rated meter.
c) Final determination of meter type and configuration shall be made by the AE metering group.

b. Installations 1.0 MW to <10MW:

i. Contact **AE Complex Metering: (512) 505-7045**
ii. The distributed generation facility owner will need to register the resource with ERCOT. Refer to ERCOT website for more information: **http://www.ercot.com/services/rq/re/dgresource**
iii. AE shall provide at AE's expense the necessary EPS metering equipment for interconnection to the AE system.

6. **Inverters (for Inverter based systems):**

a. Solar PV inverters shall be certified to UL1699B, UL1741 and IEEE1547 and must be on the approved list published by the California Energy Commission (CEC) on its website **http://www.gosolarcalifornia.org**

b. Inverters in non-Solar PV distributed generation systems must meet requirements of IEEE 1547 and be certified to UL 1741, and UL2200 if applicable, and may not be self-commutating while paralleled with the AE system.
   i. Inverters shall be set per the default settings as defined in IEEE1547a-2014.
   ii. Inverters in areas with high levels of DG penetration may require alternate settings.

c. Inverters used with energy storage systems shall be certified by the Energy Storage Battery manufacturer for use with their system.

d. Inverters used to provide backup power (such as for energy storage systems) shall include a transfer switch to disconnect from the AE system while operating in island mode using self-commutation.

e. Three phase systems must either use a three phase inverter or single phase inverters arranged in a wye configuration. Single phase inverters may not be connected in a delta configuration due to grounding concerns.

7. Grounding:

a. Grounding shall be done in accordance with UL 1741 and NEC Articles 250 and 690.

b. All inverters shall be effectively grounded and shall have Ground Fault protection per NEC Article 690.11.

8. **Protective Devices and Functions**:

All DG installations shall have protective devices that provide an automatic method of disconnecting its generation equipment from the AE system along with electronic programmable relays to meet the requirements of IEEE 1547 Section 4-Interconnection Technical Specifications and Requirements. The automatic disconnecting device may be of

the manual or automatic reclose type and shall not be capable of reclosing until the AE System voltage and frequency return to normal range and the system is stabilized for the duration specified in (f) below. Note that inverters certified to UL1741 provide many of these functions.

a. Voltage and Flicker The customer equipment shall provide under/overvoltage trip capability. AE shall endeavor to maintain the voltages on the AE system but shall not be responsible for factors or circumstances beyond its control. If the customer's electrical generation equipment has automatic voltage control capability, it shall be operated in the manual mode with power factor control consistent with the power factor requirement set out below and in IEEE1547.
   i. The customer owned equipment will not cause AE system voltage to go outside of the limits set by ANSI C84.1.
   ii. In accordance with IEEE 519, the flicker shall not exceed 3.0% voltage change, measured at the point of common coupling. If high or low voltage complaints or flicker complaints result from the operation of the customer's electrical generation, the customer's generating system shall be disconnected until the problem is resolved.

b. Frequency The customer equipment shall provide under/overfrequency trip capability. AE will endeavor to maintain a 60-hertz nominal frequency on the AE system. If the customer's electrical generation equipment has speed or frequency control, it shall be operated in the manual droop mode.

c. Harmonics The customer's electrical generation system shall not cause voltage harmonic content or total harmonic distortion (THD) in excess of the limits of IEEE 519 and 1547 when measured at the point of common coupling with the AE system.

d. Fault and Loss of Source In accordance with IEEE 1547, in the event of a fault on the customer's system or a fault or loss of source on the AE system, the customer shall provide an automatic method of disconnecting its generation equipment from the AE system within 10 cycles should the voltage on one or more phases fall below 50.0% of nominal voltage on the AE system serving the customer premises at the point of common coupling.
   i. In the event of an outage, the DG system shall contain anti-islanding protection to de-energize system and prevent inadvertent backfeed during this outage into AE's electrical system.
   ii. Installations over 2 MW shall provide for transfer trip of the DG facility.

e. Power Factor The customer's electrical generation system shall be designed, operated and controlled at all times to provide reactive power requirements at the point of interconnection per IEEE1547, but in no case exceeding from 0.95 lagging to 0.95 leading power factor unless approved in writing by AE.

f. Reconnection to AE Service After any disturbance resulting in a service interruption or feeder breaker actuation, no Distributed Generation source may reconnect until the AE System voltage and frequency return to normal range and the system is stabilized for a

period of **5 minutes** (300 seconds), or as approved in writing by AE. This disconnect timing ensures that the generator is disconnected from the AE System prior to automatic re-close of feeder breakers.

g. Relay Settings (if applicable) The settings for all distribution interconnections shall be approved by System Engineering in conjunction with IEEE 1547 and AE Transmission and Substation Engineering and Construction as necessary.

To enhance system reliability and safety and with AE's approval, the customer may employ a modified relay scheme with delayed frequency or voltage tripping using communications equipment between the customer and AE.

9. **Main Service Disconnect:**
All customers must have a code-compliant service disconnecting means. Refer to the AE Design Criteria Manual for specifics.

10. **Rapid Shutdown Feature (Solar PV only):**
All installations submitted for approval shall incorporate a rapid shutdown feature if required by the AHJ per Article 690.12 of the NEC.

11. **DC Disconnects:**
DC Disconnects are required and typically internal to Inverters. Additional DC disconnects may be required to meet Rapid shutdown requirements.

12. Solar Panel Access and Spacing requirements (Solar PV only):
Solar panels shall be installed with perimeter access per the most recent revision of IFC 605.11.3. The IFC along with many other codes can be found at: http://publicecodes.cyberregs.com/icod/

13. **Energy Storage Equipment:**
All Energy Storage equipment shall be certified to UL1973, and installation shall comply with manufacturer's instructions. Lithium Ion systems shall be certified to UL1642. Lead-Acid systems shall be certified to UL1989.

D. DETAILED REQUIREMENTS FOR PARALLEL SYSTEMS

1. ADDITIONAL TECHNICAL REQUIREMENTS BY SYSTEM CLASSIFICATION

a. **Residential Systems (not on the downtown network) less than 10kW:**
i. No additional requirements

b. **Systems (not on the Downtown Network)rated at least 10 kW to less than 1.0 MW must also have**:

i. An automatic synch-check relay (if generator is synchronous or self-commutated) or open transition transfer switch.
ii. If the facility is exporting power, the power direction protective function may be used to block or delay the under frequency trip with the agreement of AE. (not common)
iii. The system must have the ability to provide power factor support from 0.9 lagging to 0.9 leading. Exact settings will be determined with AE.
iv. Refer to simplified diagrams in **Figures 1-4**.

c. **Systems (not on the Downtown Network)rated 1.0 MW to less than 10 MW must have**:
i. If the facility is capable of exporting to the AE system, there shall be a redundant circuit breaker interfaced to AE relay system.
ii. ERCOT requires EPS metering for systems 1 MW and up. Refer to metering section **C.5** for additional requirements.
iii. Utility grade relays approved by AE and compatible with AE relay communication. The relay shall be compatible with MirrorBit protocol. The relay shall provide the following functions at a minimum:
a. An under-voltage /over-voltage trip with sensing/readout by phase
b. An under/over frequency trip with sensing/readout by phase
c. An automatic synchronism check relay (for facilities with stand-alone capability)
d. Telemetry/transfer trip to be done in accordance with IEEE 1547.
e. Either a ground over-voltage or a ground over-current trip depending on the grounding system.
f. If the facility is exporting power, the power direction protective function may be used to block or delay the under frequency trip with the agreement of AE.
g. On-board data acquisition and event log to record actual readings for all events
h. All required fault-detection relays shall coordinate with AE's devices, as necessary.
i. All interconnection relays shall be set to provide overlapping or coordinated protection to prevent extensive damage should an interrupting device fail to clear when required. The line-protection schemes shall be able to distinguish between generation, inrush, and fault current.
j. Where the existing relay schemes have to be reset, replaced, or augmented with additional relays to coordinate with the customer's new facility, all work shall be done at the customer's expense.
iv. Systems greater than 2.0 MW must have two-way fiber optic communications channel between AE and the customer's facility for monitoring and relay communication and shall comply with the requirements of IEEE 1547.3. The customer will pay for all installation charges and communications equipment.
v. DG facilities of 4 MW or larger defined as intermittent sources will either require a dedicated feeder, or have the facility load split between multiple feeders to minimize/reduce voltage fluctuations that would affect other customers.
vi. DG facilities of 5 MW or larger shall be provided electrical service at primary voltage (12.47kV) and will be responsible for providing their own step-up transformers which shall be a grounded-WYE configuration on the utility side.

vii. The system must have the ability to ramp output up or down either by use of dynamically controlled inverters or staged ramping sequences. Ramping sequences shall be for minimizing adverse voltage effects and shall be approved by AE.

viii. The system must have the ability to provide power factor support from 0.9 lagging to 0.9 leading. Exact settings will be determined with AE.

d. **Facilities on the Downtown Network**:

Refer to Appendix E for interconnecting DG in the downtown network.

2. **Dedicated Service** AE will determine the need and feasibility for dedicated service on a case-by-case assessment of each customer-owned power production facility. The customer is responsible for all connection charges above standard service.

Dedicated Feeder: Proposed Distributed Generation facilities may not represent greater than 25% of the existing feeder load or 15% of the maximum available fault available on the circuit without written approval from AE.

3. Additional Requirements for Non-Inverter based generation

a. All generating units must comply with all of the applicable standards of ANSI and IEEE as well as be certified to UL2200 "Stationary Engine Generator Assembly".

b. The customer should contact Austin Energy to determine the phase rotation at their proposed site.

c. Fault current of the system must be recalculated to include the proposed generation, and all equipment must be rated to handle the increased fault current.

d. Machine rating will be determined from faceplate rating of the generator at 100% power factor.

e. Synchronous machines

i. The distributed generation facility's circuit breakers shall be three-phase devices with electronic control.

ii. The Customer is solely responsible for proper synchronization of its generator with the AE system.

iii. The generator's excitation system shall conform to the field voltage versus time criteria specified in the most recent version of ANSI Standard C50.13.

iv. For generating systems greater than two (2) megawatts (MW) the customer shall maintain the automatic voltage regulator (AVR) of each generating unit in service and operable at all times. AE shall be notified if the AVR is removed from service for maintenance or repair.

f. Induction machines

i. The induction machines used for generation may be connected and brought up to synchronous speed (as an induction motor) if it can be demonstrated that the initial voltage drop at the point of interconnection is within the flicker limits specified in this document.

ii. Induction generators shall have static capacitors that provide at least 95% of the magnetizing current requirements of the induction generator field. AE may, in the

interest of safety, authorize the omission of capacitors. However, where capacitors are used for power factor correction, additional protective devices may be required to guard against self-excitation of the customer's generator field.

4. **Additional Requirements for Electric Energy Storage Systems:**
   a. All Energy Storage systems shall be installed per manufacturer's instructions
   b. A second disconnect means shall be installed in proximity to the Energy Storage system if the AE required disconnect is not within sight.
   c. Energy Storage systems installed in parallel with other DG such as solar PV(as shown in Figure 3), may not both simultaneously discharge to the AE distribution system, unless the capacity of the transformer serving the customer has been reviewed by AE to ensure safe operation.

5. **Protective Devices:** The foregoing provides a statement of the minimum requirements for parallel operation on the AE system. In addition, AE will have the right to specify certain protective devices including relays and circuit breakers that must be installed at the customer's expense to operate in parallel with AE's system, to protect the safety of its employees and equipment, maintain the reliability of the system, or improve the accuracy of its metering equipment.

6. **Technical Exceptions**
   a. AE will review and consider exceptions that customers may have to the "Requirements for Parallel Systems" provided, however, that legal requirements such as compliance with fire safety, electrical or construction codes may not be waived unless such law, code, or ordinance provides for waiver or approval of alternate requirements and then only under the conditions set out therein for the grant of such waiver or written approval of alternate requirements.

   b. Customers desiring to present exceptions for consideration should submit in writing a completed description of the nature of each such exception to AE.

   c. Customers submitting exceptions should also include recommendations for an alternative approach to this particular requirement.

E. COMPLIANCE WITH APPLICABLE LAWS AND INSTALLATION RULES

1. Compliance with Laws. All customer-owned power production facilities located in the AE service area shall comply with the latest version of the Austin Electrical Utility Service regulations, City of Austin Electrical Code (§25-12-111), Ercot Distributed Generation Requirements, NFPA 70 (National Electrical Code), and NESC (National Electrical Safety Code), as well as the most current version of all other applicable federal, state, or local laws or ordinances as of date of installation. Refer to **Section G** for a listing of additional codes and standards. AE Customers in areas outside of the city of Austin may be required to have an additional permit depending on any local area having jurisdiction (AHJ).

2. Compliance with Installation Rules. All customer-owned power production facilities shall also comply with the Installation Rules and Standards for Electric Service established for the AE service area. All equipment rated for use at 1000V or below shall be UL listed and shall comply with NEC article 490.

   a. Note that per City and State Law, solar PV systems may only be installed by a licensed contractor. Homeowner exemptions do not apply for working on electrical services.

3. Applicability for Emergency or Standby Systems. Emergency and/or standby systems as defined in articles 700 through 702 of the NEC not in parallel with the AE electrical distribution system other than brief transition switching periods are not required to follow this Interconnection procedure. However, if the design of the system involves parallel operation with the AE distribution system for periods typically longer than 15 seconds, then the customer is required to follow the procedure outlined in this guide. Note—Any closed transition switching requires synchronizing controls.

4. Interconnect studies. Detailed interconnect studies may be required if the generation is connected to AE's distribution system and AE determines it to be necessary for safety and reliability purposes:

   a. Facilities rated <500 kW (not on the network)
      i. Interconnect study typically not required for equipment pre-certified to UL 1741.

   b. Facilities rated 500 kW to 1.0 MW
      i. Interconnect study typically not required for equipment pre-certified to UL 1741.
      ii. If an interconnect study is desired, AE to bear all costs for studies performed.

   c. Facilities rated >1.0 MW but less than 10 MW, or on the Downtown Network
      i. Interconnect study typically required at customer's expense.
      ii. Austin Energy shall determine the cost and timeline for performing a detailed interconnect study.

5. Installation Safety. Due to the arc flash hazards present in larger commercial systems, all work on the customer electrical system shall be performed under the direct supervision of a Master Electrician.
   a. All Energized meter sockets shall be covered with a UL listed plastic meter cover blank-off plate until the meter has been installed to prevent inadvertent electrical contact

6. Inspection. All customer-owned power production facilities shall be inspected for compliance with minimum safety code requirements and installation rules by a licensed electrical inspector. Isolated systems will also be inspected to ensure that the customer's load and power production equipment are not connected to an electrical circuit in common with the AE system. Inspection approval shall mean only that as of the date of the inspection, the customer's system met minimum code requirements at the time of such inspection and shall not be construed as endorsement, approval or recommendation of a

particular system design for the customer's needs nor a representation that the facility continues to comply with such codes following the inspection.

7. Enforcement. AE reserves the right to discontinue electric service to customers who have interconnected without AE authorization, fail or refuse to comply with minimum requirements or applicable law or who, as determined by AE, are operating their power production equipment in a hazardous or unsafe manner. AE may also pursue such other and further rights or remedies as are available to enforce these requirements.

8. Operating Safety. Adequate protection and documented operational procedures must be jointly developed and followed by the customer and AE for each customer power production facility operating in parallel with the AE system. These operating procedures must be approved by both the customer and AE. The customer shall be required to furnish, install, operate and maintain in good order and repair and be solely responsible for, without cost to AE, all facilities required for the safe operation of a customer generation system in parallel with the AE system.

9. Maintenance of Protective Equipment. All interconnection equipment on the customer's facility shall be installed and maintained by the customer at their sole expense and in accordance with minimum guidelines established by AE.

    a. The customer shall provide a maintenance schedule and perform maintenance of protective equipment at their sole expense at least every two (2) years, or as mandated by current standards, equipment manufacturer recommendations, or as required by AE to provide a safe, reliable system while operating in parallel with the AE system. Circuit breakers must be trip-tested by the customer at least once each year.

    b. A periodic test report log shall be maintained. Testing shall include but is not limited to, for example, the tripping of the circuit breakers by the protective relays. The customer shall provide appropriate access to all facilities for the purpose of such inspections. AE reserves the right to periodically re-inspect the system with prior notification to the customer.

    c. Maintenance records for parallel systems must be provided to AE upon request.

10. Self Protection. The minimum protection requirements are designed and intended to protect the Austin Energy electrical distribution system only. The customer shall provide at their sole expense, all devices necessary to protect the customer's electrical generating system by conditions that may occur on the AE system resulting in interruptions and restorations of electrical service. The equipment so installed must protect the customer's electric generating system from overvoltage, undervoltage, overload, short circuits including ground fault conditions, open circuits, phase imbalance and reversal, over and under frequency conditions and other injurious electrical conditions that may arise during the operation of the AE system.

11. Capital Cost Responsibility. The customer is required to bear all initial and subsequent costs associated with the change-out, upgrading or addition of protective devices, transformers, poles, line, services, meters, switches, and associated equipment and devices beyond that which would be required to provide normal service to the customer if no generation was involved. The customer shall be invoiced for all material and labor that are required in excess of those covered by other applicable installation charges or fees (see appropriate schedules). Upon written request, AE shall supply the customer a cost estimate prior to any work being done.

12. Liability. The customer assumes all responsibility for damage or loss that may occur from improper coordination and synchronization of its generator with the AE system.

    a. The customer shall provide proof of insurance of at least $500,000 for systems over 500kW and at least $1M for systems over 1 MW.

    b. The customer shall be responsible for coordination and synchronization of the customer's electrical generating system with all aspects of AE's electrical system.

13. Confidentiality. Due to the nature of the rapidly evolving regulations for DG, non-specific information might be shared among working groups to better understand and optimize the process for interconnection. Detailed or specific information provided, such as customer identification, one-line or site diagrams or specific component information, shall not be shared without customer approval.

14. Third Party Leases. Austin Energy is the exclusive provider of electric service within its service territory. State law prohibits other owners of electric equipment from furnishing electricity for compensation. Therefore, leases related to solar generation must be equipment leases for flat payments and may not be based on volumetric charges or multipliers for the kWh output of the photovoltaic equipment, nor may leases be based on the customer's consumption from the equipment. As such, a customer may generate electricity to meet its own needs but cannot buy electricity from anyone else. A customer may lease the equipment on a cost basis but may not have lease payments based on the energy produced, which would be construed as the sale of electricity. It is up to each customer lessee and solar equipment lessor to ensure that a lease does not violate state law.

F. DEFINITIONS

1. AE System: The Electric Utility System of Austin Energy (AE). A detailed map of the service area is available on the Austin Energy Storm Center Website: **https://my.austinenergy.com/outages/**

2. Customer: Refers to both co-generators and small power producers within the AE service area who use conventional fossil fuels or alternative sources such as solar, wind or biomass to produce power. The customer must have legal ownership rights of the proposed distributed generation facility and property.

3. IEEE : Institute of Electrical and Electronics Engineers

4. Interconnection: The physical means by which electric energy is received from a generating source. The principal elements of an electric interconnection include transmission and distribution circuits, transformers and switching devices such as circuit breakers, fuses and isolating disconnect switches. Supplemental elements may include sensing devices and protective relay equipment.

5. Point of Common Coupling or Interconnection Point: The point at which energy first enters or leaves the line or apparatus owned by the customer and leaves or enters the line or apparatus owned by AE and is the point of common coupling as defined in IEEE 1547. Typically, this is defined as the load side of the revenue meter. (see NEC article 705.2)

6. Supplementary Electric Service: Electric power required on a regular basis to serve a portion of the customer's load in addition to that served by the customer's power source.

7. Maintenance Electric Service: Electrical power which is required to serve the customer's load during specific prearranged periods of scheduled outage of the customer's power source for maintenance or repair.

8. Isolated System: A system in which there is no interconnection of the customer's power source or load served by the customer's power source to an electrical circuit common with the AE electric utility system. Customers dedicating their power production equipment to a particular load without standby electric service from AE would be considered as having a totally isolated system.

9. Separate System: A system in which there is no intended interconnection of the customer's electrical generation system in parallel with the AE electric utility system but whose load receives standby service from AE. Customers dedicating their power production equipment to a particular load and who receive standby electric service for the load from AE must be capable of transferring the load between the two electrical systems in an open transition in order to be considered as having a separate system; that is, the customer's power production equipment is not connected to the AE electric utility system directly or indirectly through the load. Typical emergency backup generation systems with an automatic transfer switch

fall into this category. However, power production equipment intended to operate with a closed transition must be reviewed by AE as well.

10. Parallel System: A system in which the customer's electrical generation system can be connected to an electrical circuit common with the AE electric utility system. Customers who receive supplementary electric service from AE will be considered as having a parallel system. This system allows for the flow of power from AE to the customer and from the customer to AE. Typical distributed generation falls into this category.

11. UPS: An Uninterruptible Power Supply (UPS) system that is not normally capable of backfeed into the AE system other than brief transition periods will be classified as a Separate system. If the UPS system is capable of backfeed into the AE system for periods exceeding 15 seconds, it will be classified as a Parallel system.

12. Backfeed: A situation whereby the normal power flow is reversed and current flows from the customer system into the AE distribution system.

13. Microgrid: A microgrid is a local energy network offering integration of DG with local electric loads, which can operate in parallel with the AE System or in an intentional island mode. This is a new type of system being developed and includes the use of DG paired with smart load shed/load management techniques to enable it to run in an islanded configuration. Although IEEE standard 1547.4 is available for review, AE procedures to handle this type of system have not been developed.

14. ESPA: **Electric Service Planning Application form**(s) which are required to be filled out for any change in the service connection to Austin Energy:
    http://www.austinenergy.com
    - **Select the "Contractors" tab**
    - **Select the "Electric Service Design & Planning Tab"**

15. DGPA: **Distributed Generation Planning Application form**(s) which are required to be filled out for any Distributed Generation interconnection to Austin Energy
    http://www.austinenergy.com
    - **Select the "Contractors" tab**
    - **Select the "Electric Service Design & Planning Tab"**

16. Dedicated Service: A feeder or transformer, or both, in the AE Distribution system that only serves a single customer.

17. Downtown Network: The network refers to an area of the AE distribution system in downtown Austin where multiple feeders are "networked" together. Areas of downtown Austin are on the Downtown Network and due to safety and power quality concerns, additional protection is required so that **no** distributed generation facility will be allowed to export power to the AE grid. These requirements are documented in IEEE Standard 1547.6 and an analysis of the issues was documented by the National Renewable Energy Labs at:
    http://www.nrel.gov/docs/fy09osti/45061.pdf

18. Electric Energy Storage: Electric Energy storage systems connected in parallel to the AE distribution system are considered to be distributed generation assets.

19. Anti-islanding: Detection circuitry required for DG systems that sense when a power outage has occurred on the utility lines and shuts itself off so there is no possibility of backfeeding into the utility system.

20. High-Leg service: Refers to a 4-wire 3-phase open delta system where the midpoint of one phase winding is grounded. See NEC article 110.15, and the AE design Criteria manual section. A licensed electrician should verify each phase relative to ground using suitable equipment to determine the exact circuits powered by the high leg.

21. ERS: ERCOT Response System. Refer to: http://www.ercot.com/services/programs/load/eils/

22. Generating Facility Capacity: The net capacity of the generating facility connecting at a single point of common coupling and the aggregate net capacity of the facility where multiple generators connect at the same point of common coupling.

23. EPS Metering: ERCOT Polled Settlement Metering. May be required for DG greater than 1 MW Refer to: http://www.ercot.com/services/programs/load/eils/

G. Certification Codes and Standards

(Refer to the most recent version of the following documents:)

Note—Many codes are available from the City of Austin Planning and Development Review website. http://publicecodes.cyberregs.com/icod/

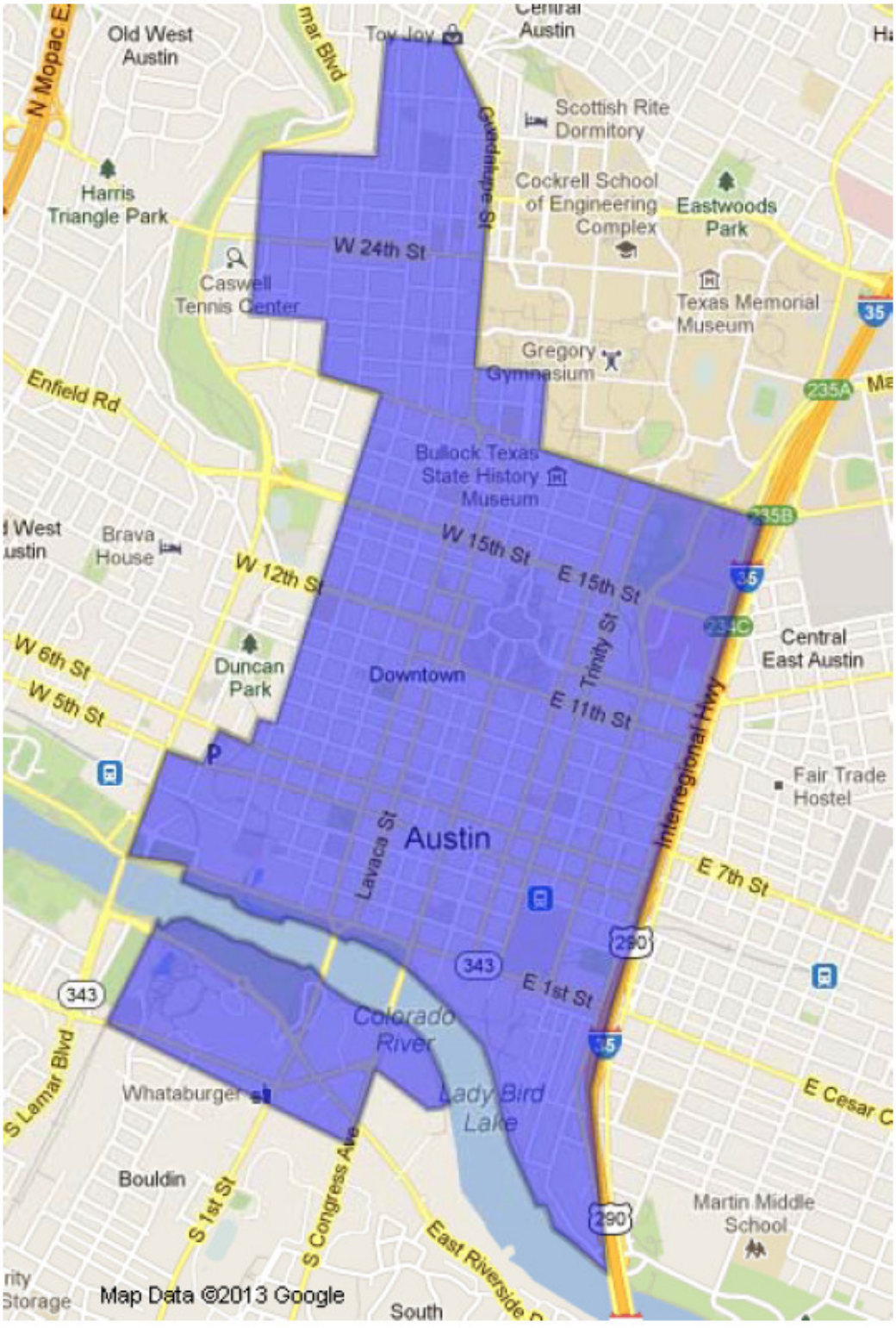
City of Austin Electrical Codes
http://www.ci.austin.tx.us/development/onestop/codes_tech_info.htm

Austin Energy Design Criteria manual
http://www.austinenergy.com/About%20Us/Company%20Profile/AEDesignCriteria.pdf

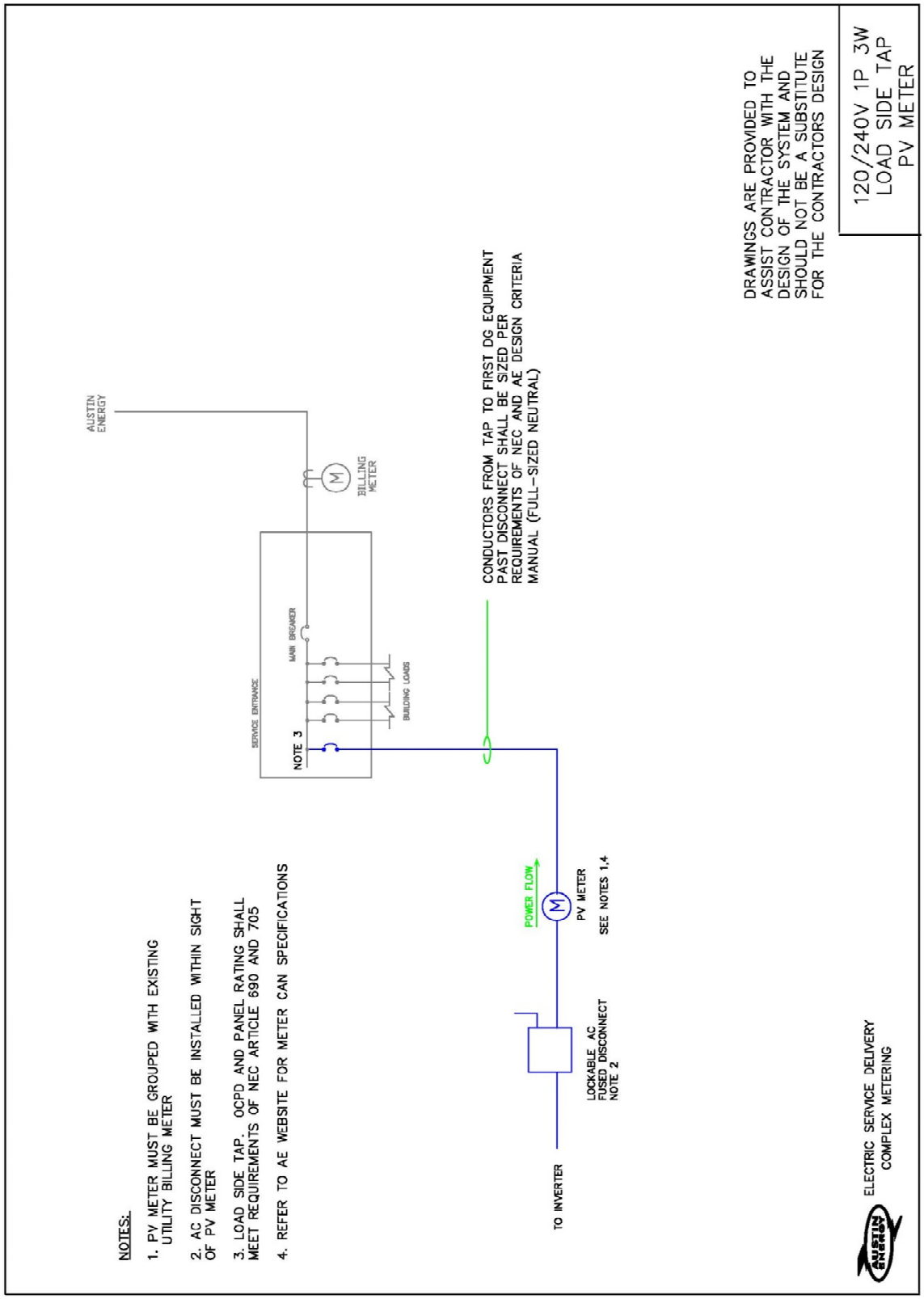
IEEE1547 Standard for Interconnecting Distributed Resources with Electric Power Systems (including IEEE 1547a, 1547.1, 1547.2, 1547.3, 1547.4, 1547.6, 1547.7)
UL 1699B Photovoltaic (PV) DC Arc-Fault Circuit Protection
UL 1741 Inverters, Converters, and Controllers for Use with Distributed Energy Resources
UL 1642 Standard for Lithium Ion batteries
UL 1973 Batteries for Use in Light Electric Rail (LER) and Stationary Applications
UL 1989 Standard for Standby Batteries
UL P9540 (Draft) Safety for Energy Storage Systems and Equipment
UL 2200 Stationary Engine Generator Assemblies
NESC, National Electrical Safety Code
NFPA 70, National Electrical Code, version as approved by City of Austin Electrical Code

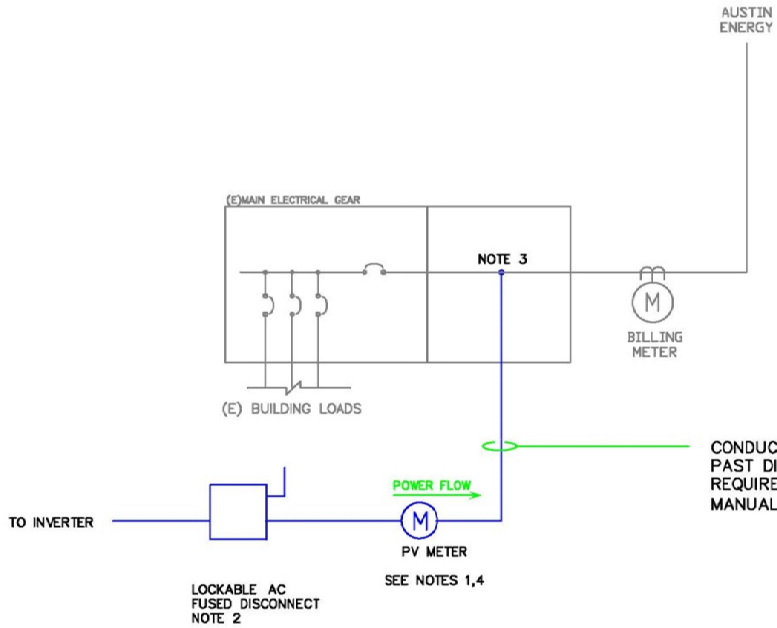
IEEE STD C37.90.1, IEEE Standard Surge Withstand Capability (SWC) Tests for Protective Relays and Relay Systems
IEEE STD C37.90.2, IEEE Standard Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers
IEEE STD C37.108, IEEE Guide for the Protection of Network Transformers
IEEE STD C57.12.44, IEEE Standard Requirements for Secondary Network Protectors
IEEE STD C62.41.2, IEEE Recommended Practice on Characterization of Surges in Low Voltage (1000V and Less) AC Power Circuits
IEEE STD C62.45, IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000V and Less) AC Power Circuits
ANSI C84.1, Electric Power Systems and Equipment – Voltage Ratings (60 Hertz)
IEEE STD 100, IEEE Standard Dictionary of Electrical and Electronic Terms
IEEE STD 519, IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
NEMA MG 1, Motors and Generators
California Energy Commission(CEC)Solar Energy Resource **http://www.gosolarcalifornia.org/**

Appendix A- Map of the Downtown Network



Appendix B—Standard Complex Meter Configurations





NOTES:

1. PV METER MUST BE GROUPED WITH EXISTING UTILITY NET METER
2. AC DISCONNECT MUST BE INSTALLED WITHIN SIGHT OF PV METER
3. LINE TAP MUST BE ON THE LOAD SIDE OF THE NET METER.
4. REFER TO AE WEBSITE FOR METER CAN SPECIFICATIONS

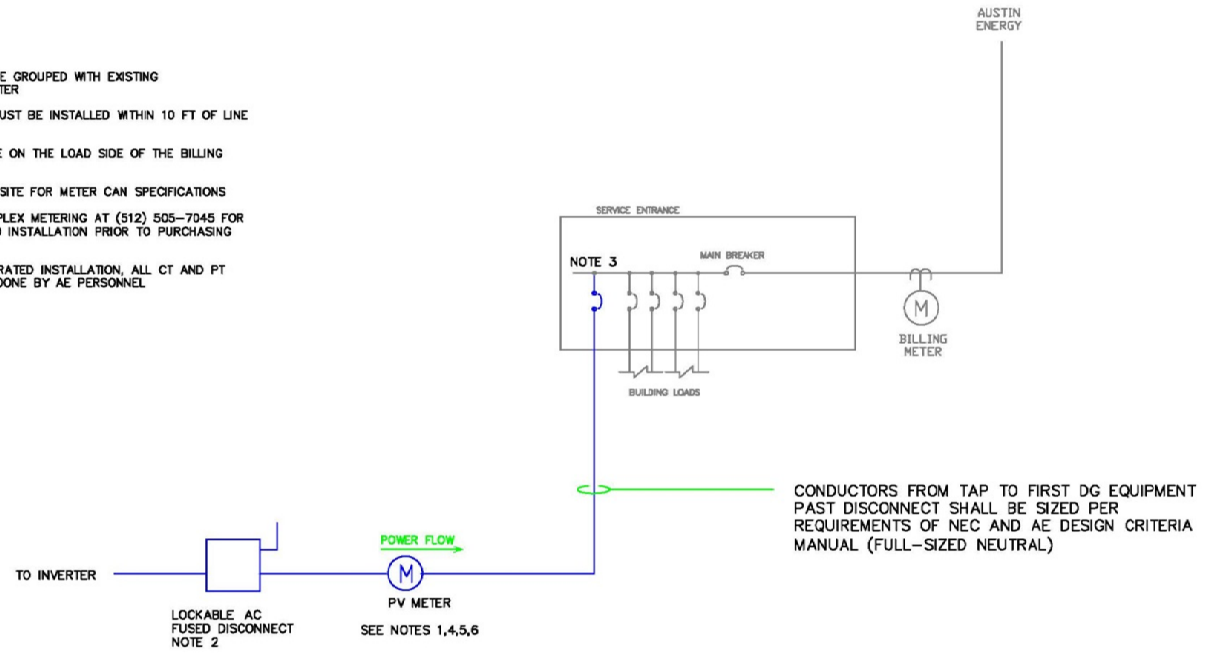
DRAWINGS ARE PROVIDED TO ASSIST CONTRACTOR WITH THE DESIGN OF THE SYSTEM AND SHOULD NOT BE A SUBSTITUTE FOR THE CONTRACTORS DESIGN

ELECTRIC SERVICE DELIVERY

TITLE:
120/240V 1P 3W
LINE SIDE TAP
PV METER

NOTES:

1. PV METER MUST BE GROUPED WITH EXISTING UTILITY BILLING METER
2. AC DISCONNECT MUST BE INSTALLED WITHIN 10 FT OF LINE SIDE TAP
3. LINE TAP MUST BE ON THE LOAD SIDE OF THE BILLING METER.
4. REFER TO AE WEBSITE FOR METER CAN SPECIFICATIONS
5. CONTACT AE COMPLEX METERING AT (512) 505-7045 FOR INSTRUMENT RATED INSTALLATION PRIOR TO PURCHASING EQUIPMENT.
6. FOR INSTRUMENT RATED INSTALLATION, ALL CT AND PT WIRING SHALL BE DONE BY AE PERSONNEL



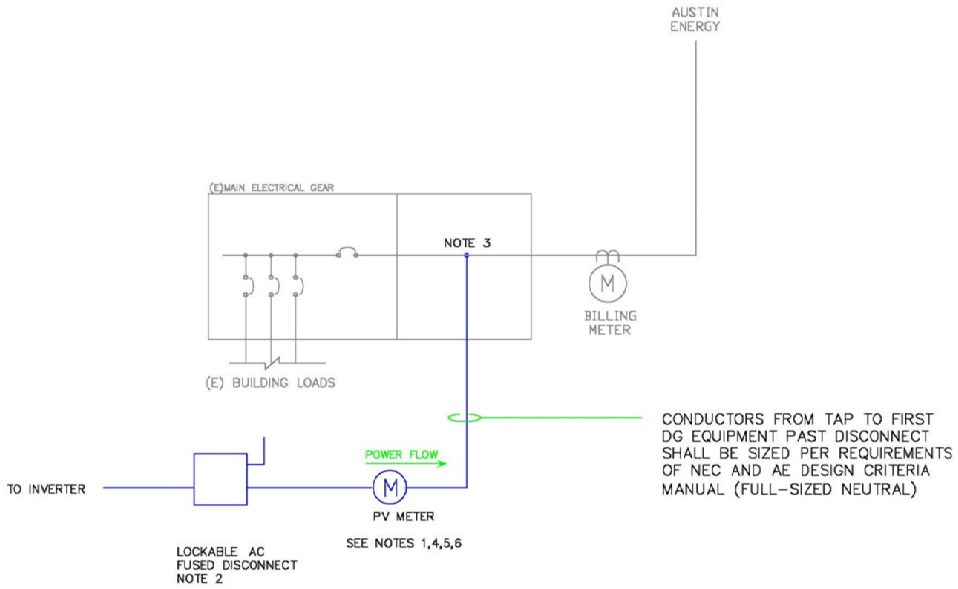
DRAWINGS ARE PROVIDED TO ASSIST CONTRACTOR WITH THE DESIGN OF THE SYSTEM AND SHOULD NOT BE A SUBSTITUTE FOR THE CONTRACTORS DESIGN

ELECTRIC SERVICE DELIVERY

208/120V 3P 4W
LOAD SIDE TAP
PV METER

NOTES:

1. PV METER MUST BE GROUPED WITH EXISTING UTILITY BILLING METER
2. AC DISCONNECT MUST BE INSTALLED WITHIN 10 FT OF LINE SIDE TAP
3. LINE TAP MUST BE ON THE LOAD SIDE OF THE BILLING METER.
4. REFER TO AE WEBSITE FOR METER CAN SPECIFICATIONS
5. CONTACT AE COMPLEX METERING AT (512) 505-7045 FOR INSTRUMENT RATED INSTALLATION PRIOR TO PURCHASING EQUIPMENT.
6. FOR INSTRUMENT RATED INSTALLATION, ALL CT AND PT WIRING SHALL BE DONE BY AE PERSONNEL



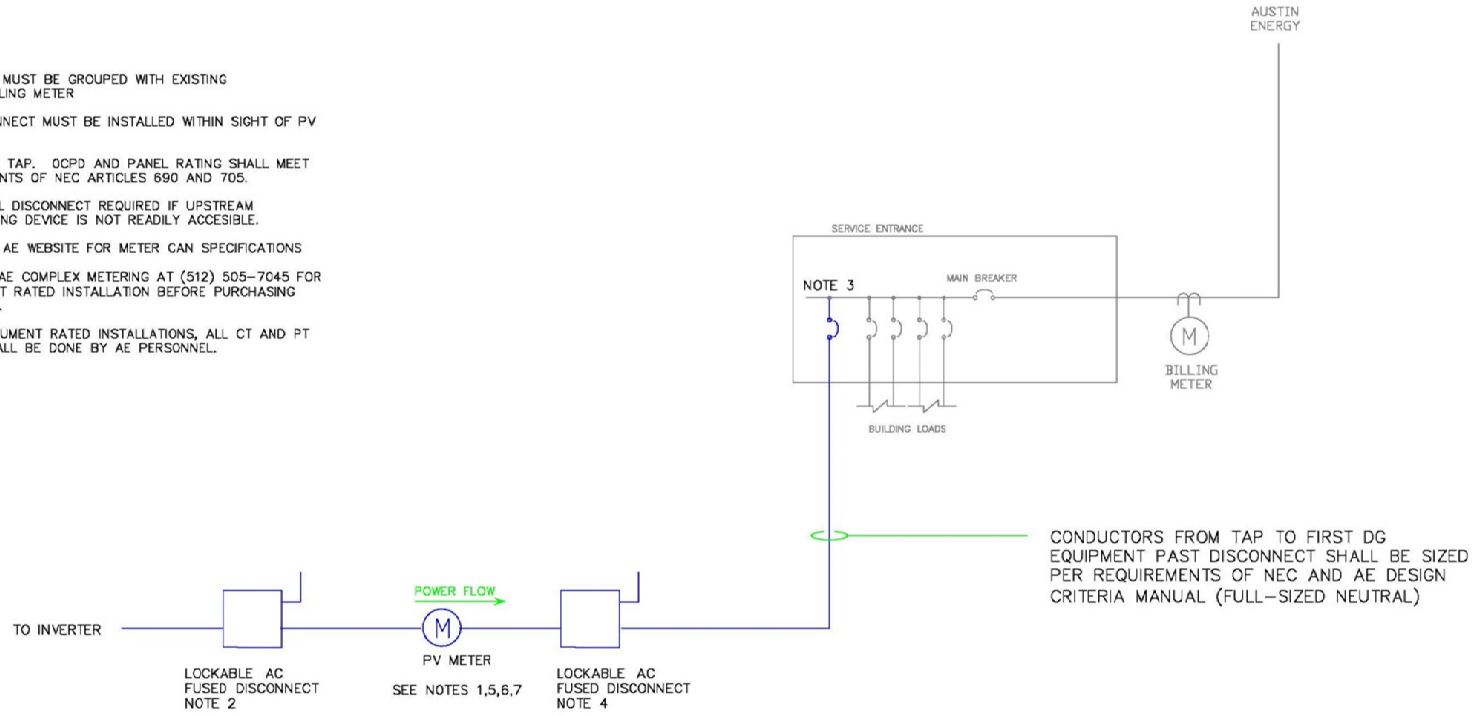
DRAWINGS ARE PROVIDED TO ASSIST CONTRACTOR WITH THE DESIGN OF THE SYSTEM AND SHOULD NOT BE A SUBSTITUTE FOR THE CONTRACTORS DESIGN

ELECTRIC SERVICE DELIVERY

3P 4W 208/120V
LINE SIDE TAP
PV METERING

NOTES:

1. PV METER MUST BE GROUPED WITH EXISTING UTILITY BILLING METER
2. AC DISCONNECT MUST BE INSTALLED WITHIN SIGHT OF PV METER
3. LOAD SIDE TAP. OCPD AND PANEL RATING SHALL MEET REQUIREMENTS OF NEC ARTICLES 690 AND 705.
4. ADDITIONAL DISCONNECT REQUIRED IF UPSTREAM INTERRUPTING DEVICE IS NOT READILY ACCESIBLE.
5. REFER TO AE WEBSITE FOR METER CAN SPECIFICATIONS
6. CONTACT AE COMPLEX METERING AT (512) 505-7045 FOR INSTRUMENT RATED INSTALLATION BEFORE PURCHASING EQUIPMENT.
7. FOR INSTRUMENT RATED INSTALLATIONS, ALL CT AND PT WIRING SHALL BE DONE BY AE PERSONNEL.



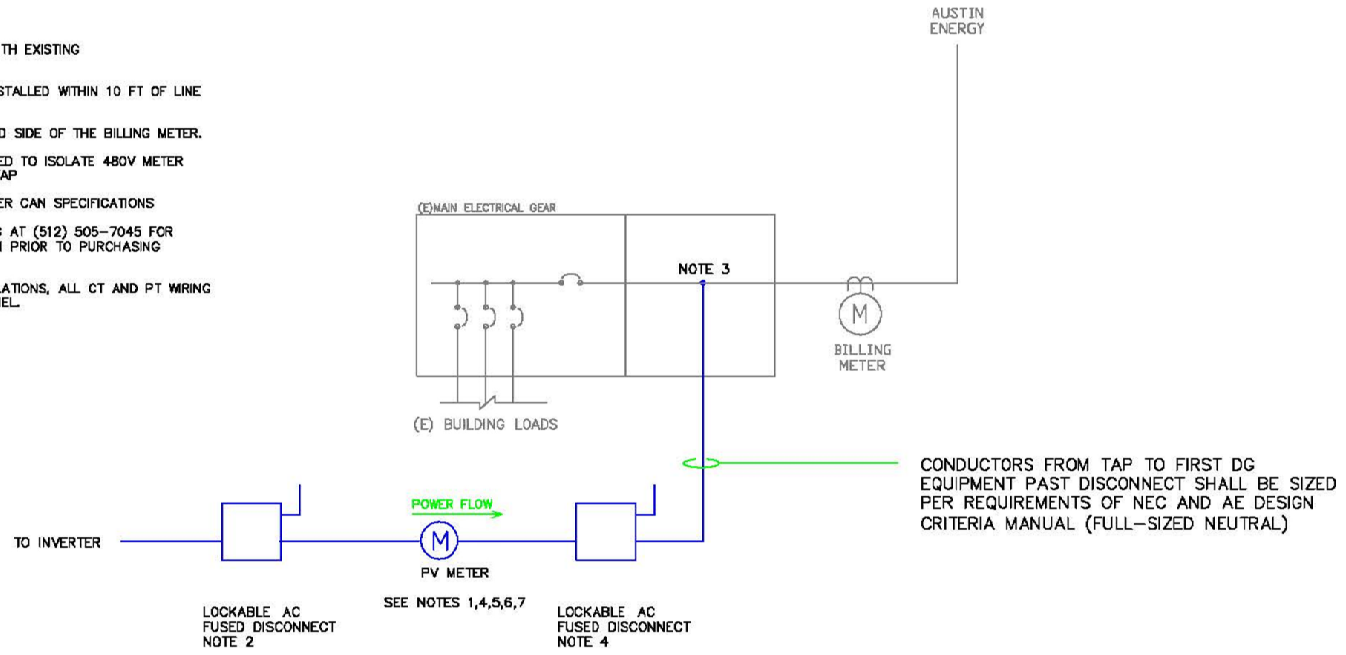
DRAWINGS ARE PROVIDED TO ASSIST CONTRACTOR WITH THE DESIGN OF THE SYSTEM AND SHOULD NOT BE A SUBSTITUTE FOR THE CONTRACTORS DESIGN

ELECTRIC SERVICE DELIVERY

480/277V 3P 4W
LOAD SIDE TAP
PV METER

NOTES:

1. PV METER MUST BE GROUPED WITH EXISTING UTILITY BILLING METER
2. FUSED DISCONNECT MUST BE INSTALLED WITHIN 10 FT OF LINE SIDE TAP
3. LINE TAP MUST BE ON THE LOAD SIDE OF THE BILLING METER.
4. ADDITIONAL DISCONNECT REQUIRED TO ISOLATE 480V METER WHERE SYSTEM IS A LINE SIDE TAP
5. REFER TO AE WEBSITE FOR METER CAN SPECIFICATIONS
6. CONTACT AE COMPLEX METERING AT (512) 505-7045 FOR INSTRUMENT RATED INSTALLATION PRIOR TO PURCHASING EQUIPMENT.
7. FOR INSTRUMENT RATED INSTALLATIONS, ALL CT AND PT WIRING SHALL BE DONE BY AE PERSONNEL.



DRAWINGS ARE PROVIDED TO ASSIST CONTRACTOR WITH THE DESIGN OF THE SYSTEM AND SHOULD NOT BE A SUBSTITUTE FOR THE CONTRACTORS DESIGN

ELECTRIC SERVICE DELIVERY

3P 4W 480/277V
LINE SIDE TAP
PV METERING

NOTES:

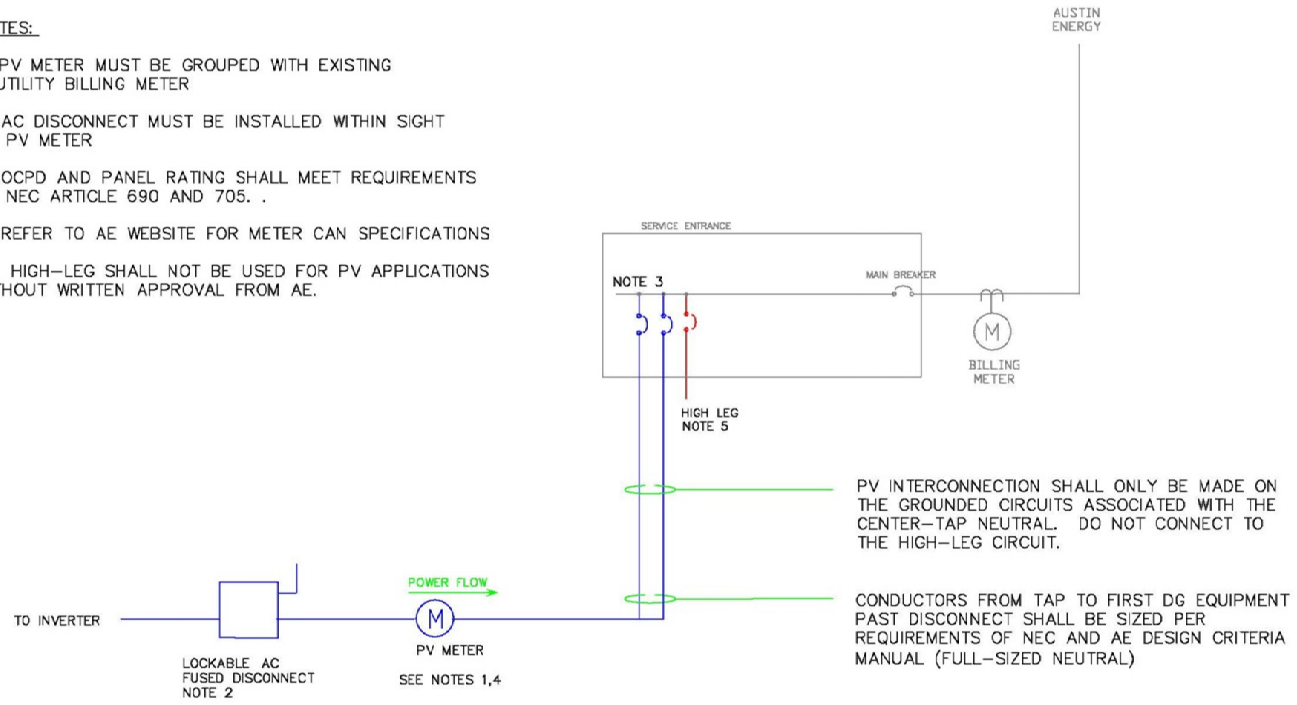
1. PV METER MUST BE GROUPED WITH EXISTING UTILITY BILLING METER

2. AC DISCONNECT MUST BE INSTALLED WITHIN SIGHT OF PV METER

3. OCPD AND PANEL RATING SHALL MEET REQUIREMENTS OF NEC ARTICLE 690 AND 705. .

4. REFER TO AE WEBSITE FOR METER CAN SPECIFICATIONS

5. HIGH-LEG SHALL NOT BE USED FOR PV APPLICATIONS WITHOUT WRITTEN APPROVAL FROM AE.



DRAWINGS ARE PROVIDED TO ASSIST CONTRACTOR WITH THE DESIGN OF THE SYSTEM AND SHOULD NOT BE A SUBSTITUTE FOR THE CONTRACTORS DESIGN

ELECTRIC SERVICE DELIVERY

120/240V 3P "HIGH-LEG" PV METER

Appendix C—AE DG Inspection Checklist

Customer:_____

Contractor:_____

Address:_____

Meter Number_____

Tilt:_____

Azimuth:_____

Electrical Permit Number:_____

Building Permit Number:_____

General

- ☐ System meets AE Design Criteria, Interconnection Guidelines and Local Ordinances.
- ☐ Design drawings are present.
- ☐ Installation is consistent with drawings.
- ☐ All equipment UL listed.
  - ☐ Inverter certified to UL1741.(**inverter based generation only**)
- ☐ All equipment new. (**rebate customers only**)
- ☐ All electrical components are listed for voltage and current ratings necessary for application and installed per mfg specifications.
- ☐ Line side tap or interconnection at panel.
  - o Verify a main building disconnect.
  - o For interconnection at panel, verify OCPD sized correctly for panel main busbar per NEC articles 690 and 705.
- ☐ All building penetrations are sealed and fire resistance is maintained.
- ☐ Dissimilar metals that have galvanic action are isolated.
- ☐ All components mounted securely.
- ☐ Modules and Inverter/s meets requirements of respective program guidelines? (**rebate customers only**)
- ☐ Workmanship warranty duration per program guidelines.(**rebate customers only**)
- ☐ Entire system properly grounded-
  - o Grounding electrode system for inverter.
  - o Grounding conductor is 8AWG or sized according to code and continuous or irreversibly spliced.
  - o Neutral is full-size per AE Design Criteria Manual
- ☐ Permanent Labels are applied to system components as required by local and national codes.(Locations of disconnects, modules, inverters, standby systems, etc)

Inspection of Interconnection Equipment:

- ☐ OCPD sized correctly in DC disconnect.
- ☐ Lightning Arrestor is installed.(**solar PV only**)
- ☐ If multiple inverter, with potential exception of micro-inverter, an aggregation panel is used before meter.
- ☐ If customer has three phase **delta** system (not common):
  - o Single phase inverters may not be used for three phase use
  - o Inverters must be certified for use in delta systems.
- ☐ AC disconnect is on load side of the DG meter so the meter can remain energized while the DG system is disconnected (except 480V).
  - o Proper meter can is installed. (Single-phase, three-phase, CT Can)

- o DG Meter has isolated neutral block type distribution block.
- o Meters and disconnects grouped with billing meter.
- o OCPD sized correctly in AC disconnect.

☐ Wire management:
- o Check that all conduit is properly connected (wrench tight), no loose fittings, no cross threading.
- o All work performed in neat and workmanlike manner.
- o All conductors properly color coded.

☐ Only positive portion of DC fused in uni-polar system? (If bi-polar fuse both sides)

☐ **Maintain 3 foot clearance from the gas meter.(measured horizontally)**

Inspection of Array (Solar PV only):

☐ System Size matches plans and specs.

☐ Module string configuration designed per inverter manufacturer string sizing calculations from their website.

☐ Solar Radiation access meets the requirements of respective program guidelines.(**rebate customers only**)

☐ Roof perimeter access meets IFC 605.11.3. (3 feet minimum typical)

☐ Stainless steel fasteners are used on modules and racking.

☐ Modules are not modified such that it voids the listing or warranty.

☐ Fuses in combiner box properly sized (if applicable).

☐ Expansion fittings over expansion joints.

☐ All conductors properly secured above the roof surface.

☐ Local AC disconnect required at the roof (if applicable).

☐ Roof penetrations are performed according to respective program guidelines. **(must provide roof boots or flashings)**

☐ Mounting system meets structural requirements.
- o Roof is capable of sustaining extra weight.
- o Array is capable of sustaining wind requirements.

☐ If module array is not visible at DC disconnect, add DC disconnect near array at grade.

☐ If DC goes through building, there is a disconnect on roof before entering building with visible blade disconnect.

Validation of System Performance:

☐ Inverter generating correct power?

☐ Inverter de-energize when disconnected from AC source?

☐ Inverter does not re-connect for 5 min after AC source turned back on.

Contractor Name_____

Contractor Signature_____

Current version of the AE Interconnect Guide can be found on the web at:
http://www.austinenergy.com

- **Select the "Contractors" tab**
- **Select the "Electric Service Design & Planning Tab"**

Appendix D—Interconnection Package and Forms For Systems 500kW to <10MW **or** on the Downtown Network.

Application Package Checklist

☐ 1) Copy enclosed of approved DGPA Application indicating whether or not proposed facility is in the Downtown Network.

☐ 2) Copy enclosed of completed Distributed Generation Application
a. Application form
b. Customer information
c. DG application--either PV or rotating machine sheets
d. Interconnecting facilities information
e. Interconnection Agreement (refer to Appendix G)

☐ 3) Copy enclosed of site electrical one-line diagram and schematic drawings showing the configuration of all Distributed Generation equipment, current and potential circuits, and protection and control schemes, signed and stamped by a professional engineer licensed in the state of Texas.

☐ 4) Copy enclosed of any site documentation that indicates the precise physical location of the proposed distributed generation facility (e.g., USGS topographic map or other diagram or documentation).

☐ 5) Copy enclosed of proposed location of Disconnect Switch (es) in relation to meter, generator, and main service meter.

☐ 6) Copy enclosed of any site documentation that describes and details the operation of the protection and control schemes, as well as proposed directory/plaque location.

☐ 7) Copy enclosed of schematic drawings for all protection and control circuits, relay current circuits, relay potential circuits, and alarm/monitoring circuits (if applicable).

☐ 8) Enclosed certificate of insurance and initial payment per fee schedule (if applicable). (**refer to Section E.11 and E.12**)

☐ 9) Enclosed Signed Interconnection Agreement

☐ 10) Upon completion of construction, schedule COA inspection at least 7 business days prior to energizing DG system.

Applicant Signature

I hereby certify that, to the best of my knowledge, all of the information provided in this Interconnection Request is true and correct.

Interconnection Customer: _____ Date:_____

Austin Energy Distributed Generation Application
For facilities from 500 kW to <10 MW or on the Downtown Network

Designated Contact Person: _____

Address: _____

Telephone Number: _____

Fax: _____

E-Mail Address: _____

Requested In-Service Date:_____

An Interconnection Request is considered complete when it provides all applicable and correct information as required on the following pages.

Preamble and Instructions

An Interconnection Customer who requests an Austin Energy jurisdictional interconnection must submit this Interconnection Request by hand delivery, mail, e-mail, or fax.

Processing Fee or Deposit:

The Interconnection Customer shall submit to Austin Energy a deposit towards the cost of the feasibility study as detailed on the Austin Energy Fee Schedule.
http://www.austinenergy.com/About%20Us/Rates/feeSchedule.pdf

Interconnection Customer Information

Legal Name of the Interconnection Customer (or, if an individual, individual's name)

Name: _____

Contact Person: _____

Mailing Address: _____

City: _____ State: _____ Zip: _____

Facility Location (if different from above): _____

Telephone (Day): _____ Telephone (Evening): _____

Fax: _____ E-Mail Address: _____

Application is for:
_____New Small Generating Facility _____Capacity addition to Existing Facility

A) If capacity addition to existing facility, please describe: _____
_____

B) Provide existing Account Number _____

Will the Small Generating Facility use Net Metering? Yes ___ No ___

Is customer site in the AE Downtown Network? Yes_____ No_____

Interconnection Customer or Customer-Site Load: _____kW (if none, so state)

Maximum Physical Export Capability Requested: _____ kW

Distributed Generation Facility Information
(Data apply only to the Generating Facility, not the Interconnection Facilities.)

Technology Type: ___ Renewable ___ Non-renewable

Fuel Type: ___ Solar ___ Wind ___ Diesel ___ Natural Gas ___ Fuel Oil
___ Other (state type) _____

Type of Generator: ____Synchronous ____Induction ____ Inverter

Distributed Generation Application for Solar PV

Generator (or solar collector)
Manufacturer, Model Name & Number: _____Version Number: _____

Nameplate Output Power Rating in kW: (Summer) _____ (Winter) _____
Nameplate Output Power Rating in kVA: (Summer) _____ (Winter) _____

Inverter Manufacturer, Model Name & Number (if used): _____

Is the inverter on the CEC list of approved equipment? ____Yes ____No

List components of the Small Generating Facility equipment package that are currently certified:

Equipment Type	Certifying Entity
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____
5. _____	_____

Is the generation equipment compatible with the certified protective relay package? ____Yes ____No

List of adjustable set points for the protective equipment or software: _____

Distribution Facility Characteristic Data for inverter-based machines

Max design fault contribution current: _____ Instantaneous ___ or RMS? ___
Harmonics Characteristics: _____
Start-up requirements: _____

Note: An approved ESPA must be supplied with the Interconnection Request.

For installations less than 1.0MW, City permits should be obtained using the Quick-turn process.

Interconnection Facilities Information

Part A Transformer

Will a transformer be used between the generator and the point of common coupling? ___Yes ___No

Will the transformer be provided by the ____Interconnection Customer or ____AE?

If transformer is provided by AE, the rest of part A (below) is left blank

Transformer Data (for Customer-Owned Transformer only):

Size: _____kVA Transformer Impedance: _____% on _____kVA Base

Transformer Primary: _____ Volts _____ Delta _____Wye _____ Wye Grounded
Transformer Secondary: _____ Volts _____ Delta _____Wye _____ Wye Grounded
Transformer Tertiary: _____ Volts _____ Delta _____Wye _____ Wye Grounded

Transformer Fuse Data (if applicable):
Manufacturer: _____ Type: _____ Size: _____Speed: _____

Interconnecting Circuit Breaker (if applicable):

Manufacturer: _____ Type: _____
Load Rating (Amps): _____ Interrupting Rating (Amps): _____ Trip Speed (Cycles): _____

Interconnection Protective Relays (If Applicable):

List of Functions and Adjustable Setpoints for the protective equipment or software:

Setpoint Function	Minimum	Maximum
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____

Part B - Reconnection Time

Programmed Time Delay for Reconnection after Interruption:

___300 Seconds(default) ___Other (specify)_____

Distributed Generation Application for Rotating Machines
(not required for Solar PV systems)

RPM Frequency: _____
(*) Neutral Grounding Resistor (If Applicable): _____

Synchronous Generators:

Direct Axis Synchronous Reactance, Xd: _____ P.U.
Direct Axis Transient Reactance, X'_d: _____P.U.
Direct Axis Subtransient Reactance, X''_d: _____P.U.
Negative Sequence Reactance, X_2: _____ P.U.
Zero Sequence Reactance, X_0: _____ P.U.
KVA Base: _____
Field Volts: _____
Field Amperes: _____

Induction Generators:

Motoring Power (kW): _____
Locked Rotor current_____
I_2^2t or K (Heating Time Constant): _____
Rotor Resistance, Rr: _____ P.U.
Stator Resistance, Rs: _____ P.U.
Stator Reactance, Xs: _____ P.U.
Rotor Reactance, Xr: _____ P.U.
Magnetizing Reactance, Xm: _____ P.U.
Short Circuit Reactance, Xd": _____ P.U.
Exciting Current: _____
Temperature Rise: _____
Frame Size: _____
Design Letter: _____
Reactive Power Required In KVars (No Load): _____
Reactive Power Required In KVars (Full Load): _____
Total Rotating Inertia, H: _____ Per Unit on kVA Base

Excitation and Governor System Data for Synchronous Generators Only

Individual Generator Power Factor
Rated Power Factor: Leading: _____Lagging: _____

If Discrete Components:

(Enclose Copy of any Proposed Time-Overcurrent Coordination Curves)

Manufacturer: _____ Type: _____ Style/Catalog No.: _____ Proposed Setting: _____
Manufacturer: _____ Type: _____ Style/Catalog No.: _____ Proposed Setting: _____
Manufacturer: _____ Type: _____ Style/Catalog No.: _____ Proposed Setting: _____
Manufacturer: _____ Type: _____ Style/Catalog No.: _____ Proposed Setting: _____
Manufacturer: _____ Type: _____ Style/Catalog No.: _____ Proposed Setting: _____

Current Transformer Data (If Applicable):

(Enclose Copy of Manufacturer's Excitation and Ratio Correction Curves)

Manufacturer: _____
Type: _____ Accuracy Class: ___ Proposed Ratio Connection: ____

Manufacturer: _____
Type: _____ Accuracy Class: ___ Proposed Ratio Connection: ____

Potential Transformer Data (If Applicable):

Manufacturer: _____
Type: _____ Accuracy Class: ___ Proposed Ratio Connection: ____

Manufacturer: _____
Type: _____ Accuracy Class: ___ Proposed Ratio Connection: ____

Interconnection Agreement

This Interconnection Agreement ("Agreement") is made and entered into this ____ day of _____, 20__, by Austin Energy and _____("Customer"), a _____ [specify whether corporation, and if so name state, municipal corporation, cooperative corporation, or other], each hereinafter sometimes referred to individually as "Party" or both referred to collectively as the "Parties". In consideration of the mutual covenants set forth herein, the Parties agree as follows:

1. **Scope of Agreement** -- This Agreement is applicable to conditions under which Company and Customer agree that one or more generating facility or facilities of ten megawatts or less and related interconnecting facilities to be interconnected at less than 60 kilovolts ("Facilities") may be interconnected to Company's facilities, as described in the application.

2. **Establishment of Point(s) of Interconnection** -- Company and Customer agree to interconnect Facilities at the locations specified in this Agreement, in accordance with the Austin Energy Distribution Interconnection Guide for Customer Owned Power Production Facilities less than 10MW (the "Rules") or any successor rule addressing distributed generation and as described in the attached Appendix D (the "Interconnection").

3. **Responsibilities of Company and Customer** -- Customer shall, at its own cost and expense, operate, maintain, repair, and inspect, and shall be fully responsible for, Facilities specified on the application. Customer shall conduct operations of Facilities in compliance with all aspects of the Rules, and Company shall conduct operations on its facilities in compliance with all aspects of the Rules, and as further described and mutually agreed to in the applicable Facility Schedule. Maintenance of Facilities shall be performed in accordance with the applicable manufacturer's recommended maintenance schedule. Customer agrees to cause Facilities to be constructed in accordance with specifications equal to or greater than those provided by the National Electrical Safety Code, approved by the American National Standards Institute, in effect at the time of construction.

Each Party covenants and agrees to design, install, maintain, and operate, or cause the design, installation, maintenance, and operation of, its facilities so as to reasonably minimize the likelihood of a disturbance, originating in the facilities of one Party, affecting or impairing the facilities of the other Party, or other facilities with which Company is interconnected.

Company shall notify Customer if there is evidence that operation of Facilities causes disruption or deterioration of service to other utility customers or if the operation of Facilities causes damage to Company's facilities or other facilities with which Company is interconnected.

Company and Customer shall work cooperatively and promptly to resolve the problem.

Customer shall notify Company of any emergency or hazardous condition or occurrence with Facilities which could affect safe operation

of Company's facilities or other facilities with which Company is interconnected.

Customer shall provide Company at least 14 days' written notice of a change in ownership or cessation of operations of one or more Facilities.

4. Limitation of Liability and Indemnification

a. Notwithstanding any other provision in this Agreement, with respect to Company's provision of electric service to Customer other than the interconnections service addressed by this Agreement, Company's liability to Customer shall be limited as set forth in Section 5.2.1 of Company's Commission-approved tariffs, which are incorporated herein by reference.

b. Neither Company nor Customer shall be liable to the other for damages for anything that is beyond such Party's control, including an act of God, labor disturbance, act of a public enemy, war, insurrection, riot, fire, storm or flood, explosion, breakage or accident to machinery or equipment, a curtailment, order, or regulation or restriction imposed by governmental, military, or lawfully established civilian authorities, or the making of necessary repairs upon the property or equipment of either party.

c. Notwithstanding Paragraph 4.b of this Agreement, Company shall assume all liability for and shall indemnify Customer for any claims, losses, costs, and expenses of any kind or character to the extent that they result from Company's negligence in connection with the design, construction, or operation of its Facilities as described in the application; provided, however, that Company shall have no obligation to indemnify Customer for claims brought by claimants who cannot recover directly from Company. Such indemnity shall include, but is not limited to, financial responsibility for: (a) Customer's monetary losses; (b) reasonable costs and expenses of defending an action or claim made by a third person; (c) damages related to the death or injury of a third person; (d) damages to the property of Customer; (e) damages to the property of a third person; (f) damages for the disruption of the business of a third person. In no event shall Company be liable for consequential, special, incidental or punitive damages, including, without limitation, loss of profits, loss of revenue, or loss of production. The Company does not assume liability for any costs for damages arising from the disruption of the business of Customer or for Customer's costs and expenses of prosecuting or defending an action or claim against Company. This paragraph does not create a liability on the part of Company to Customer or a third person, but requires indemnification where such liability exists. The limitations of liability provided in this paragraph do not apply in cases of gross negligence or intentional wrongdoing.

d. Please check the appropriate box.

☐ **Private Entity**

Notwithstanding Paragraph 4.b of this Agreement, Customer shall assume all liability for and shall indemnify Company for any claims, losses, costs, and expenses of any kind or character to the extent that they result from Customer's negligence in connection with the design, construction, or operation of Facilities as described in the application; provided, however, that
Customer shall have no obligation to indemnify Company for claims brought by claimants who cannot recover directly from Customer. Such indemnity shall include, but is not limited to, financial responsibility for: (a) Company's monetary losses; (b) reasonable costs and expenses of defending an action or claim made by a third person; (c) damages related to the death or injury of a third person; (d) damages to the property of Company; (e) damages to the property of a third person; (f) damages for the disruption of the business of a third person. In no event shall Customer be liable for consequential, special, incidental or punitive damages, including, without limitation, loss of profits, loss of revenue, or loss of production. The Customer does not assume liability for any costs for damages arising from the disruption of the business of Company or for Company's costs and expenses of prosecuting or defending an action or claim against Customer. This paragraph does not create a liability on the part of Customer to Company or a third person, but requires indemnification where such liability exists. The limitations of liability provided in this paragraph do not apply in cases of gross negligence or intentional wrongdoing.
 Federal Agency
Notwithstanding Paragraph 4.b of this Agreement, the liability, if any, of Customer relating to this Agreement, for injury or loss of property, or personal injury or death shall be governed exclusively by the provisions of the Federal Tort Claims Act (28 U.S.C. §§ 1346, and 2671-2680). Subject to applicable federal, state, and local laws, each Party's liability to the other for any loss, cost, claim, injury, liability, or expense, including reasonable attorney's fees, relating to or arising from any act or omission in its performance of this Agreement shall be limited to the amount of direct damages actually incurred, and in no event shall either Party be liable to the other for any indirect, special, consequential, or punitive damages.

e. Company and Customer shall each be responsible for the safe installation, maintenance, repair, and condition of their respective facilities on their respective sides of the Points of Interconnection. Company does not assume any duty of inspecting Customer's Facilities.

f. For the mutual protection of Customer and Company, only with Company prior authorization are the connections between
Company's service wires and Customer's service entrance conductors to be energized.

5. **Right of Access, Equipment Installation, Removal & Inspection**– Upon reasonable notice, Company may send a qualified person to the premises of Customer at or immediately before the time Facilities first produce energy to inspect the interconnection, and observe Facilities' commissioning (including any testing), startup, and operation for a period of up to three days after initial startup of Facilities.
Following the initial inspection process described above, at reasonable hours, and upon reasonable notice, or at any time without notice in the event of an emergency or hazardous condition, Company shall have access to Customer's premises for any reasonable purpose in connection with the performance of the obligations imposed on it by this Agreement or if necessary to meet its legal obligation to provide service to its customers.

6. **Disconnection of Facilities –** Customer retains the option to disconnect from Company's facilities. Customer shall notify Company of its intent to disconnect by giving Company at least thirty days' written notice. Such disconnection shall not be a termination of this Agreement unless Customer exercises rights under Section 7.
Customer shall disconnect Facilities from Company's facilities upon the effective date of any termination under Section 7.
Subject to Commission Rule, for routine maintenance and repairs of Company's facilities, Company shall provide Customer with seven business days' notice of service interruption.
Company shall have the right to suspend service in cases where continuance of service to Customer will endanger persons or property.
During the forced outage of Company's facilities serving Customer, Company shall have the right to suspend service to effect immediate repairs of Company's facilities, but Company shall use its best efforts to provide Customer with reasonable prior notice.

7. **Effective Term and Termination Rights**-- This Agreement becomes effective when executed by both Parties and shall continue in effect until terminated. The Agreement may be terminated for the following reasons: (a) Customer may terminate this Agreement at any time, by giving the Company sixty days' written notice; (b) Company may terminate upon failure by Customer to generate energy from Facilities in parallel with the Company's facilities within twelve months after completion of the interconnection; (c)
either Party may terminate by giving the other Party at least sixty days written notice that the other Party is in default of any of the material terms and conditions of the Agreement, so long as the notice specifies the basis for termination and there is reasonable opportunity to cure the default; or (d) Company may terminate by giving Customer at least sixty days' notice in the event that there is a material change in an applicable rule or statute that necessitates termination of this Agreement.

8. **Governing Law and Regulatory Authority** -- *Please check the appropriate box.*
 Private Entity:
This Agreement was executed in the State of Texas and must in all respects be governed by, interpreted, construed, and enforced in accordance with the laws thereof. This Agreement is subject to, and the parties' obligations hereunder include, operating in full compliance with all valid, applicable federal, state, and local laws or ordinances, and all applicable rules, regulations, orders of, and tariffs approved by, duly constituted regulatory authorities having jurisdiction.

 Federal Agency:

This Agreement was executed in the State of Texas and, to the extent not inconsistent with all applicable federal law (including, but not limited to: (a) the Anti-Deficiency Acts, 31 USC §§1341, 1342 and 1501-1519; (b) the Tort Claims Act, 28 USC Chapter 171, §§2671-
2680, and 28 CFR Part 14; and (c) the Contract Disputes Act of 1978, as amended, 41 USC §§601-613), must in all respects be governed by, interpreted, construed, and enforced in accordance with the laws thereof. This Agreement is subject to, and the Parties' obligations hereunder include, operating in full compliance with all valid, applicable federal, state, and local laws or ordinances, and all applicable rules, regulations, orders of, and tariffs approved by, duly constituted regulatory authorities having jurisdiction.

9. **Amendment** --This Agreement may be amended only upon mutual agreement of the Parties, which amendment will not be effective until reduced to writing and executed by the Parties.

10. **Entirety of Agreement and Prior Agreements Superseded** -- This Agreement, including the attached application and Facility Schedules, which are expressly made a part hereof for all purposes, constitutes the entire agreement and understanding between the
Parties with regard to the interconnection of the facilities of the Parties at the Points of Interconnection expressly provided for in this Agreement. The Parties are not bound by or liable for any statement, representation, promise, inducement, understanding, or undertaking of any kind or nature (whether written or oral) with regard to the subject matter hereof not set forth or provided for herein.
This Agreement replaces all prior agreements and undertakings, oral or written, between the Parties with regard to the subject matter hereof, including without limitation _____ [specify any prior agreements being superseded], and all such agreements and undertakings are agreed by the Parties to no longer be of any force or effect. It is expressly acknowledged that the Parties may have other agreements covering other services not expressly provided for herein, which agreements are unaffected by this Agreement.
11. **Written Notices** – Written notices given under this Agreement are deemed to have been duly delivered if hand delivered or sent by United States certified mail, return receipt requested, postage prepaid, to:
(a) If to Company:
_____
_____
_____
_____
(b) If to Customer:
_____
_____
_____
_____
The above-listed names, titles, and addresses of either Party may be changed by written notification to the other, notwithstanding Section
10.

12. **Invoicing and Payment** -- Invoicing and payment terms for services associated with this agreement shall be consistent with applicable Substantive Rules of the Commission.

13. **No Third-Party Beneficiaries** -- This Agreement is not intended to and does not create rights, remedies, or benefits of any character whatsoever in favor of any persons, corporations, associations, or entities other than the Parties, and the obligations herein assumed are solely for the use and benefit of the Parties, their successors in interest and, where permitted, their assigns.

14. **No Waiver** -- The failure of a Party to this Agreement to insist, on any occasion, upon strict performance of any provision of this Agreement will not be considered to waive the obligations, rights, or duties imposed upon the Parties.

15. **Headings** -- The descriptive headings of the various parts of this Agreement have been inserted for convenience only and are to be afforded no significance in the interpretation or construction of this Agreement.

16. **Multiple Counterparts** -- This Agreement may be executed in two or more counterparts, each of which is deemed an original but all constitute one and the same instrument.

IN WITNESS WHEREOF, the Parties have caused this Agreement to be signed by their respective duly authorized representatives.

[COMPANY NAME]	[CUSTOMER NAME]
BY:_____	BY:_____
PRINTED NAME	PRINTED NAME
_____	_____
TITLE:_____	TITLE:_____
DATE:_____	DATE:_____

Appendix E—Network Interconnection Specifications

Purpose

This appendix to the Austin Energy **"Distribution Interconnection Guide"** will detail the requirements, safeguards, modeling and performance criteria that are required for successfully integrating distributed generation (DG), typically solar PV operating at less than 1000VAC on the downtown network, that meet all of the initial requirements in section E.1.d. Please refer to Appendix A of the guide for a map of the Secondary Network.

The requirements shall be met at the point of common coupling although the devices used to meet the requirements can be located elsewhere.

This specification does not address self-protection of the DG or provide any safeguard to the operating facility as that is the responsibility of the DG owner. Implementation of DG on the network fundamentally affects the design of the network and may result in outages to the customer. The customer is required to acknowledge and accept that outages may occur, and Austin Energy will not be liable for any damages to the DG system, or outages that are a result of the customers DG system backfeeding the AE system, since although the methods outlined in this section are fairly detailed, they do not guarantee the system will never backfeed.

This specification does not address financial impacts as a result of curtailing generation during periods of low customer loads. It is the responsibility of the customer to understand the impact to the generation capability, and Austin Energy will not be liable for any loss of generation as a result of curtailment systems required to interconnect the system.

References (covered in section G as well)

- IEEE1547 IEEE Standard for Interconnecting Distributed Resources with Electric Power Systems
- IEEE1547.6 IEEE Recommended Practice for Interconnecting Distributed Resources with Electric Power Systems Distribution Secondary Networks
- IEEE/ANSI C84.1 Electric Power Systems and Equipment
- IEEE/ANSI C37.108 Guide for the Protection of Network Transformers
- IEEE/ANSI C57.12.44 Standard Requirements for Secondary Network Protectors.

Introduction and Background

Secondary Networks were not designed to accommodate generation of any kind. They were designed to provide highly reliable service to dense urban areas by putting multiple feeders in parallel. For safety reasons, they are designed to intercept and react to faults that could cause backfeed on the network system, and as a result, the network protectors are designed to instantaneously open upon detecting a reverse current flow. Distributed generation can be installed, as long as steps are taken to ensure that backfeed will not occur.

All DG on the secondary network must be inverter-based and less than 2 MW. Typical synchronous or induction generators can easily contribute fault currents that exceed a network protectors rating.

Note: Emergency or standby generators may not utilize closed-transition transfer switches where facilities are connected to the Downtown Network.

Basic Design Requirements

The primary concern about tripping network protectors is that they operate by interrupting current flow using spring-loaded finger contacts, so as a result, their lifetimes are typically a limited number of operations, compared to an average circuit breaker which has almost unlimited operations. In addition, network protectors (NP) are not designed or tested for interrupting increased fault currents, so these restrictions have led to some fundamental requirements as outlined in IEEE1547.6 section 6:

- DG may not cause any NP to exceed its fault interrupting capability
- DG may not cause any NP to separate two dynamic sources
- DG may not cause any NP to connect two dynamic systems together
- DG may not cause any NP to operate more frequently than prior to DR operation
- DG may not prevent or delay the NP from opening for faults on the network feeders
- DG may not delay or prevent NP closure
- DG may not energize a de-energized network
- DG may not require the NP settings to be adjusted except by consent of the area EPS operator
- DG may not cause an islanding condition within part of a grid network
- DG may not remain connected to the network if 50% or more of the NPs serving the network are open

Distributed generation on a secondary spot network must be designed with all above requirements taken into consideration.

Part 1: Load Calculation and System Sizing Analysis.

The customer should contact AE accounts department to obtain the usage data and calculate the minimum loads for the months of November, December, January and February. Contact System Engineering for all-new facilities.

A. Determine average minimum load for the facility (see example next page)

1. **Contact AE customer support for actual daily metered load data. If not available, Divide total usage for the month by the number of days in the billing cycle to get the average usage per day (if not already shown on bill)**

2. **Take the results from i and divide by 24 to get average use/hr.**

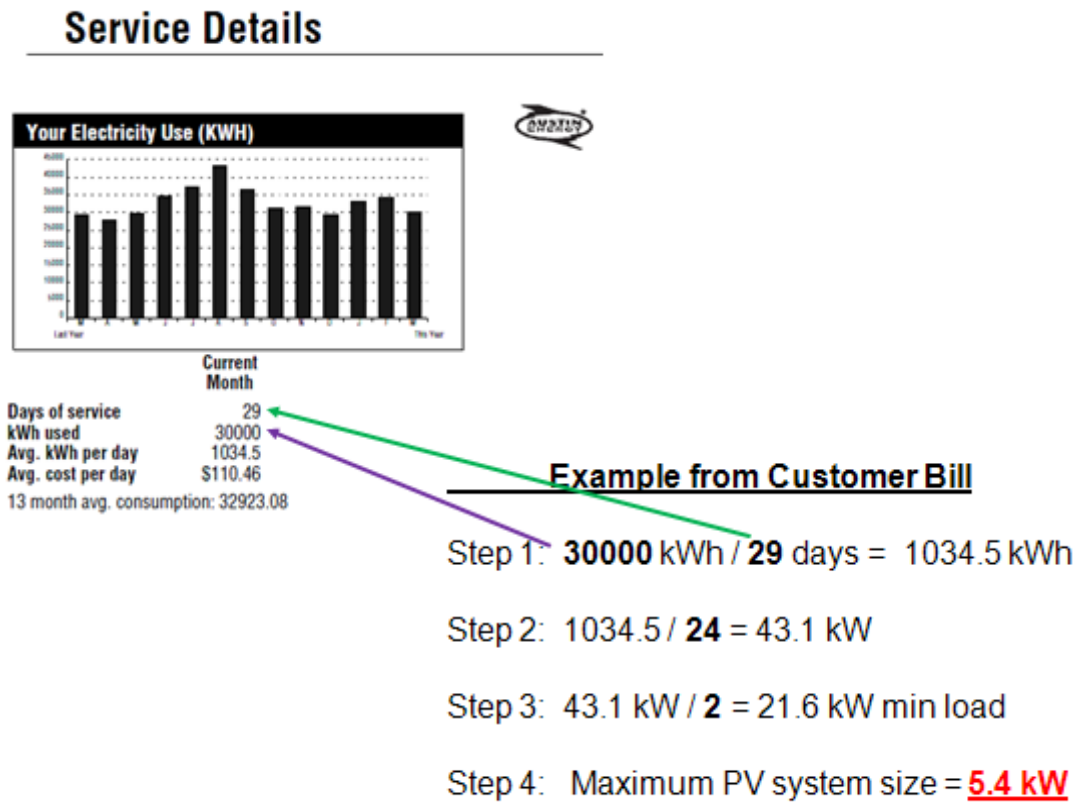
3. **Take results from step ii and divide by 2 to get estimated minimum load for the month.**

4. **Take the average of the four months (if available) to determine the average minimum load.**

B. Determine estimated PV system size

The Solar PV system should be sized no greater than 25% of the minimum load from step 3 to qualify for a de-minimus installation per PUCT guidelines. Refer to part 2 of this appendix for requirements for interconnection.

Procedures for accommodating larger systems are under development for future revisions of this document.



Part 2: Network Interconnection utilizing "de minimus" method.

Introduction

Conceptually, the goal of "de minimus" interconnection is not that complex -the distributed generation must not generate more than the facility load at any given time to prevent backfeeding and tripping a network protector, as described in section 7 of IEEE1547.6. This is achieved by sizing the distributed generation small enough so that it is unlikely that the load drops below the generation during operational hours, resulting in backfeed.

Basic Design Requirements

Only contractors with a minimum of 2 years' experience installing commercial solar PV systems should attempt the design and execution of a system interfaced to the downtown network for safety reasons, due to the complexity of the installation, as well as the high fault currents involved. The solar contractor is also responsible for contracting for engineering services to perform the design of the control system. The engineer must be licensed in the state of Texas.

- The control system shall have a minimum import relay installed, which should continuously monitor both the generation and utility supply, set to maintain a 3:1 ratio of utility supplied power

to on-site generation. If the customer load drops so that the utility supply is below this 3:1 ratio, the relay should send a signal to the inverter to either reduce or disable generation.

- The control system must have a backup minimum import relay installed along with a shunt trip electronically reclosable breaker set to a minimum forward current in case the primary control system fails.

- All CT's shall be metering accuracy class.

- The network protectors shall be monitored by AE, and loss of any network protector shall result in loss of a control signal that will shut down the inverter(s). The solar contractor shall provide a wet (24VDC) signal to AE to route to the network protectors and then return to a dry contact on the inverter. Loss of this signal shall cause the inverters to shut down.

- It is recommended that the control system be remotely connected via Ethernet to enable remote diagnostics by the contractor.

Refer to figure 1 on the next page for a conceptual diagram of the system and controls.

Design, Installation and Commissioning Requirements

Once the system size and control setpoints have been defined, basic design drawings and documents shall be submitted for approval per the Interconnection process.

The overall system one-line diagram, three line diagram, System Instrument and Control schematic including complete controls narrative, and a control wiring diagram shall be submitted for joint review. All drawings should be sealed by an electrical engineer licensed in the state of Texas.

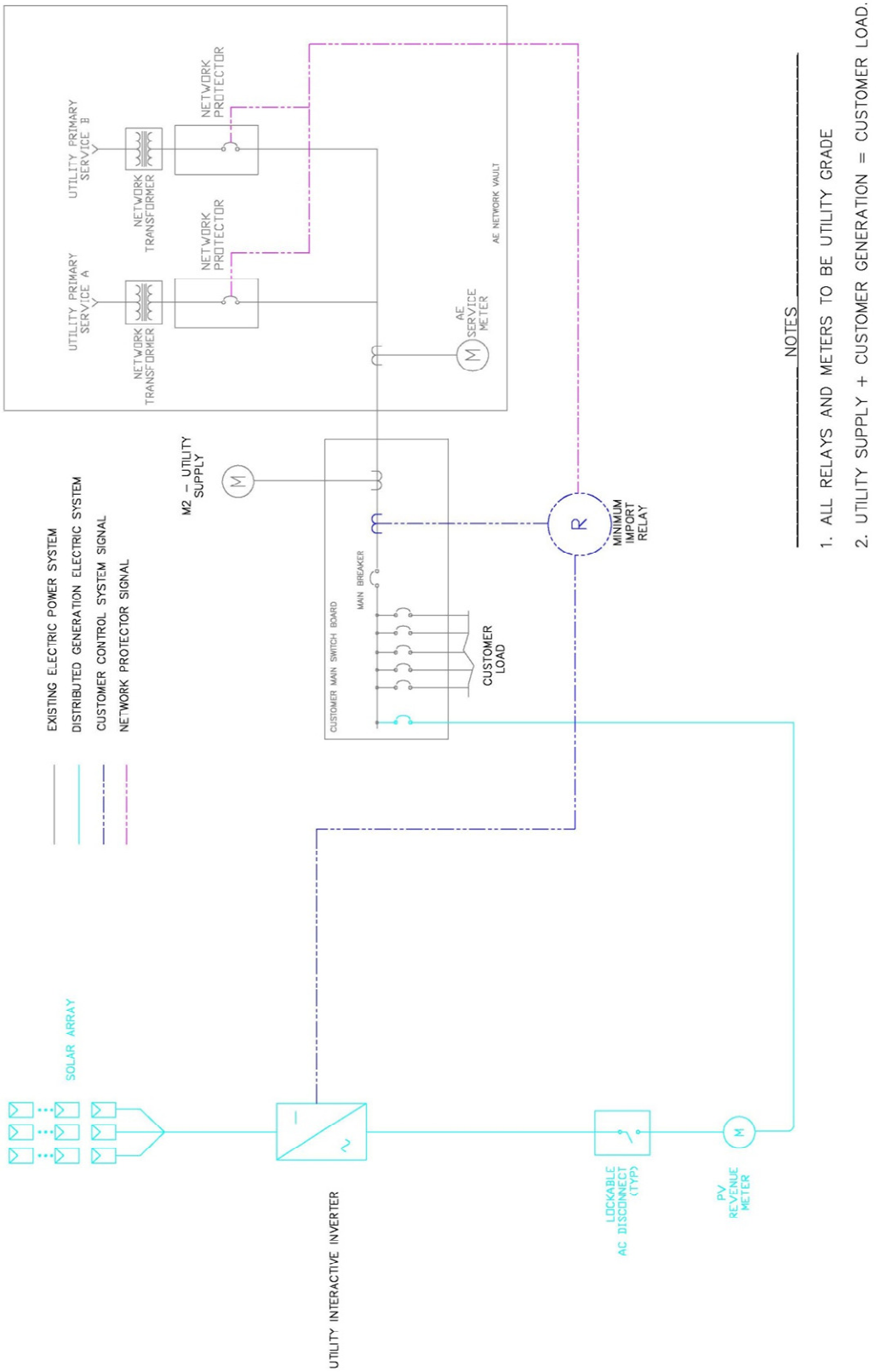
A commissioning test for the proposed installation will be jointly developed based on the final system design and intended operation. After installation, the system will not be energized for testing prior to the commissioning test.

Maintenance and Operation Requirements

There should be a short review of the system after the first 6 months of operation. The requirement is for there to be zero actuation of the network protectors caused by the DG. Note that in normal operation, AE will occasionally open network protectors for maintenance activities and these actuations will not be considered being caused by the DG.

Failure of the control system resulting in backfeed that trips the network protectors will result in the system being locked out by AE until the contractor can review and modify the control system with new setpoints, and the commissioning tests repeated to validate the new settings.

It is the customer's responsibility to ensure the control system does not trip the network protectors. Therefore, a long-term maintenance contract for the control system is strongly recommended so the customer can reap the projected economic benefit of the system.


EXISTING ELECTRIC POWER SYSTEM
DISTRIBUTED GENERATION ELECTRIC SYSTEM
CUSTOMER CONTROL SYSTEM SIGNAL
NETWORK PROTECTOR SIGNAL
UTILITY PRIMARY SERVICE A
UTILITY PRIMARY SERVICE B
NETWORK TRANSFORMER
NETWORK TRANSFORMER
NETWORK PROTECTOR
NETWORK PROTECTOR
AE NETWORK VAULT
AE SERVICE METER
M2 – UTILITY SUPPLY
CUSTOMER MAIN SWITCH BOARD
MAIN BREAKER
CUSTOMER LOAD
MINIMUM IMPORT RELAY
SOLAR ARRAY
UTILITY INTERACTIVE INVERTER
LOCKABLE AC DISCONNECT (TYP)
PV REVENUE METER
NOTES
1. ALL RELAYS AND METERS TO BE UTILITY GRADE
2. UTILITY SUPPLY + CUSTOMER GENERATION = CUSTOMER LOAD.

Part 3: Network Interconnection utilizing alternate methods.

This section to be addressed in future revisions of this document.

Appendix F—Emergency Response Service (ERS) Application.

Emergency Response Service (ERS) Application

A Customer who requests ERS participation in Austin Energy Service Territory must submit this ERS Application by hand delivery, e-mail to SystemEngineeringAdm@austinenergy.com, or mail to attention: System Engineering 721 Barton Springs Rd. Austin, TX 78704. Allow 30 business days for System Engineering processing.

ERS Customer Information

Designated Contact Person: _____

Address: _____

Telephone Number: _____

E-Mail Address: _____

Customer Name: _____

Location Address: _____

Facility Phone # (Day): _____

Facility Phone # (Night): _____

Facility E-Mail Address: _____

Customer Participation Requirements:

- Parallel generation is not permitted on distribution system. Parallel generation on transmission system must be approved by Austin Energy Substation & Transmission Engineering & Construction Department.
- Closed-transition transfer-switching is not permitted for customers on the downtown Network. All non-network customers shall refer to Distributed Interconnection Guide for Customer Owned Power Production Facilities less than 10 MW for interconnection requirements.
- Austin Energy prohibits accessing or modifying utility meters and CT enclosures. Customer based sub-metering CT's may not be used in Austin Energy equipment.

ERS RESOURCE

Contract Time Period:

☐ BH1 (8:00AM TO 1:00PM) Maximum Offer: _____(kW) Load Description: _____	☐ ERS-10 Weather-Sensitive ☐ ERS-10 Non-Weather-Sensitive	☐ ERS-30 Weather-Sensitive ☐ ERS-30 Non-Weather-Sensitive
☐ BH2 (1:00PM TO 4:00PM) Maximum Offer: _____(kW) Load Description: _____	☐ ERS-10 Weather-Sensitive ☐ ERS-10 Non-Weather-Sensitive	☐ ERS-30 Weather-Sensitive ☐ ERS-30 Non-Weather-Sensitive
☐ BH3 (4:00PM TO 8:00PM) Maximum Offer: _____(kW) Load Description: _____	☐ ERS-10 Weather-Sensitive ☐ ERS-10 Non-Weather-Sensitive	☐ ERS-30 Weather-Sensitive ☐ ERS-30 Non-Weather-Sensitive
☐ NBH (All other hours) Maximum Offer: _____(kW) Load Description: _____	☐ ERS-10 Weather-Sensitive ☐ ERS-10 Non-Weather-Sensitive	☐ ERS-30 Weather-Sensitive ☐ ERS-30 Non-Weather-Sensitive

Application Checklist for ERS Load Customers with Generator

☐ 1) Copy enclosed of completed ERS Application
   a. Application Form
   b. Customer Information
   c. Generator Technical Information
   d. Interconnecting Facilities Information

☐ 2) Copy enclosed of site electrical one-line diagram and schematic drawings showing the configuration of all Generation equipment, current and potential circuits, and protection and control schemes.

☐ 3) Copy enclosed of any site documentation that indicates the precise physical location of the proposed generation facility (e.g., USGS topographic map or other diagram or documentation).

☐ 4) Copy enclosed of schematic drawings for all protection and control circuits, relay current circuits, relay potential circuits, and alarm/monitoring circuits (if applicable).

Generation Facility Information

(Data apply only to the Generating Facility, not the Interconnection Facilities.)

Fuel Type: ___ Solar ___ Wind ___ Diesel ___ Natural Gas ___ Fuel Oil
___ Other (state type) _____

Type of Generator: ____Synchronous ____Induction ____ Inverter

Nameplate Rating (kW): _____

Applicant Signature

I hereby certify and acknowledge that, to the best of my knowledge, all of the information provided in this Interconnection Request is true and correct.

QSE Representative: _____ Date: _____

ERS Customer: _____ Date: _____

Austin Energy Response

☐ No Exceptions Taken ☐ Rejected ☐ Resubmit

AE Representative: _____ Date: _____

FOR INTERNAL USE ONLY

Meter ID _____ Service Point ID: _____ Feeder: _____

Power Saver™ Program *Saving Energy Together*

COMMERCIAL SOLAR PHOTOVOLTAIC PERFORMANCE-BASED INCENTIVE PROGRAM GUIDELINES

These guidelines govern the procedures and qualifications for incentives under the Austin Energy Commercial Solar Photovoltaic ("PV") Performance-Based Incentive ("PBI") Program.

I. Eligible Customers

A. PBI applicants must either have an Austin Energy commercial electric utility account or own the property that has, or will have, an Austin Energy commercial electric utility account at the service address where the PV system is to be installed and interconnected.

B. If the applicant is not the owner of the property, the applicant must submit documentation of approval from the property owner.

C. PV systems must be owned by the PBI applicant, unless the system qualifies under section VII of this document, "Equipment Leases for Non-Profit and Governmental Organizations."

II. Incentive Program Structure, Caps, and Incentive Funding

A. Definitions:

Unless otherwise indicated, "**kW**" means alternating current (AC) kilowatts, where AC kilowatt is calculated by multiplying direct current (DC) kilowatt by 0.83. References to MW are also in AC.

"**Project Capacity**" means the kW capacity of a proposed commercial PV system located behind a single revenue meter.

"**Customer**" means, in relation to the customer applicant and property owner where the PV system is to be installed, an individual, partnership, association, firm, public or private corporation, governmental authority, or other legal entity or entities under a single federal tax identification number or employer identification number, or as deemed by Austin Energy to be related legal entities (affiliate, parent, subsidiary, etc.), whether or not separate legal entities. Thus, one Customer could have multiple electric accounts and addresses.

"**Customer Capacity**" means the aggregated kW capacity of Customer's commercial PV systems receiving Austin Energy Incentives (including completed projects still receiving incentives, pending applications, or projects committed by an Austin Energy letter of intent).

B. The PBI Program consists of three incentive tiers, Small Commercial, Medium Commercial, and Large Commercial. These tiers are based on Project Capacity and Customer Capacity.

1. To qualify for the Small Commercial incentive, the Project Capacity must be no more than 75 kW[1], and the Customer Capacity must be no more than 400 kW.
2. To qualify for the Medium Commercial incentive, the Project Capacity must be no more than 400 kW, and the Customer Capacity must be no more than 400 kW.
3. Large Commercial incentive funding is in three steps of 4 MW each. Customers may only receive up to 800 kW of incentives from each 4 MW funding step, for a maximum of 2.4 MW. In the event the Project Capacity exceeds the available capacity in a step, the project will be incentivized in the subsequent step and a Customer's unused available capacity will be transferred to the subsequent step. To qualify for a Large Commercial incentive (at the applicable incentive step), the Project Capacity must be less than 1000 kW.

C. Current incentive levels and the remaining capacity for each tier are displayed at *www.austinenergy/go/currentsolar.*

[1] Exception: Non-profit organizations and governmental entities (under Article VII of these guidelines) with a Project Capacity of no more than 400 kW qualify for the Small Commercial incentive.

Austin Energy guidelines and incentive levels are subject to change without prior notice, and Austin Energy reserves the right to refuse any application or request for incentive payment for systems that do not meet all program requirements.

D. For applications received after 6/26/15, only one new PBI project will be allowed behind a single revenue meter.

E. The PBI will be provided as a monthly credit on the electric bill for the electric account associated with the PV meter, based on metered production for a period of 120 months, and is locked at the rate identified in the Letter of Intent (LOI).

F. Letters of Intent (LOIs): Austin Energy makes no financial commitment to PBI applicants until a signed LOI is issued. Simply submitting an application does not entitle a customer to the incentive rate or amount requested.

1. LOIs will be issued at AE's discretion, pending submission of complete application package, verification of solar access, and budget approval.
2. City Council approval is required for customers whose cumulative annual PBI projected incentive expenditures exceed the City Manager's administrative spending authority under the City Charter, which is $58,000 for FY15.
3. The total PBI amount is capped based on applicable prevailing incentive rates, project capacity, and projected production. LOIs will include a not-to-exceed incentive amount calculated as [115% of PV-Watts modeled annual production at the default setting of 83% derate factor] x [10 years] x [prevailing PBI rate].
4. LOIs are valid for an initial 90 day period where-in the contractor must supply proof of interconnection approval where applicable and the contractor must also supply the installation contract. If these documents are not provided within 90 days, the LOI will expire and the application will be voided.
5. If the required documentation is received within the 90 day period, and the application is approved by Austin Energy, the LOI will continue to be valid for an additional 120 days for existing construction and 180 days for new construction.
6. Under extenuating circumstances, applicants may request extensions to their LOI. Requests for LOI extensions must be submitted prior to LOI expiration, in writing, accompanied by a detailed explanation of the reason for the delay and need for extension. Contractor must demonstrate that the cause of the delay is out of their control along with substantial progress toward project completion. Extensions will be granted at the sole discretion of Austin Energy.
7. If an LOI expires, the applicant may reapply for the PBI program at the prevailing incentive level.

G. The PBI is transferable upon sale of the property and/or change to a new account holder associated with the solar meter. Austin Energy must be notified by the new account holder for the PBI rate to be applied to the new electric account.

H. Payments made under the PBI program are special limited obligations of the City of Austin, payable solely from the revenues of Austin Energy, and not from any tax revenues of the City. The PBI is subject to annual budget appropriations and does not constitute indebtedness or a loan of credit. Neither the faith and credit nor the taxing power of the City is pledged to any potential PBI payment obligations.

III. Solar Access Requirements

A. Austin Energy retains the right to deny incentives based on excessive shading and or poor orientation of the solar array.

B. Contractor must design the system to ensure that the minimum performance of each string in the PV system shall be at least 1000 kWh/kW-dc per year.

C. Contractors must submit an analysis which includes azimuth, tilt and shading to show this requirement will be met with initial application submittal.

IV. Installation and Warranty Requirements

A. Systems must be installed by a participating PV installer, listed on Austin Energy's commercial solar PBI program website.

B. The PV system must be electrically interconnected and attached to permanent, non-mobile structures.

C. Equipment must be listed by the California Energy Commission on its website, www.gosolarcalifornia.org, to be eligible.

D. All major solar energy system components eligible for incentives must have a minimum 10-year warranty to protect against defects and undue degradation of electrical generation output.

Austin Energy guidelines and incentive levels are subject to change without prior notice, and Austin Energy reserves the right to refuse any application or request for incentive payment for systems that do not meet all program requirements.

E. The participating installer must warrant the PV system installation for a minimum of 10 years.

F. The installer must advise the customer of the potential for vermin-caused damage and mitigation options.

G. The roof on which the PV system is to be installed must have a minimum of ten years of usable (warrantied) life remaining.

H. All roof penetrations must be flashed. Unflashed roof penetrations must be pre-approved by Austin Energy. Requests for approval should be accompanied by compatibility documentation from the racking system manufacturer specific to the roof type that it is to be installed on, and written acknowledgement by the owner that they have been notified that the roof will be penetrated and what method of attachment will be used.

I. Clamping attachments (such as S-5 Clamps) must be rated by the manufacturer to be compatible with the roofing system.

J. AC and DC surge protection are required.

K. All PV systems must be interconnected to Austin Energy's electrical grid, at customer's expense, in accordance with Austin Energy's *Distribution Interconnection Guide for Customer Owned Power Production Facilities less than 10MW,* which can be found at the Electric Service Design & Planning section of the Austin Energy website.

L. Contractor must include all costs, including any required service upgrades (such as service panel, weatherhead, wiring, etc.), in the original bid. Costs that are not eligible for federal tax credits or local incentives must be itemized separately.

M. Before any work is started, the participating installer must submit a separate Austin Energy Distributed Generation Application for **all systems located within the downtown network** (see map of the Downtown Network in Distribution Interconnection Guide, Appendix A) and **all systems with a nameplate rating of 50kW up to 10MW, including when aggregated with any currently existing on-site PV system.** The application is located in Austin Energy's Distribution Interconnection Guide in Appendix D, which can be found at the Electric Service Design & Planning pages of the Austin Energy Website. This application may reveal additional required PV installation costs, or restrictions, and must be completed and approved before any work begins.

N. An electric permit and a separate building permit is required for all commercial PV installations within the City of Austin's jurisdiction. A separate building permit may be required for structural engineering review by the Authority Having Jurisdiction (AHJ) in other regions. If the commercial PV installation is on a property located outside of the City of Austin's jurisdiction, and not requiring a building permit, Austin Energy will require an engineer stamped structural drawing for final incentive approval.

O. The work must be performed in accordance with all applicable federal, state, and local regulations, codes, and permitting jurisdictions, along with equipment manufacturer's standards.

P. The Texas Department of Licensing and Regulation requires electrical contractors to obtain appropriate permits and perform all electrical work.

Q. All installations must meet the requirements in the Austin Energy Design Criteria Manual and Distribution Interconnection Guide, which can be found at the Electric Service Design & Planning pages of the Austin Energy Website.

R. The STC rating of the system [STC rating of panels X number of panels] shall not exceed 120% of the associated inverter rating. Exceptions may be granted at Austin Energy's discretion on a case by case basis with the submittal of documentation from the manufacturer stating that the design is approved and will not void the warranty.

S. NABCEP certified installer must review the layout and system design prior to submittal, and include NABCEP certification number and signature on each document.

T. ***AUSTIN ENERGY IS NOT A MANUFACTURER, SUPPLIER, OR GUARANTOR OF PV EQUIPMENT OR INSTALLERS. AUSTIN ENERGY, WHETHER BY MAKING AVAILABLE A LIST OF REGISTERED INSTALLERS AND EQUIPMENT SOURCES OR OTHERWISE, MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY NATURE, DIRECTLY OR INDIRECTLY, EXPRESS OR IMPLIED, AS TO PERFORMANCE OF THE INSTALLER OR RELIABILITY, PERFORMANCE, DURABILITY, CONDITION, OR QUALITY OF ANY PV SYSTEM.***

V. Commercial Solar Metering and Billing, and System Sizing

A. Solar arrays will be connected on the customer's side of the electric meter and will offset the customer's power consumption from the electric grid, per Austin Energy's Commercial Electric Tariffs.

Austin Energy guidelines and incentive levels are subject to change without prior notice, and Austin Energy reserves the right to refuse any application or request for incentive payment for systems that do not meet all program requirements.

B. Systems up to 20kW will be eligible for net metering as stated in the Distributed Generation from Renewable Energy Rider to the Commercial Electric Tariff, found on Austin Energy's website.

C. Contractors are required to use best practices to assure that PV systems are sized appropriately for their customers. These practices include but are not limited to the following.

1. For customers with potential PV system sizes that are less than 20 kW where customers are eligible for net metering:
    - **a.** The PV system will be sized so that the annual production of the system will not exceed the annual consumption of the connected loads.
    - **b.** Contractor is to analyze at least one year worth of consumption data, or for new construction, modelled energy consumption, and size system accordingly.
2. For customers with potential PV system sizes that are greater than 20 kW where customers are not eligible for net metering:
    - **a.** The PV system will be sized so that the coincident production of the system will not exceed the corresponding loads. Production that exceeds coincident use will not be credited to the customer, and such oversizing will lower the benefit to the customer.
    - **b.** The PV contractor will take necessary measures to ensure that PV production will be primarily used onsite by performing consumption profile analysis and production modeling to inform system design.

D. Installed PV system size may not exceed the size authorized in the incentive LOI, and may not be increased after final inspection without the explicit authorization of Austin Energy.

New PBI PV installations may not be tied to meters with existing grid tied solar arrays without a variance approved by Austin Energy. Variance requests should be made upfront with the application submittal. A two way revenue meter may have a maximum of two PV meters feeding into it.

VI. Additional Requirements

A. Property deed restrictions at the service address must not prohibit the installation of a PV system.

B. The customer must transfer to Austin Energy all renewable energy credits (RECs) and other environmental attributes (other than tax credits) from power generated by PV systems receiving incentives from Austin Energy. If the proper documents are submitted proving that the RECs are required to achieve LEED certification, RECs may be retained by customer, and Austin Energy, as the REC aggregator, will reserve and finally retire the RECs on customer's behalf as required for LEED certification. (See Appendix A: Austin Energy Renewable Energy Credit Agreement).

C. Customer must sign the Renewable Energy Credit Microgenerator Listing Form (see Appendix B).

D. The PV system must remain interconnected to Austin Energy's electrical grid for the useful life of the system (a minimum of 20 years or longer based on the modules' warranty length), or may be required to forfeit any incentives received from Austin Energy.

E. Austin Energy solar program guidelines, incentive levels, and electric tariffs are subject to change without prior notice, and Austin Energy reserves the right to refuse any application or request for incentive payment for any project that does not meet all requirements.

VII. Equipment Leases for Non-Profit and Governmental Organizations

A. Only not-for-profit organizations organized under section 501(c)(3) of the Internal Revenue Code and governmental entities, including public school districts, may be eligible for PBIs for leased PV systems, subject to all other requirements. PV systems leased by other commercial customers are not eligible for participation in the PBI program.

B. Austin Energy is the exclusive provider of electricity within its service territory. State law prohibits other owners of electric equipment from furnishing electricity for compensation. Therefore, leases must be *flat monthly payment* leases and may not be based on volumetric charges or multipliers for kWh output of the PV equipment or consumption. Likewise any true-ups or performance guarantees may not be denominated in kWh.

C. Leased PV systems must be installed on facilities owned by the qualifying non-profit or governmental customer/lessee.

D. Lessor and lessee must have an agreement in place which ensures the proper function of the leased PV equipment and appropriately allocates ongoing maintenance responsibility of the equipment.

E. Both lessor and lessee must transfer to Austin Energy, in writing, all RECs and other environmental attributes through the execution of the REC Assignment Agreement form by both parties.

Austin Energy guidelines and incentive levels are subject to change without prior notice, and Austin Energy reserves the right to refuse any application or request for incentive payment for systems that do not meet all program requirements.

F. Information detailing the total equipment and installation costs of the PV system paid by lessor and installer must be provided to Austin Energy.

G. All contracts associated with the lease, installation, and on-going maintenance/performance of the PV system and all attachments must be provided to Austin Energy.

Austin Energy – Solar PBI Program – Commercial Incentive
811 Barton Springs Road, 3rd Floor. Austin, TX 78704. Phone (512) 482-5346.
email: conservation@austinenergy.com website: www.austinenergy.com

Austin Energy guidelines and incentive levels are subject to change without prior notice, and Austin Energy reserves the right to refuse any application or request for incentive payment for systems that do not meet all program requirements.

Distributed Generation Planning Application (DGPA)

Refer to the Austin Energy Interconnection Guidelines

Fill out one DGPA per main disconnect or distribution enclosure. Review of this application may result in a request for additional information.

I. Select Service Center

Service Center is the location for customers to turn in the completed DGPA form for approval. Please check one.
A map of service center locations can be found at http://www.austinenergy.com. Search "design contacts".

All DG under 50kW	All DG 50kW and over and not in the downtown Network		All DG in the downtown Network
☐ One Stop Shop 505 Barton Springs Austin, TX 78701 Ph: 512-974-2632 *or* 512-974-9112 Fax: 512-974-9109 *or* 512-974-9779	☐ North: Kramer Service Center 2412 Kramer Lane Bldg C Austin, TX 78758 ☐ NE Ph: 512-505-7206 ☐ NW Fax: 512-505-7208	☐ South: St. Elmo Service Center 4411B Meinardus Dr Austin, TX 78744 ☐ SE Ph: 512-505-7500 ☐ SW Fax: 512-505-7742	☐ Downtown Network (Address and phone same as South)

II. Customer & Project Information

(a) Customer Information:

Contact Name: _____ Title: ☐ Electrical Engineer ☐ Electrical Contractor ☐ Other _____

Phone: _____ Fax: _____ Email: _____

Signature: _____ Date: _____

(b) Project Information:

Project Name: _____

Project Address: _____

Nearest Intersection: _____

Service Provider: ☐ Austin Energy ☐ Other_____

(c) Project Type:

☐ New Service for DG *or* ☐ Feed DG from Existing Service

Distributed Generation Type: _____ (Solar, Wind, etc.)

Receiving AE Rebates? ☐ Yes ☐ No

Estimated Service Need Date:_____

(For loads other than Distributed Generation use the Electric Service Planning Application (ESPA) form.)

III. DG Electrical Information

Refer to the appropriate table in the Austin Energy Criteria Manual for available electric services.

(a) Distributed Generation Information:

Inverter Capacity: _____ (W-ac)

Solar Only: Solar Module STC Rating: _____ (W-dc) x Number of Solar Modules: _____ /1000 = STC System Rating: _____(kW-dc)

System Size: _____ (kW-ac = kW-dc x 0.77)

(b) Type of Service:

☐ Overhead Service
☐ Secondary Riser
☐ Pad-Mount Transformer

Downtown Network Only
☐ Network Transformer Vault
☐ Network Underground Secondary

(c) AE Service Voltage:

☐ 120/240 V, 1ϕ, 3-Wire
☐ 120/240 V, 3ϕ, 4-Wire (Overhead or secondary riser only)
☐ 120/208V, 3ϕ, 4-Wire
☐ 120/208V, 1ϕ, 3-Wire (Network Only)
☐ 277/480 V, 3ϕ, 4-Wire
☐ 7200/12470 V (Primary Meter)

(d) Main Disconnect (1st interrupting device) or Distribution Enclosure size (total of all meters):

☐ 100 Amps ☐ 800 Amps ☐ 2000 Amps
☐ 200 Amps ☐ 1200 Amps ☐ Other_____
☐ 400 Amps ☐ 1600 Amps

(f) New Meter Size(s):

1. Meter Size_____ (amps) x # Meters _____
2. Meter Size_____ (amps) x # Meters _____

Number of Existing Meters: _____

Application expires 180 days after date of approval. Any change to the above information requires a new DGPA.

For internal use only:

All DG 50kW and over and all DG in the downtown Network requires Sys Eng review.

AE Sys Eng Rep: _____ Phone: _____ Date: _____

Reviewed: ☐ Yes ☐ No Comments: _____

☐ Design Required ☐ Service Only

AE Design Rep: _____ Phone: _____ Date: _____

Approval Verification Stamp

Comments:

For internal use only – Metering Department; 2526 Kramer Ln Building C; Ph: 512-505-7045; Fax: 512-505-7103

Metering CT's Required: ☐ Yes ☐ No Size CT's: _____

For internal use only – Permitting Department; 505 Barton Springs Rd; 1st Floor; Ph: 512-974-2747; Fax: 512-974-6578

Electric Permit #: _____

Customer is responsible for following all criteria in the Austin Energy Design Criteria Manual.