ORIGINAL

ARIZONA CORPORATION COMMISSION
FORMAL COMPLAINT FORM

FORMAL COMPLAINT

0000116124

COMPLAINT: Viktor Petel Polivka	COMPLAINT NUMBER: 86551
ADDRESS: 4675 S. Harrison Rd. Lot # 82	PHONE (HOME): 520-303-7503
NAME OF RESPONSIBLE PARTY: Viktor Petel Polivka	PHONE (WORK): N/A
NAME OF UTILITY: Tucson Electric Power	ACCOUNT NUMBER: 4110917652

GROUNDS FOR COMPLAINT: (COMPLETE STATEMENT OF THE GROUNDS FOR COMPLAINT. INDICATING DATE(S) OF COMMISSION/OMISSION OR ACTS OR THINGS COMPLAINED OF.) (USE ADDITIONAL PAGE IF NECESSARY.)

SEE ATTACHED SHEETS

E-01933A-10-0340

RECEIVED
2010 AUG 11 A 11:02
AZ CORP COMMISSION
DOCKET CONTROL

NATURE OF RELIEF SOUGHT: (USE ADDITIONAL PAGE IF NECESSARY.)

SEE ATTACHED SHEETS

Arizona Corporation Commission
DOCKETED
AUG 11 2010
DOCKETED BY: MR

SIGNATURE OF COMPLAINANT OR ATTORNEY

RE: Formal Complaint # 86551

VIOLATION: No. V-1
R14-2-1801 "Renewable Energy Standard and Tariff"
Eligibility for Incentive denied. Not eligible for program for non payment of Tariff

SOLUTION: No. S-1
R14-2-1801 Restore customers eligibility status. Customer was indeed paying the Tariff, until he was advised by TEP to "disconnect" on 04/09/2010 to qualify for approved Off Grid Incentive (submitted Final Bill copy as evidence)Re connected to grid 06/29/2010

VIOLATION: No.-2
R14-2-1803 "Ruled by TEP "Not eligible for Renewable Energy Resources Incentive". due to use of a battery storage backup system.

SOLUTION: No. S-2
R14-2-1803 (A) 10. "Solar Electricity Resources" use sunlight to produce electricity by certified photovoltaic devices. Battery systems are not a disqualifier as per Arizona Administrative Code. The system indeed "produces" an electric current of 240v-60Hzthat meet all electric and code standards as required. Reverse disapproval by TEP.

VIOLATION: No.-3
R14-2-1803 "Renewable Energy Credits" denied by TEP, due to the installation of battery storage system as integral component of the system.

SOLUTION: No.-3
R14-2-1803 (A) One Energy Credit shall be created for each kWh derived from Eligible Resource. The system indeed harvests solar energy with certified PV modules that in stored in lead acid batteries as DC current and then "inverted" into AC 240v-60Hz to meet the Grid current standards and his household consumption. Harvesting capacity is 45.000Wh on average 10 Hr daylight. The system indeed qualifies as a Grid Tie system with ample capacity to earn credits, and eliminate the monthly electric bill from TEP.

VIOLATION: No.-4
R14-2-1804 " Annual Renewable Energy Requirements"
The system was disapproved by TEP merely on the basis that it uses a battery storage process, prior to "inversion" DC current into AC Grid Current.

SOLUTION: No.-4
R14-2-1804 (A) This system by no means "intervenes or disrupts" the Grid nor any "metering issues, and has ample capacity to aid in aiding TEP to meet the Annual Renewable Energy Requirements. Seeking reversal of Denial to a Grid Tied system not approved for the TEP incentive program.

VIOLATION: No.-5
R14-2-1805 "Distributed Renewable Energy" requirement. System solely disapproved on the fact that it is a battery system.

SOLUTION: No.-5
R14-2-1805 (A) does not restrict or disallows the usage of a battery system specifically, hence the system meets all standards to interact with the Grid. Reversal of TEP decision not to approve the system due to a battery storage as a component of the customers installed system. (Certificate of Compliance enclosed)

VIOLATION: No.-6
Disapproval by TEP of the system on basis of being a self-install project is contrary to TEP guidelines.

SOLUTION: No.-6
TEP guidelines on page 1-7 states: "Residential Customers" may "self-install" Solar Electric Systems 10 kWac or smaller, providing they adhere to all applicable codes and standards. The customer self-install systems are eligible for an incentive equal of 70% of the standard UFI. The customers system meets all the required code and standards as well as workmanship quality. Hence, a approval for the Incentive Program is requested without any biases or personal preferences by TEP.

VIOLATION: No.-7
Disapproval by TEP of the customers system, based on the "Battery storage" that is not a TEP preference.

SOLUITION: No,-7
TEP indeed has an identical system, set up on a trailer fro use in demonstration and marketing of the "Renewable Energy Program", which also includes a battery back up system. Based on TEP precedence and experience that the system indeed is an effective efficient Renewable Energy system. The only reservation is that these systems do indeed minimize or entirely eliminate the customers monthly electric bill, while earning Energy Credits payable to the customer at the end of the fiscal year. Request reversal of disapproval by TEP on bias self serving evaluation of a system that meet all standards.

VIOLATION: No.-8
R14-2-1812 & R14-2-1813 " Compliance Reports" & "Implementation Plans"
TEP disapproval of customers system, contrary to the Arizona Administrative Code

SOLUTION: No.-8
The customer requests that as outlined in R14-2-1812 (C) and R14-2-1813 (C) The Commission may hold a hearing to determine whether as Affected Utility compliance satisfies the requirements of these rules, and schedule a hearing for the customer to be able to provide all the applicable evidence, not excluding the Commissions visit to the site, to inspect -- including to furnish their own in depended engineering evaluation to inspect the system in question at any time at the Commissions convenience without the need to make an appointment (see the actual system in question in full operation since 04/09/2010), to be considered by the Commission in the Review Process that will aid in the decision making regarding this complaint. Seeking the approval of a qualified system for a Grid Tie or Off Grid renewable Energy System

VIOLATION: No-9
TEP refusal to issue a Letter of Acknowledgement to enable customer to secure/apply for a Permit from the City Development Services Department, City of Tucson. The letter is a fundamental requirement by the City Development Department in the application process to obtain a permit for a Grid Tie Residential Solar System installation for his home. TEP has been ignoring customers request since November 2009 up to March 2010

SOLUTION: No-9
Customer requests that the ACC issue an order to TEP, to issue a letter of acknowledgement (DSD requirements attached) for the system that was inspected by a TEP Engineer on 04/09/2010 @ 8AM, when he approved the system for Off Grid, assuring customer that the system is eligible for a full incentive (5000 Watts) in the Residential Renewable Energy Solar System

VIOLATION: No-10
TEP issue a letter of offer to pay incentive for a 2000Watt Off Grid system must have been issued in error. Customer only applied for a Grid Tie or Off Grid solar system, applications dated February 24, 2010. To this date not processed.

SOLUTION: No.-10
To process and pay out the appropriate UFI as per application for a Off Grid system to a Tariff paying customer. The offered $4,000.00 UFI is not appropriate, but merely an offer to minimize the payout. The customer is indeed eligible to receive the full UFI as per application the sum of $17,136.00 as per ACC Application approved 04/10/2008, plus the allowed statutory interest accumulated since the filing of the application on February 22, 2010, not to exclude any punitive damages due to intentional delays to avoid payment of UFI as prescribed by ACC.

Dear Mr. Polivka:

Tucson Electric Power Company (TEP) is in receipt of both the On-Grid and Off-Grid Residential Solar Applications for 4675 S. Harrison Road, Tucson, AZ, dated stamped February 22, 2010.

As you are aware, the referenced system was installed prior to utility review and approval. Additionally the system is a battery back-up which does not meet TEP's requirements as outlined on page 1-10 of the Renewable Energy Credit Purchase Program (see attachment) which specifically states, "Storage Batteries are not allowed as part of the Customer System unless the inverter is a separate component and TEP can locate the Solar Meter at the inverter's output. If configured otherwise, battery losses will adversely reflect in the annual AC metered energy output. Customer's solar energy generation and energy storage system must meet the requirements of 2 and 3 of this Attachment A."

After discussion between myself and our department engineer, Chris Lindsey, a site visit was conducted to determine that the system would not back feed into the TEP grid during an outage. A department decision was made to offer the compromise of allowing your system to be considered "off-grid" because requirements 2 and 3 referenced above were met wherein allowing us some leeway to pay an incentive based on considering this to be an off-grid system.

It is understood that your service from TEP is now totally disconnected. Referenced on Page 1-11 under *Additional requirements for Off-Grid Systems,* "The maximum Solar Electric array size for customers currently paying into the REST tariff shall not exceed 4,000 Wac. For customers not currently paying into the REST tariff, systems shall not exceed 2,000 Wac." Your system exceeds the 2,000 Wac requirement.

Taking into consideration the size of your system – incenting up to 2857 Wdc of a self installed system, TEP is able to pay an incentive of $4,000.

If you'll respond via e-mail in agreement to this incentive, I would be more than happy to process an incentive for you

Blanka Anderson
REST/Residential Coordinator

Tucson Electric Power
A UniSource Energy Company

Final Bill

Account: [redacted]

Bill Date: 4-15-2010

Customer Name: POLIVKA, VIKTOR P

Service Address: 4675 S HARRISON RD, 82
TUCSON AZ 85730-4537

Previous Balance	- Payments/Credits	+ Charges/Debits	= Current Balance
15.31	15.31	9.71	9.71

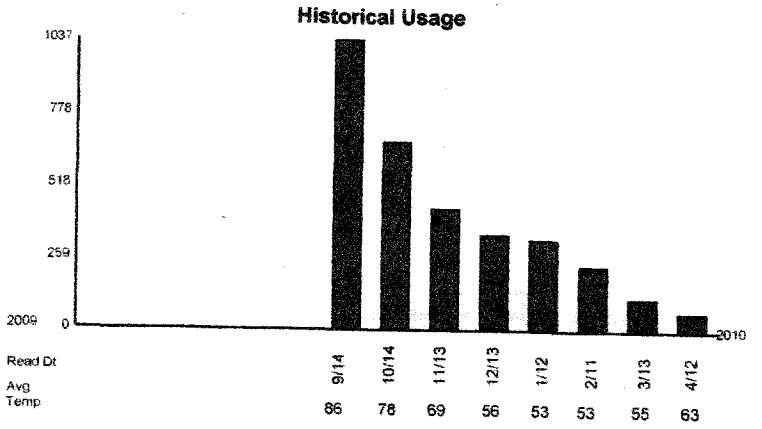
DUE DATE	AMOUNT DUE
4-27-2010	**$9.71**

Payment: $15.31 on 04/07/2010 - Thank You!

R-01 - Residential (Closed Service No. 4110417710)

Electric Charges for Period 03-31 - 04-12

DELIVERY SERVICES	
Customer Charge	7.00
Winter - 1st 500 kWh 20 @ $0.047309	0.95
POWER SUPPLY CHARGES	
Winter - kWh 20 @ $0.025698	0.51
PPFAC - kWh 20 @ $0.00	
GREEN ENERGY CHARGES	
Renewable Energy Standard Tariff	0.17
DSM Surcharge - kWh 20 @ $0.000831	0.02
TAXES AND ASSESSMENTS	
ACC Assessment	0.01
City Franchise Fee	0.19
State Sales Tax	0.50
County Sales Tax	0.04
City Sales Tax	0.17
City Public Utility Tax	0.15
Total Electric Service Charges	9.71



Meter	Unit of Measure	Next Read Date	Current Read Date	Prior Read Date	Days	Current Reading	- Prior Reading	= Reading Difference	x Multiplier	= Usage
XH-331582	KWH	4-28	4-12	3-30	13	8110	8108	2	10	20

Tucson Electric Power
A UniSource Energy Company

Account: [redacted]

Bill Date: 7-01-2010

Customer Name: POLIVKA, VIKTOR P

Service Address: 4675 S HARRISON RD, 82
TUCSON AZ 85730-4537

35

Previous Balance	- Payments/Credits	+ Charges/Debits	= Current Balance
9.71	9.71	28.43	28.43

DUE DATE	AMOUNT DUE
7-13-2010	$28.43

Payment: $9.71 on 04/21/2010 - Thank You!

Effective June 1, 2010, the DSM Surcharge has increased from $0.000831 to $0.001249 per KWH, and the Arizona sales tax has increased from 5.6 percent to 6.6 percent.

R-01 - Residential (Service No. 4110417234)

Electric Charges for Period 06-18 - 06-29

DELIVERY SERVICES	
Customer Charge	7.00
Summer - 1st 500 kWh 200 @ $0.046925	9.39
POWER SUPPLY CHARGES	
Summer - kWh 200 @ $0.033198	6.64
PPFAC - kWh 200 @ $0.00	
GREEN ENERGY CHARGES	
Renewable Energy Standard Tariff	1.73
DSM Surcharge - kWh 200 @ $0.001249	0.25
TAXES AND ASSESSMENTS	
ACC Assessment	0.05
RUCO Assessment	0.01
City Franchise Fee	0.56
State Sales Tax	1.72
County Sales Tax	0.14
City Sales Tax	0.50
City Public Utility Tax	0.44
Total Electric Service Charges	28.43

Meter	Unit of Measure	Next Read Date	Current Read Date	Prior Read Date	Days	Current Reading	- Prior Reading	= Reading Difference	x Multiplier	= Usage
XH-331582	KWH	7-29	6-29	6-17	12	8130	8110	20	10	200

Tucson Electric Power
A UniSource Energy Company

Account: [redacted]

Bill Date: 7-30-2010

Customer Name: POLIVKA, VIKTOR P

Service Address: 4675 S HARRISON RD, 82
TUCSON AZ 85730-4537

35

Previous Balance	- Payments/Credits	+ Charges/Debits	= Current Balance
28.43	28.43	52.29	52.29

DUE DATE	AMOUNT DUE
8-11-2010	**$52.29**

Payment: $28.43 on 07/08/2010 - Thank You!

R-01 - Residential (Service No. 4110417234)

Electric Charges for Period 06-30 - 07-29

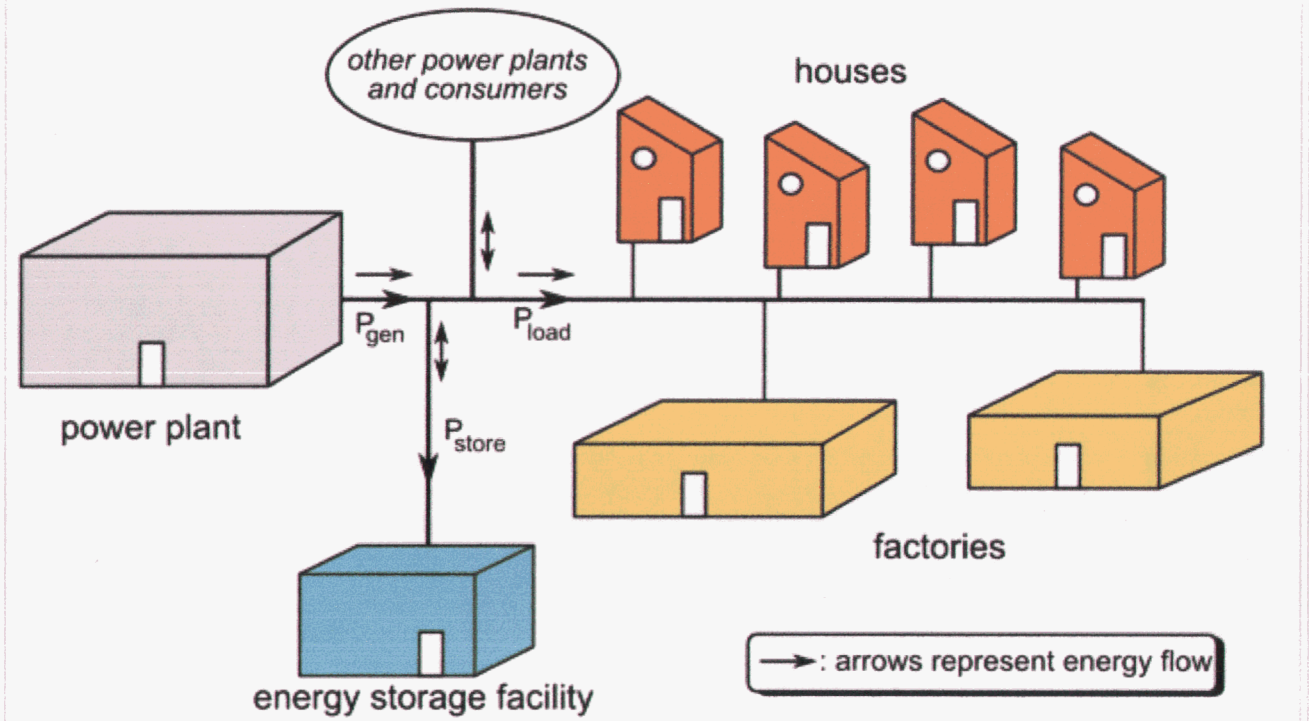
DELIVERY SERVICES	
Customer Charge	7.00
Summer - 1st 500 kWh 440 @ $0.046925	20.65
POWER SUPPLY CHARGES	
Summer - kWh 440 @ $0.033198	14.61
PPFAC - kWh 440 @ $0.00	
GREEN ENERGY CHARGES	
Renewable Energy Standard Tariff	3.20
DSM Surcharge - kWh 440 @ $0.001249	0.55
TAXES AND ASSESSMENTS	
ACC Assessment	0.08
RUCO Assessment	0.02
City Franchise Fee	1.04
State Sales Tax	3.17
County Sales Tax	0.24
City Sales Tax	0.92
City Public Utility Tax	0.81
Total Electric Service Charges	52.29

NOTES:
MODE: OLD SJAP/LOAD SHED 29/7
AV. TEM 106 F - 7 TON AC 24/7
DAILY COST $1.743
AC SETTING @ 78F 29/7

Meter	Unit of Measure	Next Read Date	Current Read Date	Prior Read Date	Days	Current Reading	- Prior Reading	= Reading Difference	x Multiplier	= Usage
XH-331582	KWH	8-30	7-29	6-29	30	8174	8130	44	10	440

Grid energy storage

From Wikipedia, the free encyclopedia



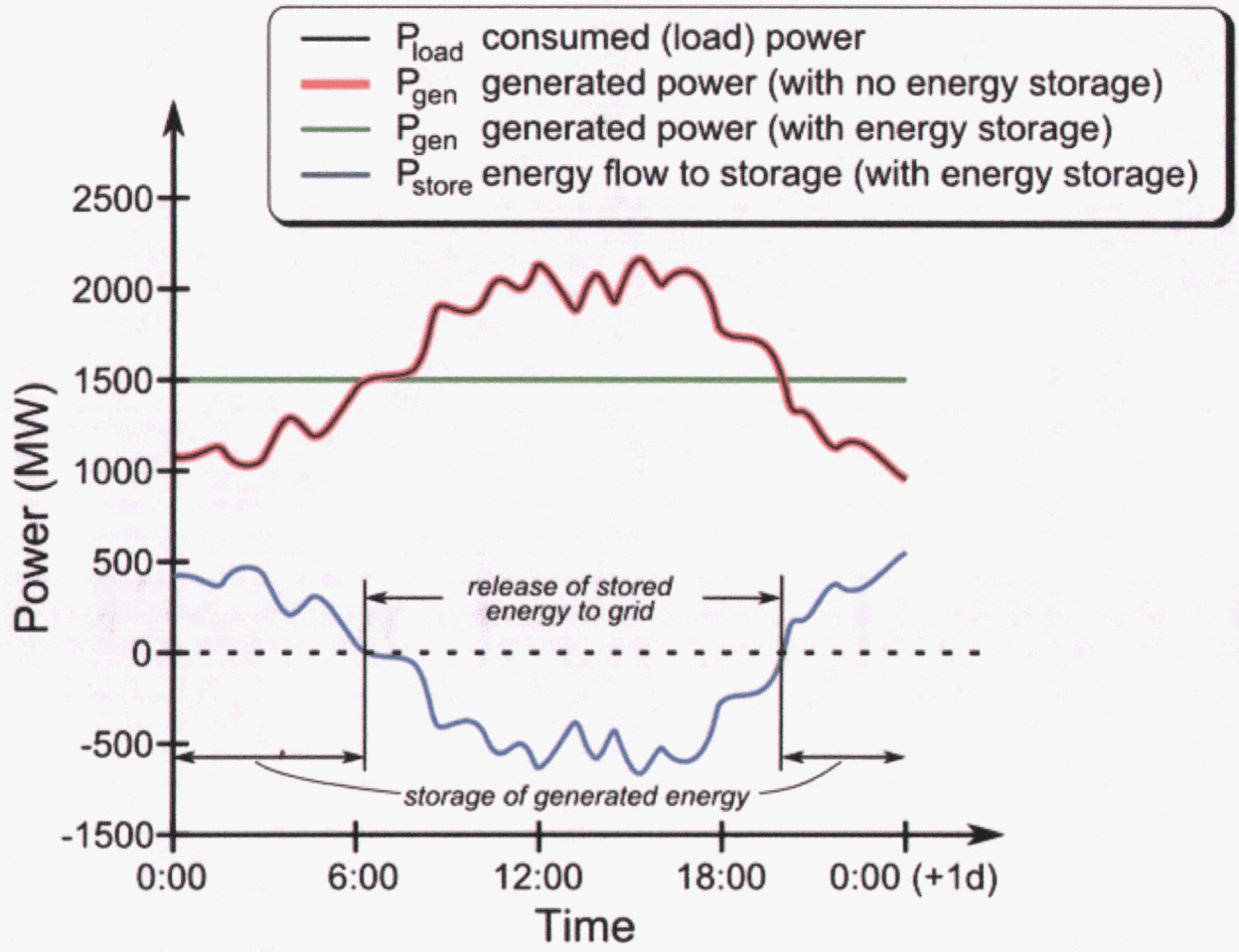
Simplified electrical grid with energy storage.

Grid energy storage (also called **large-scale energy storage**) refers to the methods used to large-scale store electricity within an electrical power grid. Electrical energy is stored during times when production (from power plants) exceeds consumption and the stores are utilized at times when consumption exceeds production. In this way, electricity production need not be drastically scaled up and down to meet momentary consumption – instead, production is maintained at a more constant level. This has the advantage that fuel-based power plants (i.e. coal, oil, gas) can be more efficiently and easily operated at constant production levels.

In particular, the use of grid-connected intermittent energy sources such as photovoltaics and wind turbines can benefit from **grid energy storage**. Intermittent energy sources are by nature unpredictable – the amount of electrical energy they produce varies over time and depends heavily on random factors such as the weather. In an electrical power grid without energy storage, energy sources that rely on energy stored within fuels (coal, oil, gas) must be scaled up and down to match the rise and fall of energy production from intermittent energy sources (see load following power plant).

Thus, **grid energy storage** is one method that the operator of an electrical power grid can use to adapt energy production to energy consumption, both of which can vary randomly over time. This is done to increase efficiency and lower the cost of energy production, and/or to facilitate the use of intermittent energy sources.

Contents



Simplified grid energy flow with and without idealized energy storage for the course of one day.

Contents

Forms

Batteries

Main article: Battery (electricity)

Battery storage was used in the early days of direct-current electric power networks, and is appearing again. Battery systems connected to large solid-state converters have been used to stabilize power distribution networks. For example in Puerto Rico a system with a capacity of 20 megawatts for 15 minutes is used to stabilize the frequency of electric power produced on the island. A 27 megawatt 15 minute nickel-cadmium battery bank was installed at Fairbanks Alaska in 2003 to stabilize voltage at the end of a long transmission line.[1] Many "off-the-grid" domestic systems rely on battery storage, but storing large amounts of electricity in batteries or by other electrical means has not yet been put to general use.

Batteries are generally expensive, have high maintenance, and have limited lifespans. One possible technology for large-scale storage are large-scale flow batteries and liquid metal batteries.[2] Sodium-sulfur batteries could also be inexpensive to implement on a large scale and have been used for grid storage in Japan and in the United States [2]. Vanadium redox batteries and other types of flow batteries are also beginning to be used for energy storage including the averaging of generation from wind turbines. Battery storage has relatively high efficiency, as high as 90% or better. The world's largest battery is in Fairbanks, Alaska, composed of Ni-Cd cells.[3]

Rechargeable flow batteries can be used as a rapid-response storage medium.[4] Vanadium redox flow batteries are currently installed at Huxley Hill wind farm (Australia), Tomari Wind Hills at Hokkaidō (Japan), as well as in other non-wind farm applications. A further 12 MW·h flow battery is to be installed at the Sorne Hill wind farm (Ireland).[5] These storage systems are designed to smooth out transient fluctuations in wind energy supply. The redox flow battery mentioned in the first article cited above has a capacity of 6 MW·h, which represents under an hour of electrical flow from this particular wind farm (at

20% capacity factor on its 30 MW rated capacity).

Electric Vehicles

Main article: Electric vehicle

Companies are researching the possible use of Electric Vehicles for meeting peak demand. A parked and plugged-in EV can sell the electricity from the battery during peak loads and charge either during night (at home) or during off-peak.[6]

When plug-in hybrid and/or electric cars are mass-produced[7][8] these mobile energy sinks could be utilized for their energy storage capabilities. Vehicle-to-grid technology can be employed, turning each vehicle with its 20 to 50 kW·h battery pack into a distributed load-balancing device or emergency power source. This represents 2 to 5 days per vehicle of average household requirements of 10 kW·h per day, assuming annual consumption of 3650 kW·h. This quantity of energy is equivalent to between 40 and 300 miles (64 and 480 km) of range in such vehicles consuming 0.5 to 0.16 kW·h per mile. These figures can be achieved even in home-made electric vehicle conversions. Some electric utilities plan to use old plug-in vehicle batteries (sometimes resulting in a giant battery) to store electricity[9][10] However, a large disadvantage of using vehicle to grid energy storage is the fact that each storage cycle stresses the battery wih one complete charge-discharge cycles. Current lithium ion batteries break down with the number of cycles.

Compressed air

Main article: Compressed air energy storage

Another grid energy storage method is to use off-peak or renewably generated electricity to compress air, which is usually stored in an old mine or some other kind of geological feature. When electricity demand is high, the compressed air is heated with a small amount of natural gas and then goes through turboexpanders to generate electricity.[11]

Flywheel

Main article: Flywheel energy storage

Mechanical inertia is the basis of this storage method. A heavy rotating disc is accelerated by an electric motor, which acts as a generator on reversal, slowing down the disc and producing electricity. Electricity is stored as the kinetic energy of the disc. Friction must be kept to a minimum to prolong the storage time. This is often achieved by placing the flywheel in a vacuum and using magnetic bearings, tending to make the method expensive. Larger flywheel speeds allow greater storage capacity but require strong materials such as steel or composite materials to resist the centrifugal forces (or rather, to provide centripetal forces). The ranges of power and energy storage technically and economically achievable, however, tend to make flywheels unsuitable for general power system application; they are probably best suited to load-leveling applications on railway power systems and for improving power quality in renewable energy systems. One application that currently uses flywheel storage is applications that require very high bursts of power for very short durations such as tokamak and laser experiments where a motor generator is spun up to operating speed and may actually come to a stop in one revolution. Flywheel storage is also currently used to provide uninterruptible power supply systems (such as those in large datacenters) for ride-through power necessary during transfer – that is, the relatively brief amount of time between a loss of power to the mains and the warm-up of an alternate source, such as a diesel generator.

This potential solution has been implemented by EDA[12] in the Azores on the islands of Graciosa and Flores. This system uses a 18 MW flywheel to improve power quality and thus allow increased renewable energy usage. As the description suggests, these systems are again designed to smooth out transient fluctuations in supply, and could never be used to cope with an outage of couple of days or more. The most powerful flywheel energy storage systems currently for sale on the market can hold up to 133 kW·h of energy.[*citation needed*]

Powercorp in Australia have been developing applications using wind turbines, flywheels and low load diesel (LLD) technology to maximise the wind input to small grids. A system installed in Coral Bay, Western Australia, uses wind turbines coupled with a flywheel based control system and LLDs to achieve better than 60% wind contribution to the town grid.

The Gerald R. Ford class aircraft carrier will use flywheels to accumulate energy from the ship's power supply, for rapid release into the Electromagnetic Aircraft Launch System. The shipboard power system cannot on its own supply the high power transients necessary to launch aircraft.

Hydrogen

Main article: Hydrogen economy

Hydrogen is also being developed as an electrical energy storage medium. See hydrogen storage. Hydrogen is produced (typically using electrical energy and/or heat), then sometimes compressed or liquefied, stored, and then converted back to electrical energy and/or heat. Hydrogen can be used as a fuel for portable (vehicles) or stationary energy generation. Compared to pumped water storage and batteries, hydrogen has the advantage that it is a high energy density, amassable fuel.

Hydrogen can be produced either by reforming natural gas with steam or by the electrolysis of water into hydrogen and oxygen (see hydrogen production). Reforming natural gas produces carbon dioxide as a by-product. High temperature electrolysis and high pressure electrolysis are two techniques by which the efficiency of hydrogen production may able to be increased. Hydrogen is then be converted back to electricity in an internal combustion engine, or a fuel cell which convert chemical energy into electricity without combustion, similar to the way the human body burns fuel.

The overall efficiency of hydrogen storage depends greatly on the technique used and the scale of the operation, but is typically 50 to 60%[*citation needed*], which is lower than for pumped storage systems or batteries. About 50 kW·h (180 MJ) of energy is required to produce a kilogram of hydrogen by electrolysis, so the cost of the electricity clearly is crucial, even for hydrogen uses other than storage for electrical generation[*citation needed*]. At $0.03/kW·h, common off-peak high-voltage line rate in the U.S., this means hydrogen costs $1.50 a kilogram for the electricity, equivalent to $1.50 a US gallon (40¢/L) for gasoline if used in a fuel cell vehicle. The equipment necessary for hydrogen energy storage includes an electrolysis plant, hydrogen compressors or liquifiers, and storage tanks.

Biohydrogen is a process being investigated for producing hydrogen using biomass.

Micro combined heat and power (microCHP) can use hydrogen as a fuel.

Some nuclear power plants may be able to benefit from a symbiosis with hydrogen production. High temperature (950 to 1,000 °C) gas cooled nuclear generation IV reactors have the potential to electrolyze hydrogen from water by thermochemical means using nuclear heat as in the sulfur-iodine cycle.

A community based pilot program using wind turbines and hydrogen generators was started in 2007 in the

remote community of Ramea, Newfoundland and Labrador.[13] A similar project has been going on since 2004 on Utsira, a small Norwegian island municipality.

Underground hydrogen storage is the practice of hydrogen storage in underground caverns, salt domes and depleted oil and gas fields. Large quantities of gaseous hydrogen have been stored in underground caverns by ICI for many years without any difficulties[14].

Pumped water

Main article: Pumped-storage hydroelectricity

In many places, pumped storage hydroelectricity is used to even out the daily generating load, by pumping water to a high storage reservoir during off-peak hours and weekends, using the excess base-load capacity from coal or nuclear sources. During peak hours, this water can be used for hydroelectric generation, often as a high value rapid-response reserve to cover transient peaks in demand. Pumped storage recovers about 75% of the energy consumed, and is currently the most cost effective form of mass power storage. The chief problem with pumped storage is that it usually requires two nearby reservoirs at considerably different heights, and often requires considerable capital expenditure.[15]

Pumped water systems have high dispatchability, meaning they can come on-line very quickly, typically within 15 seconds,[16] which makes these systems very efficient at soaking up variability in electrical *demand* from consumers. There is over 90 GW of pumped storage in operation around the world, which is about 3% of *instantaneous* global generation capacity. Pumped water storage systems, such as the Dinorwig storage system, hold five or six hours of generating capacity,[16] and are used to smooth out demand variations.

Another example is the Tianhuangping Pumped-Storage Hydro Plant in China,[17] which has a reservoir capacity of eight million cubic meters (2.1 billion U.S. gallons or the volume of water over Niagara Falls in 25 minutes) with a vertical distance of 600 m (1970 feet). The reservoir can provide about 13 GW·h of stored gravitational potential energy (convertible to electricity at about 80% efficiency), or about 2% of China's daily electricity consumption.[18]

A new concept in pumped-storage is utilizing wind energy or solar power to pump water. Wind turbines or solar cells that direct drive water pumps for an energy storing wind or solar dam can make this a more efficient process but are limited. Such systems can only increase kinetic water volume during windy and daylight periods.

Hydroelectric dam uprating

Hydroelectric dams with large reservoirs can also be operated to provide peak generation at times of peak demand. Water is stored in the reservoir during periods of low demand and released through the plant when demand is higher. The net effect is the same as pumped storage, but without the pumping loss. Depending on the reservoir capacity the plant can provide daily, weekly, or seasonal load following.

Many existing hydroelectric dams are fairly old (for example, the Hoover Dam was built in the 1930s), and their original design predated the newer intermittent power sources such as wind and solar by decades. A hydroelectric dam originally built to provide baseload power will have its generators sized according to the average flow of water into the reservoir. Uprating such a dam with additional generators increases its peak power output capacity, thereby increasing its capacity to operate as a virtual grid energy storage unit.[19][20] The United States Bureau of Reclamation reports an investment cost of $69 per kilowatt capacity to uprate an existing dam,[19] compared to more than $400 per kilowatt for oil-fired peaking generators. While an

uprated hydroelectric dam does not directly store excess energy from other generating units, it behaves equivalently by accumulating its own fuel - incoming river water - during periods of high output from other generating units. Functioning as a virtual grid storage unit in this way, the uprated dam is one of the most efficient forms of energy storage, because it has no pumping losses to fill its reservoir. A dam which impounds a large reservoir can store and release a correspondingly large amount of energy, by raising and lowering its reservoir level a few meters.

Superconducting magnetic energy

Main article: Superconducting magnetic energy storage

Superconducting magnetic energy storage (SMES) systems store energy in the magnetic field created by the flow of direct current in a superconducting coil which has been cryogenically cooled to a temperature below its superconducting critical temperature. A typical SMES system includes three parts: superconducting coil, power conditioning system and cryogenically cooled refrigerator. Once the superconducting coil is charged, the current will not decay and the magnetic energy can be stored indefinitely. The stored energy can be released back to the network by discharging the coil. The power conditioning system uses an inverter/rectifier to transform alternating current (AC) power to direct current or convert DC back to AC power. The inverter/rectifier accounts for about 2–3% energy loss in each direction. SMES loses the least amount of electricity in the energy storage process compared to other methods of storing energy. SMES systems are highly efficient; the round-trip efficiency is greater than 95%. The high cost of superconductors is the primary limitation for commercial use of this energy storage method.

Due to the energy requirements of refrigeration, and the limits in the total energy able to be stored, SMES is currently used for short duration energy storage. Therefore, SMES is most commonly devoted to improving power quality. If SMES were to be used for utilities it would be a diurnal storage device, charged from base load power at night and meeting peak loads during the day.

For superconducting magnetic energy to become practical the technical challenges have to be solved.

Thermal

Main article: Thermal energy storage

Design proposals have been made for the use of molten salt as a heat store to store heat collected by a solar power tower so that it can be used to generate electricity in bad weather or at night. Thermal efficiencies over one year of 99% have been predicted.[21]

Off-peak electricity can be used to make ice from water, and the ice can be stored until the next day, when it is used to cool either the air in a large building, thereby shifting that demand off-peak, or the intake air of a gas turbine generator, thus increasing the on-peak generation capacity.

Economics

Generally speaking, energy storage is economical when the marginal cost of electricity varies more than the costs of storing and retrieving the energy plus the price of energy lost in the process. For instance, assume a pumped-storage reservoir can pump to its upper reservoir water equivalent to 1,200 MW·h during the night, for $15 per MW·h, at a total cost of $18,000. The next day, all of the stored energy can be sold at the peak hours for $40 per MW·h, but from the 1,200 MW·h pumped 50 were lost due to evaporation and seeping in the reservoir. 1,150 MW·h are sold for $46,000, for a final profit of $28,000.

However, the marginal cost of electricity varies because of the varying operational and fuel costs of different classes of generators. At one extreme, base load power plants such as coal-fired power plants and nuclear power plants are low marginal cost generators, as they have high capital and maintenance costs but low fuel costs. At the other extreme, peaking power plants such as gas turbine natural gas plants burn expensive fuel but are cheaper to build, operate and maintain. To minimize the total operational cost of generating power, base load generators are dispatched most of the time, while peak power generators are dispatched only when necessary, generally when energy demand peaks. This is called "economic dispatch".

Demand for electricity from the world's various grids varies over the course of the day and from season to season. For the most part, variation in electric demand is met by varying the amount of electrical energy supplied from primary sources. Increasingly, however, operators are storing lower-cost energy produced at night, then releasing it to the grid during the peak periods of the day when it is more valuable.[22] In areas where hydroelectric dams exist, release can be delayed until demand is greater; this form of storage is common and can make use of existing reservoirs. This is not storing "surplus" energy produced elsewhere, but the net effect is the same - although without the efficiency losses. Renewable supplies with variable production, like wind and solar power, tend to increase the net variation in electric load, increasing the opportunity for grid energy storage.

Load levelling

The demand for electricity from consumers and industry is constantly changing, broadly within the following categories:

- Seasonal (during dark winters more electric lighting and heating is required, while in other climates hot weather boosts the requirement for air conditioning)
- Weekly (most industry closes at the weekend, lowering demand)
- Daily (such as the peak as everyone arrives home and switches the television on)
- Hourly (one method for estimating television viewing figures in the United Kingdom is to measure the power spikes during advertisement breaks or after programmes when viewers go to switch the kettle on [23])
- Transient (fluctuations due to individual's actions, differences in power transmission efficiency and other small factors that need to be accounted for)

There are currently three main methods for dealing with changing demand:

- Electrical devices generally having a working voltage range that they require, commonly 110–120 V or 220–240 V. Minor variations in load are automatically smoothed by slight variations in the voltage available across the system.
- Power plants can be run below their normal output, with the facility to increase the amount they generate almost instantaneously. This is termed 'spinning reserve'.
- Additional power plants can be brought online to provide a larger generating capacity. Typically, these would be combustion gas turbines, which can be started in a matter of minutes.

The problem with relying on these last two methods in particular is that they are expensive, because they leave expensive generating equipment unused much of the time, and because plants running below maximum output usually produce at less than their best efficiency. Grid energy storage is used to shift load from peak to off-peak hours. Power plants are able to run closer to their peak efficiency for much of the year.

Energy demand management

Main article: Energy demand management

The only way to deal with varying electrical loads is to decrease the difference between generation and demand. If this is done by changing loads it is referred to as demand side management (DSM). For decades, utilities have sold off-peak power to large consumers at lower rates, to encourage these users to shift their loads to off-peak hours, in the same way that telephone companies do with individual customers. Usually, these time-dependent prices are negotiated ahead of time. In an attempt to save more money, some utilities are experimenting with selling electricity at minute-by-minute spot prices, which allow those users with monitoring equipment to detect demand peaks as they happen, and shift demand to save both the user and the utility money. Demand side management can be manual or automatic and is not limited to large industrial customers. In residential and small business applications, for example, appliance control modules can reduce energy usage of water heaters, air conditioning units, refrigerators, and other devices during these periods by turning them off for some portion of the peak demand time or by reducing the power that they draw. Energy demand management includes more than reducing overall energy use or shifting loads to off-peak hours. A particularly effective method of energy demand management involves encouraging electric consumers to install more energy efficient equipment. For example, many utilities give rebates for the purchase of insulation, weatherstripping, and appliances and light bulbs that are energy efficient. Some utilities subsidize the purchase of geothermal heat pumps by their customers, to reduce electricity demand during the summer months by making air conditioning up to 70% more efficient, as well as to reduce the winter electricity demand compared to conventional air-sourced heat pumps or resistive heating.[24] Companies with factories and large buildings can also install such products, but they can also buy energy efficient industrial equipment, like boilers, or use more efficient processes to produce products. Companies may get incentives like rebates or low interest loans from utilities or the government for the installation of energy efficient industrial equipment.

Portability

This is the area of greatest success for current energy storage technologies. Single-use and rechargeable batteries are ubiquitous, and provide power for devices with demands as varied as digital watches and cars. Advances in battery technology have generally been slow, however, with much of the advance in battery life that consumers see being attributable to efficient power management rather than increased storage capacity. Portable consumer electronics have benefited greatly from size and power reductions associated with Moore's law. Unfortunately, Moore's law does not apply to hauling people and freight; the underlying energy requirements for transportation remain much higher than for information and entertainment applications. Battery capacity has become an issue as pressure grows for alternatives to internal combustion engines in cars, trucks, buses, trains, ships, and airplanes. These uses require far more energy density (the amount of energy stored in a given volume or weight) than current battery technology can deliver. Liquid hydrocarbon fuel (such as gasoline/petrol and diesel), as well as alcohols (methanol, ethanol, and butanol) and lipids (straight vegetable oil, biodiesel) have much higher energy densities.

There are synthetic pathways for using electricity to reduce carbon dioxide and water to liquid hydrocarbon or alcohol fuels.[25] These pathways begin with electrolysis of water to generate hydrogen, and then reducing carbon dioxide with excess hydrogen in variations of the reverse water gas shift reaction. Non-fossil sources of carbon dioxide include fermentation plants and wastewater treatment plants. Converting electrical energy to carbon-based liquid fuel has potential to provide portable energy storage usable by the large existing stock of motor vehicles and other engine-driven equipment, without the difficulties of dealing with hydrogen or another exotic energy carrier. These synthetic pathways may attract attention in connection with attempts to improve energy security in nations that rely on imported petroleum, but have or can develop large sources of renewable or nuclear electricity, as well as to deal with possible future declines in the amount of petroleum available to import.

Because the transport sector uses so much energy from petroleum, replacing petroleum with electricity for

mobile energy will require very large investments over many years, regardless of which energy carriers become popular.

Reliability

Virtually all devices that operate on electricity are adversely affected by the sudden removal of their power supply. Solutions such as UPS (uninterruptible power supplies) or backup generators are available, but these are expensive. Efficient methods of power storage would allow for devices to have a built-in backup for power cuts, and also reduce the impact of a failure in a generating station. Examples of this are currently available using fuel cells and flywheels.

See also

- Battery-to-grid
- Distributed generation
- Energy storage
- Grid-tied electrical system
- Hydrogen economy
- Virtual power plant
- Wind farm

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External links

- Hydrogen Economy
- Electricity storage technologies
  - Graphical comparisons of different energy storage systems:
    - System power ratings
    - Energy density
    - Cost per unit
    - Efficiency
    - Capital cost per cycle
    - A large grid-connected nickel-cadmium battery
- Stationary Energy Storage...Key to the Renewable Grid

Retrieved from "http://en.wikipedia.org/wiki/Grid_energy_storage"
Categories: Energy storage | Power engineering | Renewable energy storage technology

xantrex™

CE Declaration of Conformity

Product Type: **Photovoltaic Charge Controller**

Product Model Numbers: **XW-MPPT60-150**

These products comply with and are CE-marked under the following directives:

- **EMC Directive 2004/108/EC**
- **Low Voltage Directive 2006/95/EC**

Compliance of these products with the above Directives is confirmed through the application of the following harmonized standards:

- **EMC Directive**
  - **EN61000-6-1:2001** - **Generic standards - Immunity for residential, commercial, and light-industrial environments**
  - **EN61000-6-3/A11:2004** - **Generic standards – Emission standard for residential, commercial, and light-industrial environments**
- **Low Voltage Directive**
  - **EN50178:1997** - **Electronic Equipment for Use in Power Installations**
  - **EN 60529/A1:2000** - **Degrees of protection provided by enclosures (IP Code 20)**

Manufacturer: **Xantrex Technology Inc., 8999 Nelson Way, Burnaby, B.C. Canada**

Authorized Representative: **Xantrex Technology Inc., Edificios Diagonal 2A - C/ Constitución, 3, 4º 2ª 08960 Sant Just Desvern (Barcelona),Spain**

Signed on **February 6, 2008,**

Xantrex Technology Inc.

Jim Eichner
Compliance Engineering Manager

CE

THE NEW VALUE FRONTIER

KYOCERA

KYOCERA Solar, Inc.
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Limited Warranty for Kyocera Photovoltaic Module(s) Models KD130GX-LP, KD135GX-LP, KD135GX-LPU, KD135SX-UPU, KD180GX-LP, KD185GX-LPU, KD205GX-LP, KD205GX-LPU, KD210GX-LP, KD210GX-LPU, and KD215GX-LPU

This Limited Warranty applies to photovoltaic module models KD130GX-LP, KD135GX-LP, KD135GX-LPU, KD135SX-UPU, KD180GX-LP, KD185GX-LPU, KD205GX-LP, KD205GX-LPU, KD210GX-LP, KD210GX-LPU, AND KD215GX-LPU ("PV Module(s)") manufactured by Kyocera Corporation or an affiliated company ("Kyocera") warrants the quality of such PV Module(s), and specifies the scope of such warranty.

A. Five Year Limited PV Module(s) Warranty

Kyocera warrants the PV Module(s) to be free from the defects and/or failures specified below for a period not exceeding five (5) years from the date of sale to the original customer ("Customer"):

1) defects and/or failures due to manufacturing;
2) defects and/or failures due to materials;
3) cracking of the front glass surface due to foreign objects inside the glass; or
   Note: This limited warranty shall exclude cracking of the front glass surface due to external shock from flying objects or external stress.
4) non-conformity to specifications due to faulty manufacturing and/or inspection processes.

If the PV Module(s) fails to conform to this warranty, Kyocera will repair or replace the PV Module(s), at Kyocera's sole option.

B. Limited Power Output Warranty of 20 years (90% / 80%)

Subject to Kyocera determining in its sole discretion that any power loss is due solely to defects in materials or workmanship, Kyocera warrants the power output of the PV Module(s) as follows:

Kyocera warrants that if, (a) within the first ten (10) years from the date of sale to the Customer, the PV Module(s) exhibits a power output of less than ninety percent (90%) of the original minimum rated power specified at the time of sale*,or (b) within twenty (20) years from the date of sale to the Customer, the PV Module(s) exhibits a power output of less than eighty percent (80%) of the original minimum rated power specified at the time of sale*, Kyocera will deliver additional PV Module(s) to replace the missing power output, or repair or replace the PV Module(s), at Kyocera's sole option.

*The power output values shall be those measured under Kyocera's standard measurement conditions as follows: (a) light spectrum of AM 1.5; (b) irradiation of 1,000w per m^2; and (c) a cell temperature of 25 degrees Centigrade. Such measurements are carried out in accordance with IEC 60904 as tested at the junction box terminals per the calibration and testing standards of Kyocera which are valid at the date of manufacture of the PV Module(s). Kyocera's calibration standards shall be compliant with the standards applied by international institutions accredited for this purpose.

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http://www.kyocerasolar.com

C. Warranty Exclusions

1) No claim based on this Limited Warranty may be brought after the applicable warranty period. Any delivery of additional PV Module(s) or the repair or replacement of the PV Module(s) shall not extend the original terms of this Limited Warranty.

2) This Limited Warranty shall not cover defects and/or failures of the PV Module(s) from the following causes even though such defects and/or failures are discovered within the applicable warranty period:

   a) defects and/or failures caused by devices and/or parts other than the PV Module(s) or by mounting methods of such devices and/or parts;
   b) defects and/or failures caused by defective wiring, installation, or handling;
   c) defects and/or failures caused by installations not in conformance with PV Module(s) specifications, installation manuals, operation manuals, or labels attached to the PV Module(s);
   d) defects and/or failures caused by unauthorized maintenance, operation or modification;
   e) defects and/or failures caused by removal from the original place of installment;
   f) defects and/or failures caused by repairs not in accordance with Kyocera's instructions;
   g) defects and/or failures caused by inappropriate handling during transportation or storage;
   h) defects and/or failures caused by use on a mobile unit including, but not limited to, vehicles, vessels, etc.;
   i) defects and/or failures caused by external accidents such as fire, explosion, and civil disorder;
   j) defects and/or failures caused by natural forces, acts of God or force majeure events and other unforeseen circumstances or causes beyond Kyocera's reasonable control including, but not limited to, earthquakes, typhoons, hurricanes, tornadoes, volcanic action, floods, tsunami, lightning, snow damage, etc.; or
   k) defects and/or failures caused by smoke and/or other pollution, salt damage, acid rain, etc.

3) This Limited Warranty covers only the transportation cost for reshipment of any repaired or replaced PV Module(s) to the applicable location, and does not cover the transportation cost for return of the PV Module(s) to Kyocera or Kyocera's authorized agent and costs associated with installation, removal, or reinstallation of the PV Module(s).

D. Obtaining Warranty Performance

1) This Limited Warranty is applicable only to Customers who have purchased the PV Module(s) directly from Kyocera or from an authorized agent of Kyocera. To qualify for this warranty, it is necessary for the Customer to prove that the PV Module(s) was purchased from Kyocera or such authorized agent.

2) When applying for warranty coverage, please provide Kyocera or Kyocera's authorized agent with the PV Module(s) model name, a description of the defect and/or failure, and the serial number located on the PV Module(s) label attached to the backside of the PV Module(s) at the time of manufacture

3) Any uninstalled PV Module(s) shall become the property of Kyocera. Kyocera shall have the right to deliver another type of PV Module(s) (different in size, color, shape and/or power) if Kyocera has discontinued manufacture of the PV Module(s) in question at the time the warranty claim is accepted.

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4) This Limited Warranty is transferable to a new owner of the location where the PV Module(s) were originally installed provided that the PV Module(s) remain installed at the location where originally installed.

E. Warranty Limitations

THE LIMITED WARRANTY SET FORTH HEREIN IS EXPRESSLY IN LIEU OF AND EXCLUDES ALL OTHER EXPRESS OR IMPLIED WARRANTIES INCLUDING, BUT NOT LIMITED TO, THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND ALL OTHER OBLIGATIONS OR LIABILITIES ON THE PART OF KYOCERA, UNLESS SUCH OTHER WARRANTIES, OBLIGATIONS OR LIABILITES ARE EXPRESSLY AGREED TO IN WRITING BY KYOCERA. KYOCERA SHALL HAVE NO RESPONSIBILITY OR LIABILITY WHATSOEVER FOR DAMAGES OR INJURY TO PERSONS OR PROPERTY, OR FOR OTHER LOSS OR INJURY RESULTING FROM ANY CAUSE WHATSOEVER ARISING OUT OF OR RELATING TO THE PV MODULE(S) INCLUDING, WITHOUT LIMITATION, ANY DEFECTS AND/OR FAILURES IN THE PV MODULE(S) OR FROM USE OR INSTALLATION.

KYOCERA SHALL NOT BE LIABLE UNDER ANY CIRCUMSTANCES FOR ANY INCIDENTAL, INDIRECT, CONSEQUENTIAL OR SPECIAL DAMAGES, HOWSOEVER CAUSED. IN NO EVENT SHALL KYOCERA'S AGGREGATE LIABILITY EXCEED THE VALUE OF THE PV MODULE(S) WHICH IS THE SUBJECT OF A CLAIM OR DISPUTE.

SOME JURISDICTIONS DO NOT ALLOW LIMITATIONS ON WARRANTIES OR EXCLUSIONS OR LIMITATION OF DAMAGES. ACCORDINGLY, THE ABOVE EXCLUSIONS OR LIMITATIONS MAY NOT APPLY. THESE WARRANTIES GIVE A CUSTOMER SPECIFIC LEGAL RIGHTS, AND A CUSTOMER MAY HAVE OTHER RIGHTS THAT VARY FROM JURISDICTION TO JURISDICTION.

F. Validity

This Limited Warranty shall **be valid from September. 1st, 2009** and shall apply to all PV Module(s) sold to specified Customers on or after this date. This Limited Warranty shall be valid until a new revision is issued by Kyocera.

CSA INTERNATIONAL

Certificate of Compliance

Certificate: 1873035 **Master Contract:** 159409

Project: 1981978 **Date Issued:** 2008/03/26

Issued to: **Xantrex Technology Inc.**

8999 Nelson Way
Burnaby, BC V5A 4B5
Canada
Attention: Mr. Ralph McDiarmid

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US'

C US

Issued by: Ernesto Lopez, AScT.

Authorized by: Lindsay Clark, Product Group Manager

PRODUCTS

CLASS 5311 09 - POWER SUPPLIES - Distributed Generation Power Systems Equipment
CLASS 5311 89 - POWER SUPPLIES - Distributed Generation - Power Systems Equipment
- Certified to U.S. Standards

PART A: Combined Inverter/Battery Charger, permanently connected:

Stand-alone Inverter/Charger/Utility-Interactive Inverter, Model XW6048-120/240-60, with Conduit Box supplied are permanently connected, fixed equipment. System ratings as follows:

Grid-interactive Mode:

The 'C' and 'US' indicators adjacent to the CSA Mark signify that the product has been evaluated to the applicable CSA and ANSI/UL Standards, for use in Canada and the U.S., respectively. This 'US' indicator includes products eligible to bear the 'NRTL' indicator. NRTL, i.e. National Recognized Testing Laboratory, is a designation granted by the U.S. Occupational Safety and Health Administration (OSHA) to laboratories which have been recognized to perform certification to U.S. Standards.

CSA INTERNATIONAL

Certificate:	1873035	**Master Contract:**	159409
Project:	1981978	**Date Issued:**	2008/03/26

Maximum System Voltage: 57 V dc (Input), 264 V ac (Output)

Range of Operating DC Voltage: 52 – 57 V dc

Max. Operating Current (DC): 160 A

Maximum Input Short Circuit Current (DC): 3000 A

Max. Utility Backfeed Current (AC): 0 A

Output Power Factor Rating: >0.98

Operating Voltage Range (AC): 211 - 264 V ac

Operating Frequency Range: 59.4 - 60.4 Hz

Nominal Output Voltage (AC): 240 V ac

Nominal Output Frequency: 60 Hz

Maximum Continuous Output Current (AC or DC): 30 Arms

Maximum Continuous Output Power (AC): 6000 W

Maximum Output Fault Current and Duration: 425A pk, ~0.4 milliseconds

Maximum Output Overcurrent Protection: 60 A

Utility Interconnection Voltage and Frequency Trip Limits and Trip Times: See Note 3 below

Synchronization In-rush Current: 0 A

Trip Limit and Trip Time Accuracy: +/-3V L-L, +/-1.5V L-N, +/-0.05 Hz, +/-15% trip time

Normal Operation Temperature Range: See Note 1 below.

Output Power Temperature Derating and Maximum Full Power Operating Ambient: See Note 1 below.

Charge Mode

Maximum System Voltage: 60 V dc (Output), 280 V ac (Input)

Range of Operating DC Voltage: 40 – 60 V dc

Max. Operating Current (DC): 100 A

CSA INTERNATIONAL

Certificate:	1873035	**Master Contract:**	159409
Project:	1981978	**Date Issued:**	2008/03/26

Maximum Input Short Circuit Current (DC): N/A

Max. Utility Backfeed Current (AC): N/A

Output Power Factor Rating: >0.98

Operating Voltage Range (AC): 156 - 280 V ac

Operating Frequency Range: 52 - 68 Hz

Nominal Output Voltage (AC): 50.4 V dc

Nominal Output Frequency: N/A

Maximum Continuous Output Current (AC or DC): 100 Adc

Maximum Continuous Output Power (AC): 5600 W

Maximum Output Fault Current and Duration: 5150A pk, ~1 milliseconds

Maximum Output Overcurrent Protection: 250 A

Utility Interconnection Voltage and Frequency Trip Limits and Trip Times: N/A

Synchronization In-rush Current: N/A

Trip Limit and Trip Time Accuracy: N/A

Normal Operation Temperature Range: See Note 1 below.

Output Power Temperature Derating and Maximum Full Power Operating Ambient: See Note 1 below.

Inverter Stand-alone Mode

Maximum System Voltage: 60 V dc (Output), 240 V ac (Input)

Range of Operating DC Voltage: 42 – 60 V dc

Max. Operating Current (DC): 160 A

Maximum Input Short Circuit Current (DC): 3000 A

Max. Utility Backfeed Current (AC): N/A

Output Power Factor Rating: 0 - 1.00

CSA INTERNATIONAL

Certificate:	1873035	**Master Contract:**	159409
Project:	1981978	**Date Issued:**	2008/03/26

Operating Voltage Range (AC): 120/240 V ac

Operating Frequency Range: 60 Hz

Nominal Output Voltage (AC): 120/240 V ac

Nominal Output Frequency: 60 Hz

Maximum Continuous Output Current (AC or DC): 25 Arms

Maximum Continuous Output Power (AC): 6000 VA

Maximum Output Fault Current and Duration: 925A pk, ~0.5milliseconds

Maximum Output Overcurrent Protection: 30 A

Utility Interconnection Voltage and Frequency Trip Limits and Trip Times: N/A

Synchronization In-rush Current: N/A

Trip Limit and Trip Time Accuracy: N/A

Normal Operation Temperature Range: See Note 1 below.

Output Power Temperature Derating and Maximum Full Power Operating Ambient: See Note 1 below.

Device: XW6048 (865-1000)

Protection & Main processor (Motorola): v1.10.00 B1

Notes:

1. Derated operation for elevated ambient temperatures: rated 6000 W continuous from -25°C to 40°C

Operates at reduced power at temperatures above these ratings to 70°C max; refer to operations manual for derating curves.

2. Utility-interactive evaluations were conducted with Processor (FLASH) code revision 1.10, Build 01.

3. Utility Interconnection Voltage and Frequency Trip Limits and Trip Times: Voltage and frequency limits for utility Interaction

Condition A: Simulated utility source - Voltage (V): < 0.50 Vnorb; Frequency (Hz): Rated; Maximum time (sec)

(cycles) at 60 Hza before cessation of current to the simulated utility: 0.16

Condition B: Simulated utility source - Voltage (V): 0.50 Vnorb ≤ V < 0.88 Vnor; Frequency (Hz): Rated; Maximum time (sec) (cycles) at 60 Hza before cessation of current to the simulated utility: 2

Condition C: Simulated utility source - Voltage (V): 1.10 Vnorb < V < 1.20 Vnor; Frequency (Hz): Rated; Maximum time (sec) (cycles) at 60 Hza before cessation of current to the simulated utility: 1

Condition D: Simulated utility source - Voltage (V): 1.20 Vnor ≤ V; Frequency (Hz): Rated; Maximum time (sec) (cycles) at 60 Hza before cessation of current to the simulated utility: 0.16

Condition E: Simulated utility source - Voltage (V): Rated; Frequency (Hz): f > 60.5 ; Maximum time (sec) (cycles) at 60 Hza before cessation of current to the simulated utility: 0.16

Condition F: Simulated utility source - Voltage (V): Rated; Frequency (Hz): f < (59.8 – 57.0) (Adjustable Set Point); Maximum time (sec) (cycles) at 60 Hza before cessation of current to the simulated utility: 0.16 – 300 (Adjustable)

Condition G: Simulated utility source - Voltage (V): Rated; Frequency (Hz): f < 57.0; Maximum time (sec) (cycles) at 60 Hza before cessation of current to the simulated utility: 0.16

4. All models meet the surge requirements of IEEE C62.41.2-2002, Location Category B (6kV). Tests were done using ringwave and combination waveforms, both polarities, for common mode and differential mode coupling, 20 pulses each test. After surge testing the unit was operational with control functionally verified by frequency and voltage disconnect tests.

PART B:

Stand-alone Inverter/Charger/Utility-Interactive Inverter, Model XW4024-120/240-60, with Conduit Box supplied are permanently connected, fixed equipment. System ratings as follows:

Grid-interactive Mode

Maximum System Voltage: 29 V dc (Input), 264 V ac (Output)

Range of Operating DC Voltage: 23 – 29 Vdc

Max. Operating Current (DC): 220 A

Maximum Input Short Circuit Current (DC): 3000 A

Max. Utility Backfeed Current (AC): 0 A

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Certificate:	1873035	**Master Contract:**	159409
Project:	1981978	**Date Issued:**	2008/03/26

Output Power Factor Rating: >0.98

Operating Voltage Range (AC): 211 - 264 V ac

Operating Frequency Range: 59.4 - 60.4 Hz

Nominal Output Voltage (AC): 240 V ac

Nominal Output Frequency: 60 Hz

Maximum Continuous Output Current (AC or DC): 18Arms

Maximum Continuous Output Power (AC): 4000 W

Maximum Output Fault Current and Duration: 80A pk, ~25 milliseconds

Maximum Output Overcurrent Protection: 60 A

Utility Interconnection Voltage and Frequency Trip Limits and Trip Times: See Note 3 below

Synchronization In-rush Current: 0 A

Trip Limit and Trip Time Accuracy: +/-3V L-L, +/-1.5V L-N, +/-0.05 Hz, +/-15% trip time

Normal Operation Temperature Range: See Note 1 below.

Output Power Temperature Derating and Maximum Full Power Operating Ambient: See Note 1 below.

Charge Mode

Maximum System Voltage: 32 V dc (Output), 264 V ac (Input)

Range of Operating DC Voltage: 22 – 32 Vdc

Max. Operating Current (DC): 150 A

Maximum Input Short Circuit Current (DC): N/A

Max. Utility Backfeed Current (AC): N/A

Output Power Factor Rating: >0.98

Operating Voltage Range (AC): 120/240 V ac

Operating Frequency Range: 52 - 68 Hz

CSA INTERNATIONAL

Certificate:	1873035	**Master Contract:**	159409
Project:	1981978	**Date Issued:**	2008/03/26

Nominal Output Voltage (AC): 25.2 Vdc

Nominal Output Frequency: N/A

Maximum Continuous Output Current (AC or DC): 150 Adc

Maximum Continuous Output Power (AC): 4000 W

Maximum Output Fault Current and Duration: 6500A pk, ~1 milliseconds

Maximum Output Overcurrent Protection: 250 A

Utility Interconnection Voltage and Frequency Trip Limits and Trip Times: N/A

Synchronization In-rush Current: N/A

Trip Limit and Trip Time Accuracy: N/A

Normal Operation Temperature Range: See Note 1 below.

Output Power Temperature Derating and Maximum Full Power Operating Ambient: See Note 1 below.

Inverter Stand-alone Mode

Maximum System Voltage: 32 V dc (Output), 264 V ac (Input)

Range of Operating DC Voltage: 22 – 30 Vdc

Max. Operating Current (DC): 220A

Maximum Input Short Circuit Current (DC): 3000 A

Max. Utility Backfeed Current (AC): N/A

Output Power Factor Rating: 0 - 1.00

Operating Voltage Range (AC): 120/240 V ac

Operating Frequency Range: 60 Hz

Nominal Output Voltage (AC): 240 V ac

Nominal Output Frequency: 60 Hz

Maximum Continuous Output Current (AC or DC): 18 Arms

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Project:	1981978	**Date Issued:**	2008/03/26

Maximum Continuous Output Power (AC): 4000 W

Maximum Output Fault Current and Duration: 25A rms, ~330 milliseconds

Maximum Output Overcurrent Protection: 60 A

Utility Interconnection Voltage and Frequency Trip Limits and Trip Times: N/A

Synchronization In-rush Current: N/A

Trip Limit and Trip Time Accuracy: N/A

Normal Operation Temperature Range: See Note 1 below.

Output Power Temperature Derating and Maximum Full Power Operating Ambient: See Note 1 below.

Device: XW4024 (865-1010)

Protection & Main processor (Motorola): v1.00.00 B18

Notes:

1. Derated operation for elevated ambient temperatures: rated 4000 W continuous from -25°C to 40°C Operates at reduced power at temperatures above these ratings to 70°C max; refer to operations manual.

2. Utility-interactive evaluations were conducted with Processor (FLASH) code revision 1.00, Build 18.

3. Utility Interconnection Voltage and Frequency Trip Limits and Trip Times: Voltage and frequency limits for utility Interaction

Condition A: Simulated utility source - Voltage (V): < 0.50 Vnorb; Frequency (Hz): Rated; Maximum time (sec) (cycles) at 60 Hza before cessation of current to the simulated utility: 0.16

Condition B: Simulated utility source - Voltage (V): 0.50 Vnorb $\leq$ V < 0.88 Vnor; Frequency (Hz): Rated; Maximum time (sec) (cycles) at 60 Hza before cessation of current to the simulated utility: 2

Condition C: Simulated utility source - Voltage (V): 1.10 Vnorb < V < 1.20 Vnor; Frequency (Hz): Rated; Maximum time (sec) (cycles) at 60 Hza before cessation of current to the simulated utility: 1

Condition D: Simulated utility source - Voltage (V): 1.20 Vnor $\leq$ V; Frequency (Hz): Rated; Maximum time (sec) (cycles) at 60 Hza before cessation of current to the simulated utility: 0.16

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Condition E: Simulated utility source - Voltage (V): Rated; Frequency (Hz): f > 60.5 ; Maximum time (sec) (cycles) at 60 Hza before cessation of current to the simulated utility: 0.16

Condition F: Simulated utility source - Voltage (V): Rated; Frequency (Hz): f < (59.8 – 57.0) (Adjustable Set Point); Maximum time (sec) (cycles) at 60 Hza before cessation of current to the simulated utility: 0.16 – 300 (Adjustable)

Condition G: Simulated utility source - Voltage (V): Rated; Frequency (Hz): f < 57.0; Maximum time (sec) (cycles) at 60 Hza before cessation of current to the simulated utility: 0.16

4. All models meet the surge requirements of IEEE C62.41.2-2002, Location Category B (6kV). Tests were done using ringwave and combination waveforms, both polarities, for common mode and differential mode coupling, 20 pulses each test. After surge testing the unit was operational with control functionally verified by frequency and voltage disconnect tests.

PART C: Model XW4548-120/240-60

Stand-alone Inverter/Charger/Utility-Interactive Inverter, Model XW4548-120/240-60, with Conduit Box supplied are permanently connected, fixed equipment. System ratings as follows:

Grid-interactive Mode

Maximum System Voltage: 58 V dc (Input), 264 V ac (Output)

Range of Operating DC Voltage: 46 – 58 V dc

Max. Operating Current (DC): 120 A

Maximum Input Short Circuit Current (DC): 3000 A

Max. Utility Backfeed Current (AC): 0 A

Output Power Factor Rating: >0.98

Operating Voltage Range (AC): 214 - 264 V ac

Operating Frequency Range: 59.4 - 60.4 Hz

Nominal Output Voltage (AC): 240 V ac

Nominal Output Frequency: 60 Hz

Maximum Continuous Output Current (AC or DC): 20 Arms

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Certificate:	1873035	**Master Contract:**	159409
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Maximum Continuous Output Power (AC): 4500 VA

Maximum Output Fault Current and Duration: 425A pk, ~0.4 milliseconds

Maximum Output Overcurrent Protection: 60 A

Utility Interconnection Voltage and Frequency Trip Limits and Trip Times: See Note 3 below

Synchronization In-rush Current: 0 A

Trip Limit and Trip Time Accuracy: +/-3V L-L, +/-1.5V L-N, +/-0.05 Hz, +/-15% trip time

Normal Operation Temperature Range: See Note 1 below.

Output Power Temperature Derating and Maximum Full Power Operating Ambient: See Note 1 below.

Charge Mode

Maximum System Voltage: 64 V dc (Output), 264 V ac (Input)

Range of Operating DC Voltage: 44-64 V dc

Max. Operating Current (DC): 85 A

Maximum Input Short Circuit Current (DC): N/A

Max. Utility Backfeed Current (AC): N/A

Output Power Factor Rating: >0.98

Operating Voltage Range (AC): 120/240 V ac

Operating Frequency Range: 52 - 68 Hz

Nominal Output Voltage (AC): 50.4 V dc

Nominal Output Frequency: N/A

Maximum Continuous Output Current (AC or DC): 85 Adc

Maximum Continuous Output Power (AC): 4500 VA

Maximum Output Fault Current and Duration: 5150A pk, ~1 milliseconds

Maximum Output Overcurrent Protection: 250 A

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Certificate:	1873035	**Master Contract:**	159409
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Utility Interconnection Voltage and Frequency Trip Limits and Trip Times: N/A

Synchronization In-rush Current: N/A

Trip Limit and Trip Time Accuracy: N/A

Normal Operation Temperature Range: See Note 1 below.

Output Power Temperature Derating and Maximum Full Power Operating Ambient: See Note 1 below.

Inverter Stand-alone Mode

Maximum System Voltage: 64 V dc (Output), 264 V ac (Input)

Range of Operating DC Voltage: 44 – 64 V dc

Max. Operating Current (DC): 120 A

Maximum Input Short Circuit Current (DC): 3000 A

Max. Utility Backfeed Current (AC): N/A

Output Power Factor Rating: 0 - 1.00

Operating Voltage Range (AC): 120/240 V ac

Operating Frequency Range: 60 Hz

Nominal Output Voltage (AC): 240 V ac

Nominal Output Frequency: 60 Hz

Maximum Continuous Output Current (AC or DC): 48 Arms

Maximum Continuous Output Power (AC): 4500 VA

Maximum Output Fault Current and Duration: 925A pk, ~0.5milliseconds

Maximum Output Overcurrent Protection: 30 A

Utility Interconnection Voltage and Frequency Trip Limits and Trip Times: N/A

Synchronization In-rush Current: N/A

Trip Limit and Trip Time Accuracy: N/A

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Normal Operation Temperature Range: See Note 1 below.

Output Power Temperature Derating and Maximum Full Power Operating Ambient: See Note 1 below.

Device: XW4548 (Xantrex part no. 865-1005)

Protection & Main processor (Motorola): v1.00.00 B10

Notes:

1. Derated operation for elevated ambient temperatures: rated 4500 W continuous from -25°C to 40°C. Operates at reduced power at temperatures above these ratings to 70°C max; refer to operations manual for derating curves.

2. Utility-interactive evaluations were conducted with Processor (FLASH) code revision 1.00, Build 10.

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voltage disconnect tests.

PART D: AC/DC power distribution panel (PDP), Model XW PDP, permanently connected.

Maximum System Voltage (DC): 150V dc

Maximum Battery System Voltage: 62 V dc (48V nominal)

Maximum System Voltage (AC): 140/280V ac

Maximum. Operating Current (DC): 150 A (PV)

Maximum Continuous Output Current (AC): 48A (2-pole Grid) x3circuits

Maximum Continuous Output Current (AC): 48A (2-pole Gen) x3 circuits

Maximum Continuous Output Current (AC): 48A (2-pole Load) x3 circuits

Maximum Continuous Power (AC): 3 x 6000 W

Maximum Continuous Power (DC): 2 x 3400W

Maximum Over-cur ent Protection (AC): 60 A

Maximum Over-current Protection (DC): 250A

Notes:

1. Evaluated for use with up to two CSA certified Xantrex Technology Inc., Inverter/Charger Model XW6048-120/240-60 and XW-MPPT60-150 Charge Controllers. This accessory is a circuit-breaker sub-panel that provides a balance-of-system. It accommodates both AC and DC circuit breakers for over-current protection and disconnect functionality for the XW6048 inverter charger, XW-MPPT charge controllers, AC generators and the AC load circuits.

APPLICABLE REQUIREMENTS

CAN/CSA-C22.2 No. 0-M91 - General Requirements - Canadian Electrical Code - Part II

0.4-04 - Bonding of Electrical Equipment

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107.1-01 - General Use Power Supplies

UL Std No. 1741-First Edition - Static Inverters and Charge Controllers for Use in Photovoltaic Power Systems (Including Revisions through and including November 7, 2005)

TABLE OF CONTENTS

Viktor Peter

From: <[redacted]>
To: <[redacted]>
Cc: <[redacted]>
Sent: Monday, March 22, 2010 7:41 AM
Subject: RE: Solar System

Mr. Polivka,

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CHRIS LINDSEY
TUCSON ELECTRIC POWER
ENERGY SERVICES
MAILSTOP DS502
520.918.8304

From: Anderson, Blanka
Sent: Friday, March 19, 2010 11:44 AM
To: Lindsey, Christopher
Subject: FW: Solar System

Chris: See below.

Thanks,

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Sent: Friday, March 19, 2010 11:44 AM
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Viktor Peter

From: <CLindsey@tep.com>
To: [redacted]
Sent: Tuesday, March 30, 2010 11:50 AM
Subject: RE: Solar System

Mr. Polivka,

I think it would be best if I can come take a look at your system before we move forward. Are you available on Thursday or Friday? Thanks.

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From: Viktor Peter [redacted]
Sent: Monday, March 22, 2010 12:48 PM
To: Lindsey, Christopher
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Sent: Thursday, April 01, 2010 6:16 AM
Subject: RE: Solar System

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Sent: Thursday, April 01, 2010 8:21 AM
Subject: RE: Solar System

See you tomorrow at 8AM. Thanks.

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520.918.8304

From: Viktor Peter [[redacted]]
Sent: Thursday, April 01, 2010 8:12 AM
To: Lindsey, Christopher
Subject: Re: Solar System

Friday is OK --I'll be home most of the time that day, unless you give me a time when to expect you, I'll make certain I'm here..Polivka

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> **From:** CLindsey@tep.com
> **To:** [redacted]
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Subject: RE: Solar System

Blanka: Just checking as of the status of my aplication for the incentive for my solar system.. Since I've not heard from anyone lately I assume that the "deal is off", no interest by TEP, since they can not "profit" from my system.. Please let me know, and I'll just put the subject to sleep. I alredy shut down 66% of the sytems capacity to harvest, since for my household use I do not need it.. Thanks, Polivka

Viktor Peter

From: <CLindsey@tep.com>
To: [redacted]
Sent: Wednesday, April 07, 2010 10:46 AM
Subject: RE: Solar System (metering)

Mr. Polivka,

I got your message and tried to call back. After further discussion, the only option we have is to approve this as an off-grid system. There is no way to meter your system for the data we need and this is what we have done for a similar system in the past. Unfortunately, the incentive is less than on-grid and you will still need a permit with the city for us to inspect your system and pay incentive. Give me a call when you can so we can discuss this further. Thank you for your patience with myself throughout this process.

CHRIS LINDSEY
TUCSON ELECTRIC POWER
ENERGY SERVICES
MAILSTOP DS502
520.918.8304

From: Viktor Peter [redacted]
Sent: Saturday, April 03, 2010 9:35 AM
To: Lindsey, Christopher
Subject: Re: Solar System (metering)

Chris:

After good nights sleep, I beleive I came up with the solution for the metering "problem". Actualy it is so simple I feel stupid for not seeing it sooner --I guess I did not understand the problem--- Matter of fact both of us even touched the line where this meter needs to be located,
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This is what I beleive TEP is looking for anyway, meter out what I consume as well a register what I return/feed to the grid. Hence, TEP will read the Net Meter monthly to see what I'm sending to the grid (negative/positive), and then read the "secondary meter" monthly to be added to the TOTAL AC CURRENT production from my solar array's-- this is not what I'll be billed for but merely to account for the in house sonsumtion. The Net Meter will then take care of the "consumtion/production" for billing/credit purposes.

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----- Original Message -----
From: CLindsey@tep.com
To: [redacted]
Sent: Thursday, April 01, 2010 8:21 AM
Subject: RE: Solar System

See you tomorrow at 8AM. Thanks.

CHRIS LINDSEY
TUCSON ELECTRIC POWER
ENERGY SERVICES
MAILSTOP DS502
520.918.8304

From: Viktor Peter [redacted]
Sent: Thursday, April 01, 2010 8:12 AM
To: Lindsey, Christopher
Subject: Re: Solar System

Friday is OK --I'll be home most of the time that day, unless you give me a time when to expect you, I'll make certain I'm here..Polivka

----- Original Message -----
From: CLindsey@tep.com
To: [redacted]
Sent: Thursday, April 01, 2010 6:16 AM
Subject: RE: Solar System

Mr. Polivka,

How does Friday around 8am sound for you? Thanks.

CHRIS LINDSEY
TUCSON ELECTRIC POWER
ENERGY SERVICES
MAILSTOP DS502
520.918.8304

From: Viktor Peter [mailto:ppolivka1@cox.net]
Sent: Tuesday, March 30, 2010 2:33 PM
To: Lindsey, Christopher
Subject: Re: Solar System

Chris: Sure come by anytime, am open the rest of the week....See you soon..Polivka

----- Original Message -----
From: CLindsey@tep.com
To: [redacted]
Sent: Tuesday, March 30, 2010 11:50 AM
Subject: RE: Solar System

Mr. Polivka,

I think it would be best if I can come take a look at your system before we move forward. Are you available on Thursday or Friday? Thanks.

CHRIS LINDSEY
TUCSON ELECTRIC POWER
ENERGY SERVICES
MAILSTOP DS502
520.918.8304

From: Viktor Peter [redacted]
Sent: Monday, March 22, 2010 12:48 PM
To: Lindsey, Christopher
Cc: Anderson, Blanka
Subject: Re: Solar System

Mr. Lindsey: Thank you for yot reply..However, after re rerading the TEP requirements, only the "Preformance Based System" is required to imeter ncomming (harvested current) Wh metering.. I certainly am not "interested" in that program... Before I do that, I'll rather "go off the grid entirely" (disconnected from the grid in the last few days, to test my ability to stand alone, without "any": TEP support and stand alone system. The reason I chose the "battery backup system" is to be able to have uninterrupted electric system during brown outs and major powewr grid failures-- diue to my mewdical condition, I indeed "need electicity" 24/7 to keep my medications in the fridge as well a AC since some of my medications make me severy "sensitive" to HOT WEATHER... I get seriously dizzy and vomit continualy.. That is one of the side effects of the meds! Withput the AC I would have to be hospitalized (I exprerinced this condition 2 summers ago, (that was the worst condition, but I was living in a park, where the "managfement" was re selling / fulti meyering & overchagrging for electicity from TEP - as they claimed; WE ARE THE UTILITY COMPANY and CAN DO AS WE Want, when I was withoput electicity for continuous 5 days) This is the main reason for me intalling the Soilar System, MY HEALTH and since the utility can to guaranty service, I had to take care of the problem myself and my own expence! I invested in my life/survival.

Oddly enough, Tucson Meadows (was and still is) running a private electric company using "outdarted meters --Westinghouse Type C that were purchased as "used/defective surpllus" in 70's as the national electic companies ceased using the meters as UN RELIABLE --Jeweled & iron magnets -- known in the industry as "Westies" manufactured by Westinghouse during the 1933-1957 period.. When i complained for the "questionable accurcy of meters, they even refuzed to have the meters qualified/calibrated (after a serious rsearch, I checked what the calibration was prescribed _ at full load max of 30 RPM on the disk, and the creep was not to exceed 2 Revs per minute (under a 50 AMP load, the disk rotaded at 72 RPM and creep was set a 7 RPM) This now I can proove by comparing my electric bill to the current --where TEP charged me$120.00 for 880 Wh as compared to the Meadow electri bill charging $220.00 for 550 Wh(almost double the TEP rate). Meadows did not even have (still does not have) a licensed electician on the staff. Matter of fact, due to sever "power out for at least 2 day per week, they last summer CHANGED the transformer fuses from 100Ampsz to 200 Amps to minimie the re occuring weekly "power out" all year long (by the way, my systerm detected that their "normal" frequency was in the 70-22 Hrz range--I guess to help the meter tpo run a bit faster????In the past I called TEP to hae the "meters checked and claibrated" but was told, TEP v=can not do this, since it is on private propriety--so TEP is indeed aware of ther"problem!"

Thanks again for your cooperation, and I'll see what develops, in the mean time I'll run "off the grid"(may have to add a few batteries to my system, since sunlight is only available in Tucson for around 85% on the days) 305 summy days annaualy, so I 'll not need the "grid support "then.. Polivka

- Original Message -----

From: CLindsey@tep.com
To: [redacted]
Cc: BAnderson@tep.com
Sent: Monday, March 22, 2010 7:41 AM
Subject: RE: Solar System

Mr. Polivka,

Don't give up just yet. We are still evaluating your system and the drawings you sent over to us for the metering arrangement. Please bear with me because we should be able to find a place for your system. Unfortunately, I am sick today and won't have the chance to further discuss your situation internally. You should hear from me soon. Thanks.

CHRIS LINDSEY
TUCSON ELECTRIC POWER

ENERGY SERVICES
MAILSTOP DS502
520.918.8304

From: Anderson, Blanka
Sent: Friday, March 19, 2010 11:44 AM
To: Lindsey, Christopher
Subject: FW: Solar System

Chris: See below.

Thanks,

BA
-----Original Message-----
From: Viktor Peter [redacted]
Sent: Friday, March 19, 2010 11:44 AM
To: Anderson, Blanka
Subject: RE: Solar System

Blanka: Just checking as of the status of my aplication for the incentive for my solar system.. Since I've not heard from anyone lately I assume that the "deal is off", no interest by TEP, since they can not "profit" from my system.. Please let me know, and I'll just put the subject to sleep. I alredy shut down 66% of the sytems capacity to harvest, since for my household use I do not need it.. Thanks, Polivka

Viktor Peter

From: <CLindsey@tep.com>
To: [redacted]
Sent: Wednesday, April 07, 2010 2:05 PM
Subject: RE: Solar System (metering)

Mr. Polivka,

The location you are talking about will measure the usage of your house, not the output from your system. The meter in the location you suggest will indeed only turn in one direction and only when you are using electricity. But this meter will not be able to tell if the energy is coming from your system or TEP. That is the problem. We need to meter the output of your system.

CHRIS LINDSEY
TUCSON ELECTRIC POWER
ENERGY SERVICES
MAILSTOP DS502
520.918.8304

From: Viktor Peter [redacted]
Sent: Wednesday, April 07, 2010 1:31 PM
To: Lindsey, Christopher
Subject: Re: Solar System (metering)

Chris: Sorry, but because someone else could not finbd the solution does not mean that it can not be done! Over last week ent I worked on the "problem" and I did come up with a way to METER the entire system.The line I isolated that has current running only in ONE DIRECTION,(accessed very easily in my set up) is the line that feeds the house distribution panel -- all current used by my home will have to be metered there -- That line is separeate from the GRID TIE IN, thus a true reading can be obtained there. The Grid Tie In line had 2 way trafic, , thus that will be controlled/ metered by the Net Meter. Thus if indeed TEP is interested in my system, I can PROVE MY will indded met your "srequirement". All I need is a conventional meter that is now connected to the grid, metering my house power .usage... Everithing is [possible if one decideds to make it work, just takes the extras effort.. Polivka

> ----- Original Message -----
> **From:** CLindsey@tep.com
> **To:** [redacted]
> **Sent:** Wednesday, April 07, 2010 10:46 AM
> **Subject:** RE: Solar System (metering)
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>
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From: Viktor Peter [redacted]
Sent: Saturday, April 03, 2010 9:35 AM
To: Lindsey, Christopher
Subject: Re: Solar System (metering)

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After good nights sleep, I beleive I came up with the solution for the metering "problem". Actualy it is so simple I feel stupid for not seeing it sooner --I guess I did not understand the problem--- Matter of fact both of us even touched the line where this meter needs to be located,
We need a feed line where there is only ONE WAY CURRENT TRAFIC. This location is at the HOUSE DISTRIBUTION PANEL, where current comes in to feed the house from inverter or grid, and TEP needs to meter "what current I'm using asside of what is sent to the Net Meter. Hence, I'll need to "interupt the main desitribution panel, run it to a "conventional meter and the back into the distribution panel". This then will read out the current I'm using, regardless of the source it is comming from!..

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From: CLindsey@tep.com
To: [redacted]
Sent: Thursday, April 01, 2010 8:21 AM
Subject: RE: Solar System

See you tomorrow at 8AM. Thanks.

CHRIS LINDSEY
TUCSON ELECTRIC POWER
ENERGY SERVICES
MAILSTOP DS502
520.918.8304

From: Viktor Peter [mailto:ppolivka1@cox.net]
Sent: Thursday, April 01, 2010 8:12 AM
To: Lindsey, Christopher
Subject: Re: Solar System

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TUCSON ELECTRIC POWER
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From: Viktor Peter [redacted]
Sent: Tuesday, March 30, 2010 2:33 PM
To: Lindsey, Christopher
Subject: Re: Solar System

Chris: Sure come by anytime, am open the rest of the week....See you soon..Polivka

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Sent: Monday, March 22, 2010 12:48 PM
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Cc: Anderson, Blanka
Subject: Re: Solar System

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Thanks again for your cooperation, and I'll see what develops, in the mean time I'll run "off the grid"(may have to add a few batteries to my system, since sunlight is only available in Tucson for around 85% on the days) 305 summy days annaualy, so I 'll not need the "grid support "then.. Polivka

Original Message -----

From: CLindsey@tep.com
To: [redacted]
Cc: BAnderson@tep.com
Sent: Monday, March 22, 2010 7:41 AM
Subject: RE: Solar System

Mr. Polivka,

Don't give up just yet. We are still evaluating your system and the drawings you sent over to us for the metering arrangement. Please bear with me because we should be able to find a place for your system. Unfortunately, I am sick today and won't have the chance to further discuss your situation internally. You should hear from me soon. Thanks.

CHRIS LINDSEY
TUCSON ELECTRIC POWER
ENERGY SERVICES
MAILSTOP DS502
520.918.8304

From: Anderson, Blanka
Sent: Friday, March 19, 2010 11:44 AM
To: Lindsey, Christopher
Subject: FW: Solar System

Chris: See below.

Thanks,

BA

-----Original Message-----
From: Viktor Peter [redacted]
Sent: Friday, March 19, 2010 11:44 AM
To: Anderson, Blanka
Subject: RE: Solar System

Blanka: Just checking as of the status of my aplication for the incentive for my solar system.. Since I've

not heard from anyone lately I assume that the "deal is off", no interest by TEP, since they can not "profit" from my system.. Please let me know, and I'll just put the subject to sleep. I alredy shut down 66% of the sytems capacity to harvest, since for my household use I do not need it.. Thanks, Polivka

Viktor Peter

From: <CLindsey@tep.com>
To: [redacted]
Sent: Wednesday, April 07, 2010 3:27 PM
Subject: RE: Solar System (metering)

Mr. Polivka,

Because your home still ties to the grid, it will require a permit for us to approve your system. We will however be accepting you into the off-grid program because of the challenges in metering. Let Blanka or myself know when you pass the final inspection and we can inspect and approve the system. Thanks.

CHRIS LINDSEY
TUCSON ELECTRIC POWER
ENERGY SERVICES
MAILSTOP DS502
520.918.8304

From: Viktor Peter [redacted]
Sent: Wednesday, April 07, 2010 1:31 PM
To: Lindsey, Christopher
Subject: Re: Solar System (metering)

Chris: Sorry, but because someone else could not finbd the solution does not mean that it can not be done! Over last week ent I worked on the "problem" and I did come up with a way to METER the entire system.The line I isolated that has current running only in ONE DIRECTION,(accessed very easily in my set up) is the line that feeds the house distribution panel -- all current used by my home will have to be metered there -- That line is separeate from the GRID TIE IN, thus a true reading can be obtained there. The Grid Tie In line had 2 way trafic, , thus that will be controlled/ metered by the Net Meter. Thus if indeed TEP is interested in my system, I can PROVE MY will indded met your "srequirement". All I need is a conventional meter that is now connected to the grid, metering my house power .usage... Everithing is [possible if one decideds to make it work, just takes the extras effort.. Polivka

> ----- Original Message -----
> **From:** CLindsey@tep.com
> **To:** [redacted]
> **Sent:** Wednesday, April 07, 2010 10:46 AM
> **Subject:** RE: Solar System (metering)
>
> Mr. Polivka,
>
> I got your message and tried to call back. After further discussion, the only option we have is to approve this as an off-grid system. There is no way to meter your system for the data we need and this is what we have done for a similar system in the past. Unfortunately, the incentive is less than on-grid and you will still need a permit with the city for us to inspect your system and pay incentive. Give me a call when you can so we can discuss this further. Thank you for your patience with myself throughout this process.
>
> **CHRIS LINDSEY**
> **TUCSON ELECTRIC POWER**
> **ENERGY SERVICES**
> **MAILSTOP DS502**
> **520.918.8304**
>
> **From:** Viktor Peter [mailto:ppolivka1@cox.net]

Sent: Saturday, April 03, 2010 9:35 AM
To: Lindsey, Christopher
Subject: Re: Solar System (metering)

Chris:

After good nights sleep, I beleive I came up with the solution for the metering "problem". Actualy it is so simple I feel stupid for not seeing it sooner --I guess I did not understand the problem--- Matter of fact both of us even touched the line where this meter needs to be located,
We need a feed line where there is only ONE WAY CURRENT TRAFIC. This location is at the HOUSE DISTRIBUTION PANEL, where current comes in to feed the house from inverter or grid, and TEP needs to meter "what current I'm using asside of what is sent to the Net Meter. Hence, I'll need to "interupt the main desitribution panel, run it to a "conventional meter and the back into the distribution panel". This then will read out the current I'm using, regardless of the source it is comming from!..

Therefore, I'll need a Net Meter on the grid line comming in from TEP. That meter will keep track of all current comming in or going to the grid. The second meter on the (my house) distribution panel will then read what ever current the house is consuming, regadless of the source. The only differen e is that in the event of a "power out situation" it will then still read my consumtion from the inverters, but not send any current to the grid....

This is what I beleive TEP is looking for anyway, meter out what I consume as well a register what I return/feed to the grid. Hence, TEP will read the Net Meter monthly to see what I'm sending to the grid (negative/positive), and then read the "secondary meter" monthly to be added to the TOTAL AC CURRENT production from my solar array's-- this is not what I'll be billed for but merely to account for the in house sonsumtion. The Net Meter will then take care of the "consumtion/production" for *billing/credit purposes*.

The only "glitch" will be if I completly shut down the inverters,and set my control panel breakers on BYPASS MODE, the the Net Meter will register my "negative consumption" as well as the secondary meter will still register the house current consumtion, since that meter will not be able to descriminate where the current came from (grid or inverter)--unless someone invents how to add coloring to the sepatrate currents? just kidding-- Under this condition, TEP will still be able to bill me for what I consumed as per Net Meter reading, however, the secondary meter will still register my house consumtion for the period the inverters where shut down-- Hence the reading on the secondary meter can not be used for that period as "production"to off set the NET Reading. But I trust, that this condition also occurs on a system without batteries, since the solar array is still harvesting energy but not producing current' The oly way I can see to eliminate this "issue" is to put a "meter bypass braker" in the line so my house can use grid current wihtout it being registered on the secondary meter --Then and if I shut down the inverters (manualy placing it on By Pass) I also will need to activate the the By Pass by the secondary meter so TEP does not read the meter as "produced current"--suppose I could put in a relay that will automatically switch to BY PASS when the inverters are shut down the meter but also allow grid current to feed the house directly. Matter of fact is I use a normaly open 12VDC relay --the XW's have a Aux Jack that can be set to the relay when on activating the meter-- (activated by the inverters) and when shut down it will switch automatically to BY PASS to allow the current from the grid to feed the house bypassing the meter.. The cost of this set up , is dependent on where the "secondary meter will be located (wires, conduit etc. The 50 AMP relay is somewhere around $40.00).

As I metioned, I called Xeanterx regarding the XW Config software, and finaly after one year of trying to make it work (I purchased a dedicted laptop and had Windows XP instaled, moed the uniy closer to the inerters etc, etc,, Nothing worked as expected), they finnaly admitted that ther XW Config indeed is not able to funcion as advertized-- it will keep a log for only one hour per 24 hour period, if its working. The story is when they "purchased " the company from trace, it came with the packege, but apparently, Trace did not completly finish the project,or updated the software. However, NOW they have a NEW and IMPROVED product, the XantrexCommunication Gateway system --at $1.000.00 plus plus routers and other addational hardware-- I download the "information" on the product, and it appears that this was developed by some Russian Company -- some of the information in the manual is even still in Russian, Xantrex did not bother to translate-- and aftre reading 200 some pages of "instruction", I decided that it is "not as good/functional" as they would like. Nothing is guarnteed that it will work properly or do what is need. It is an other "toy" that may or not work.. I'll just keep my money in my pocket on this one, since I learned from my XW Config that never worke and I just was spending cash for a "dream".... I do not know what will happen to Xantrex in the future, but as I mentioned, I worked for Schuller in 1961, the new owneres of Xantrex, and to this day they still owe me 2 weeks of earned

paid vacation I tried to "collect" when I returned Southwest Asia (US ARMY) in 1967but they never paid me to thid day-I guess the corporate ethics still remain the same--
The XW inveters ever designed by Trace (top name in invereters at the time) I had 2 stacked inverters from Trace for 11 years without any problems, that are still working to this day in the system I built in 1986 as they did the first day. Also Xantrex design facility is in Canada and the production is in Mexico, but apparently, Schuller is now switching the procudtion lines to China., Who know what will happen to the "quality" of the future products comming from Schuller. This is the reason! purchased 3 inverters --so I've a spare-- since I realy only need 2 (at 18 Amps each) I can remain functionning without any interruption (the house load, with Ac requires but 28 Amps max) My current system is capable of putting out 54 Amps or 12K watts, but I only use up 30% of the capacity at present.

Finnaly, it would be helpfull, TEP would install the Net Meter ASAP for starts (no need to pay me for the cuurent I send down the grid at this time), that way I'll not have to shut down 2 out of 3 controllers to run, (since the unused harwested current merely converts to heat anyway) until we resolve the technical problem of metering the "production", That way I'll be able to better judge what the system is capable of producing at max power output when conditions allow. s I metioned I tested running the sytem with only one array, and consistently each controller by itself was delivering aprox 10 -14K Wh that was based on a 10 hour of Sun per day(on overcast/rainy days I still harvest 9-11K Wh,(no need to use grid power)wich is sufficient to maintain my current needs without the need to but now the harvesting times are incresing every day, and will reach 14 Hr s sunlight soon. My constant consumtion is between 8-12K Wh per day, depending if I use the electric drier or AC. Last month I was running on the "grid support mode" setting and used 140Wh from the grid. This last month (still on Grid Support) I used 180 Wh, but I did some "welding for 2 days with my 240 wire welder). Now for ther next billing period I set the inerters to "invert" without grid support (yesterday I used some grid power for 2 hrs when you were here checking), but swithced back to "invert" when you left. This then will give me an idea how well the system works in a "stand alone mode"in the even I need to go "off grid"if the metering problem can not be resolved... Then I'll be certain that I can run my system for all my "needs": Ac, elect drier as well welding when harvesting conditions allow. Hopefully, the TEP meter will only show the 2 hrs I used this comming billing period. Hence, I prefer to use the "grid support mode", but if neded I'll go to "invet mode", with no grid tie. As I undertand, I then will not even need a "permit" for the system if I'm in a "stand alone mode" Thanks, Polivka

----- Original Message -----
From: CLindsey@tep.com
To: [redacted]
Sent: Thursday, April 01, 2010 8:21 AM
Subject: RE: Solar System

See you tomorrow at 8AM. Thanks.

CHRIS LINDSEY
TUCSON ELECTRIC POWER
ENERGY SERVICES
MAILSTOP DS502
520.918.8304

From: Viktor Peter [redacted]
Sent: Thursday, April 01, 2010 8:12 AM
To: Lindsey, Christopher
Subject: Re: Solar System

Friday is OK --I'll be home most of the time that day, unless you give me a time when to expect you, I'll make certain I'm here..Polivka

----- Original Message -----
From: CLindsey@tep.com
To: [redacted]
Sent: Thursday, April 01, 2010 6:16 AM
Subject: RE: Solar System

Mr. Polivka,

How does Friday around 8am sound for you? Thanks.

CHRIS LINDSEY
TUCSON ELECTRIC POWER
ENERGY SERVICES
MAILSTOP DS502
520.918.8304

From: Viktor Peter [redacted]
Sent: Tuesday, March 30, 2010 2:33 PM
To: Lindsey, Christopher
Subject: Re: Solar System

Chris: Sure come by anytime, am open the rest of the week....See you soon..Polivka

----- Original Message -----
From: CLindsey@tep.com
To: [redacted]
Sent: Tuesday, March 30, 2010 11:50 AM
Subject: RE: Solar System

Mr. Polivka,

I think it would be best if I can come take a look at your system before we move forward. Are you available on Thursday or Friday? Thanks.

CHRIS LINDSEY
TUCSON ELECTRIC POWER
ENERGY SERVICES
MAILSTOP DS502
520.918.8304

From: Viktor Peter [redacted]
Sent: Monday, March 22, 2010 12:48 PM
To: Lindsey, Christopher
Cc: Anderson, Blanka
Subject: Re: Solar System

Mr. Lindsey: Thank you for yot reply..However, after re rerading the TEP requirements, only the "Preformance Based System" is required to imeter ncomming (harvested current) Wh metering.. I certainly am not "interested" in that program... Before I do that, I'll rather "go off the grid entirely" (disconnected from the grid in the last few days, to test my ability to stand alone, without "any": TEP support and stand alone system. The reason I chose the "battery backup system" is to be able to have uninterrupted electric system during brown outs and major powewr grid failures-- diue to my mewdical condition, I indeed "need electicity" 24/7 to keep my medications in the fridge as well a AC since some of my medications make me severy "sensitive" to HOT WEATHER... I get seriously dizzy and vomit continualy.. That is one of the side effects of the meds! Withput the AC I would have to be hospitalized (I exprerinced this condition 2 summers ago, (that was the worst condition, but I was living in a park, where the "managfement" was re selling / fulti meyering & overchagrging for electicity from TEP - as they claimed; WE ARE THE UTILITY COMPANY and CAN DO AS WE Want, when I was withoput electicity for continuous 5 days) This is the main reason for me intalling the Soilar System, MY HEALTH and since the utility can to guaranty service, I had to take care of the problem myself and my own expence! I invested in my life/survival.

Oddly enough, Tucson Meadows (was and still is) running a private electric company using "outdarted meters --Westinghouse Type C that were purchased as "used/defective surplus" in 70's as the national electic companies ceased using the meters as UN RELIABLE --Jeweled & iron magnets -- known in the

Industry as "Westies" manufactured by Westinghouse during the 1933-1957 period.. When i complained for the "questionable accurcy of meters, they even refuzed to have the meters qualified/calibrated (after a serious rsearch, I checked what the calibration was prescribed _ at full load max of 30 RPM on the disk, and the creep was not to exceed 2 Revs per minute (under a 50 AMP load, the disk rotaded at 72 RPM and creep was set a 7 RPM) This now I can proove by comparing my electric bill to the current --where TEP charged me$120.00 for 880 Wh as compared to the Meadow electri bill charging $220.00 for 550 Wh (almost double the TEP rate). Meadows did not even have (still does not have) a licensed electician on the staff. Matter of fact, due to sever "power out for at least 2 day per week, they last summer CHANGED the transformer fuses from 100Ampsz to 200 Amps to minimie the re occuring weekly "power out" all year long (by the way, my systerm detected that their "normal" frequency was in the 70-22 Hrz range--I guess to help the meter tpo run a bit faster????In the past I called TEP to hae the "meters checked and claibrated" but was told, TEP v=can not do this, since it is on private propriety--so TEP is indeed aware of ther"problem!"

Thanks again for your cooperation, and I'll see what develops, in the mean time I'll run "off the grid"(may have to add a few batteries to my system, since sunlight is only available in Tucson for around 85% on the days) 305 summy days annaualy, so I 'll not need the "grid support "then.. Polivka

- Original Message -----

From: CLindsey@tep.com
To: [redacted]
Cc: BAnderson@tep.com
Sent: Monday, March 22, 2010 7:41 AM
Subject: RE: Solar System

Mr. Polivka,

Don't give up just yet. We are still evaluating your system and the drawings you sent over to us for the metering arrangement. Please bear with me because we should be able to find a place for your system. Unfortunately, I am sick today and won't have the chance to further discuss your situation internally. You should hear from me soon. Thanks.

CHRIS LINDSEY
TUCSON ELECTRIC POWER
ENERGY SERVICES
MAILSTOP DS502
520.918.8304

From: Anderson, Blanka
Sent: Friday, March 19, 2010 11:44 AM
To: Lindsey, Christopher
Subject: FW: Solar System

Chris: See below.

Thanks,

BA
-----Original Message-----
From: Viktor Peter [redacted]
Sent: Friday, March 19, 2010 11:44 AM
To: Anderson, Blanka
Subject: RE: Solar System

Blanka: Just checking as of the status of my aplication for the incentive for my solar system.. Since I've not heard from anyone lately I assume that the "deal is off", no interest by TEP, since they can not

"profit" from my system.. Please let me know, and I'll just put the subject to sleep. I alredy shut down 66% of the sytems capacity to harvest, since for my household use I do not need it.. Thanks, Polivka

Viktor Peter

From: <CLindsey@tep.com>
To: <[redacted]>
Cc: <BAnderson@tep.com>; <GabeTorres@Tep.com>
Sent: Thursday, April 08, 2010 7:25 AM
Subject: RE: Grid connection disconnected

Mr. Polivka,

If you do plan to completely disconnect from the grid as stated below, you would still qualify for the off-grid incentive. As I understand it, we would not require a permit for this application any longer. Please contact customer service to start the disconnect process. Once that is complete, please notify Blanka or myself if you are still interested in participating in the off-grid program. Thank you.

CHRIS LINDSEY
TUCSON ELECTRIC POWER
ENERGY SERVICES
MAILSTOP DS502
520.918.8304

From: Viktor Peter [redacted]
Sent: Wednesday, April 07, 2010 10:25 PM
To: Lindsey, Christopher
Subject: RE: Grid connection disconnected

Chris: as per your last Email, I decide we reached the " point of no return". Althouygh I've not been using any grid power-- I've been on straight invert for the last 25 days, and only coonnected last Friday, for a few hous when you came in for the "inspection" today I phisically removed, the last tie to the "umbilical cord", the 100Amp breaker under the meter, to waterproofed the post, I insolated the disconnected wire and put a lenght of "duct tape" over the openning that was left behind where the braker was mounted.

Hence you may sent over a serevice tech to take the old Wh meter out, and I'll contact TEP to come a take the last meter reading(there are 5Wh registered on the meter, used when you came by to inspect/test.

Thank you for your coperation, but now I'm FREE AT LAST!

Polivka

Viktor Peter

From: <BAnderson@tep.com>
To: <[redacted]>
Cc: <CLindsey@tep.com>
Sent: Friday, April 16, 2010 2:33 PM
Subject: RE: Dissconnection from the Grid

Viktor: I understand that has been an experience for you and I certainly apologize. I've been in and out of training all week and could not sit down and address your e-mail. I know that you and our engineer Chris spoke at length about the different options open to you - Off-Grid/On-Grid and the ramifications thereof. As the system was installed and then the utility was contacted, it has made the road more difficult in addition to the fact that this is a battery back up system. Certainly not impossible roadblocks mind you, but we do have to follow our ACC approved program.

We have no intention in any way of penalizing you for the installation of your system as you are aware self installation is an option. We have an will continue to work with you in regards to your incentive payment. I'll work with Chris to send you a certified letter next week outlining the incentive payment and ask that you agree in writing. Our payment system has been in upgrade mode, so I've not been able to process payments and upon agreement between all will pay your incentive.

Thank you,

Blanka

-----Original Message-----
From: Viktor Peter [redacted]
Sent: Friday, April 16, 2010 11:28 AM
To: Anderson, Blanka
Subject: RE: Dissconnection from the Grid

Blanka:

As per your Email dated 04/13/2001, I you were going to send me in writing the "fin al" decison of whay i was denied a Grid Tie aceptance application. Toiday is now the 04/16/2001, and still jno answer.

I NEED, ANM AM ENTILED BY LAW, EVERITHING IN WRITING, WHY MY APPLICATION WAS DENIED FOR A GRID TIE INCENTIVE!.

Also, now that a decision by TEP was made, I also would ewquest that you "return" my signed application for Grid Tie, stating why it waqs denied! Furthemore, I with the application, I also enclosed several Xantrex Manual, Certitficate oif Complience etc.. I would greatly appreciate if you would sen them back to me --I'ts mine propriety and since now you no longer need it, I like it back -By the way, TEP has that information/manaul that they received when they purchased a Xantrex inverter and conroller for your "study" of the equipmet.
I'll no longer debate the "issues" with TEP, but I(did contact the " Federal Authorires" that oversee the Renewable Energy Program", and according to them, there are not legaly mandeted restriction of "Battery Systems", "Mobile Homes "or the" Age of the applicant" - that is something the local utility is imposwing, without Federal Sancions. The ""Tarif" that is attached to EACH customers electric bill, is "coloected" from all electricity consumers to create a fund for the "icentivres: for the public to go Solar...I was infromed. and they will like to review my system to see if it was "denied" as prerscribed by Law...

According to my "estimates", TEP collects between 4 to 5 Million Dollars annualy for the "renewable energy fund", yet apparently only 139 homes have been enlisted in the incentive program, wher e TEP only spend on the average of $200.00 annualy, thus there seemms to be an accountig "flaw" somewhere of milliomns of dollars -where is it, or how it was used, is off great interest to the "authorities as well the public..But that is an other issue, and you my rerad about my "progres" on my we site, as soon as I publish it-- Something

smell here,. and I'll seach for the answer, what the TEP GO GREEN Program is all about, is it to reduce oil consumtion in tyhe production of energy, or merely it refers to the Color of the GREEN DOLLAR that goess in the TEP Bank Accounts?

I'll accept your decision,to deny my system. and also the fact that I was "ordered" to dissconnect from the grid by TEP, since I was only approved for a OFF GRID SYSTEM! (I did as soon as I was infromed of the facts, and disconnected on 04/13/2010 @ 4:00PM, but the official TEP disconnect was made on 04/15/2010, where the meter indicated I only used 10Wh since the last billing period--I expect the "full incentives" I'm allowed by law, and if "orecedence indicates, that , as a matter of Policy you do not "pay incentives" to "self install individuals" without bias, S per your website, out of 139 solar systems, 50% were "self Installed', thereore, If I find out the "noone was ever givenn the incentive, I'll be satisfied. But if indeed, you did pay incentives for self instaltion --as the application indicates-- I also want what I'm due....That is why I love my country, were,individal are aforted the same right equaly, without exeption!..

Hope to hear fro0m you soon, so as to put this mater to rest, and moe on to the next chapter of my life...Thanks,

Viktor Peter Polivka

Viktor Peter

From: <BAnderson@tep.com>
To: <[redacted]>
Sent: Tuesday, April 20, 2010 2:19 PM
Subject: Incentive

Viktor: Just to update you. Chris has given me the basis of a letter to you. I'll try to send that via e -mail tomorrow.

The situation has, of course, become more complicated with the different e-mails going back and forth. As I mentioned, I'd like to agree in writing to the incentive and then pay now that our payment system and running.

Blanka

Viktor Peter

From: <BAnderson@tep.com>
To: [redacted]
Sent: Wednesday, April 21, 2010 2:14 PM
Subject: Letter

Viktor: Just an FYI that my letter to you is being reviewed by my supervisor. I do hope to e-mail today but if not please don't worry.

Thanks,

Blanka

Viktor Peter

From: <BAnderson@tep.com>
To: [redacted]
Sent: Friday, April 23, 2010 9:13 AM
Subject: RE: TEP's Position Letter (for the Record)

Viktor: Good morning. I'll turn over your e-mail to my boss for further clarification on how to proceed. If you'll kindly give him some time to review your concerns. If you have further communication you may sent it to me or Chris.

Thank you,

Blanka Anderson

-----Original Message-----
From: Viktor Peter [redacted]
Sent: Friday, April 23, 2010 8:20 AM
To: Anderson, Blanka
Subject: Re: TEP's Position Letter (for the Record)

Blanka: After reading ALL the material you have sent me, I'm a bit "confuzed"! In the letter you sate that mysytem should not exceed 2000Wac for customers currently NOT PAYING into the REST tarriff (4000Wac limit for those paying). In fact whne I applied for the incentive I was indeed paying into the REST traffiff, and only "Disconnected": when your engineer wrote me, that i need to "disconnect" on 04/09/2010 if I was to do be on a "off grid" mode? Also you state Wac --is this a typo-- since my array system in actualu Wdc, I harvest direcrt current, not alternating current from my solar arrys....I guess I'll have to contact the ACC for "verification" of your claims and "dowgrading the battery system"... MY system if fact is 95% effective even with the ":baatery loss" (all systems that convert CD to AC have a loss in the process ranging from 4% to 6%.(that is the law of physics) Yet you seem to pay FULL incentives to Non Battery systems, that in reality only ae 50% effective at BEST, since they only produce current during sunlight, which on the aerage is 12 Hrs per day, and the must usew grid power during the housr of darkness. Hence, if they actualy were

able to
produce 100% curren of the harveatedcurrent for the 12 Hrs, then after sunset, they need to "retrive" the credited power-as in Net Metering--for
the next 12 Hrs. hence the Direct non battery systen is merely producing
only a 50% effectivenss (even in Tucson the day is but 24 Hrs long), furtermore, to validate my statement, you 138 solar customers indeed still
have a regular monthly bill for electricity, and on average only save $612.00 dollars annualy with your approved system (this information comes
straight from your website), where as my battery system in fact has a NET
SURPLUS of current even at only 95% effectiveness, as validated on my last 3
monthly electic bills - this was a period I used to refine my inverter settings that came down from 140Wh the first month, 80 Wh the second and

finaly to 20Wh the last month (this usage ws not ZERO as I plonned, but

your engineer insisted I run the "frid support mode" so he could verfiy that
I was not Feeding the grid, and turnning the meter backwards -- matter of
fact, during his "inspection" that was the only thing he came to "inspect".
and even for that he had to "borrow" my volt meter, since he claimed that
TEP did not provide him with a volt meter. he then completeded the "inspection" and ignored the rest of the instaltion. I neer een was payed
the courtesy of being "formaly in writititng" his inspection/finfings report! Thus far I accept you 'decision" not pay me the "incentive am due" (its all
about money anyway), now I've all the 'events" documented inmy dealings with
TEP, and although I dissagree with your decision, I now will persue the "issues"and the fact as claimed by your enginner --We are a Monopoly, and
can set any rules we want". Now I'll will take this to the "next" controling
authority, the ACC who oversees your activities and let thyem "judge" the
facts as presented, The "eniter truth, and not half truths to validate the
your "inverers of choise" Sunny Boy" as presented in your documents. I myself do not kinow all the facts about Sunny Boy, only now know, to "please
TEP, Sunny Boy has now "upgraded the standard guarnty" period of 5 years to

10 years , to satisfy TEP needs --the entire industry only issues a standart guarnty of 5 years normaly --. MY choise of inverter is based on my experience wi9th the Xantrex product line -I've used their inverters since 1986 (Firts it was Trace, Then Xantrex and now is is Schuller - same company, same engineering only change of ownership, however, I never "used" the waranty for those products, since I never needed it, all product I ever purchased from them -- Trace, Xanterx or Schuller -- prefomed as designed and I never had ANY problem that... I was not going to invest almost $40K with a brand I ner had any experience with, but I do know that the sytem you are "approving" was indeed developed for the "Space Program", effective in space where ther is 24Hrs sunlight available and favored by the space agency due to the "battery weight issue" , that would limit the "lunch load factor". Thais is why NASA "limits the use of batteries".. I know you8 do n opt like my Emails, but sine you are the "only" representativ" I kb ow with TEP that is in charger of the "incentive program", until that time I obtain a "new" address to contact. I'll have to Email it to your attention....At the present, I'll ac cept your decision, but if part of the "deal" is for me to keep my mouth shut, I like to infrom you that I do n ot intend to sign any agreement where I'm obligated contractualy to not persue this issue further -- my system is paid for, and I did accomplish the goal: ELIMINATE THE MONTHY ELECTIC BILL. As I understnd, the incentive program is based on CONSERVING ENERGY, not using less Whs' and paying more for the previlage. You may give me the incentive I'm "elegible for", but this matter will not be closed untill I'm paid what I'm due -- Since 2000 TEP has collected oer $50M in Trarifs, but yet only managed to find 139 ustomers --(by the way. contrary to your rules of "NO BATTERIES ALLOWED" in fact you do have approved ONE customer with am baatery back up system, b ut of course he did comply with one of your informal demands and is using a Sunny Boy product..

Its this also a coincidence?....I know you dislike my Emails, but when you
created a "disputable decision", I'm but exercissing my "FEREEDEOM" to dissagree -that what this great country ,the US is all about-- and I'll take
my dissagreement a as far as it is possible The Hill, in DC if needed.I'll
get the ball rolling and will see how many other "disatisfied" customers are
realy out there I di not speak to many oif them yet, but the ones I contacrted are sorry to have even enlisted in "TEP's Green Energy Program" --they were made believe that they would be "eliminating the electric bill, but now discoverd, they are further in the hole by inveting
in your approved system and not only are out of a substancial sum, still

have a monthly electic bill. This is a promise and my right as a citizen.....I've no electril bill anymore and am thus "saving" the entire
sum of $1,200 to $1,400 annualy, and also have "power' when your system is
out, they are in darkness and I still have lights...The outcome will be interesting, perhaps even will hit the national news in the process.. I'll
do my best....Thanks ...Polivka
----- Original Message -----
From: <BAnderson@tep.com>
To: <[redacted]>
Cc: <CLindsey@tep.com>
Sent: Thursday, April 22, 2010 1:52 PM
Subject: TEP's Position Letter

Viktor: Good afternoon. I'm attaching the promised letter regarding the incentive for your PV system. I'm also attaching the link to the RECPP referenced in the letter.

I'll be here until 5:00 and then off to the vet to pick up my dog. Let me know if there's anything else I can do.

Blanka Anderson

The message is ready to be sent with the following file or link attachments:

Shortcut to: http://tep.com/Docs/RESTDocs/2010TEP_RECPPFinal.pdf

Note: To protect against computer viruses, e-mail programs may prevent sending or receiving certain types of file attachments. Check your e-mail security settings to determine how attachments are handled.
<<2010TEP_RECPPFinal.url>>

Formal Complaint # 86551

NET METERING BILLING

Attached is a justification for REFUSING the NET METERING PLAN.

My most current monthly electric bill from TEP reflects that I used 440 kWh to supplement the SHORTAGE my Solar system did not produce due to the Monsoon weather -- overcast, rainy and extremely hot temperatures--, the cost of the current consumed was at the rate of $0.046925 kWh that equals to $20.65 for this month..

However, if indeed I was participating in the NET METERING PROGRAM the rate for current consumed in excess of my "credits" that the Solar generated, I would be subject to the Premium Rate" TEP quoted of $0.1800 kWh. Thus the $20.64 charge would have been $ 79.20.

Hence, my total monthly electric bill would been $110.84 (plus taxes and higher tariff fee) instead the $52.29, which is over "double" the current monthly bill.

This is the main reason TEP does not "approve" battery supported Residential Solar Energy Systems....It is all about "maximizing profits" and has nothing to do with the alleged disruption of metering!.... TEP regularly uses "battery stored energy" on a daily basis that is charging batteries during the off peak hours (so as not to have to shut down the generators), stored in batteries and then inverted to feed the grid as demand dictates. The metering "disruption" is indeed non existent, merely a "utilities" invented problem so as to "force" the public to use current at "premium prices".....

35

Tucson Electric Power
A UniSource Energy Company

Account: [redacted]
Bill Date: 7-30-2010
Customer Name: POLIVKA, VIKTOR P
Service Address: 4675 S HARRISON RD, 82
TUCSON AZ 85730-4537

Previous Balance	- Payments/Credits	+ Charges/Debits	= Current Balance
28.43	28.43	52.29	52.29

DUE DATE	AMOUNT DUE
8-11-2010	$52.29

@ net metering this would be $110.84

Payment: $28.43 on 07/08/2010 - Thank You!

R-01 - Residential (Service No. 4110417234)

Electric Charges for Period 06-30 - 07-29

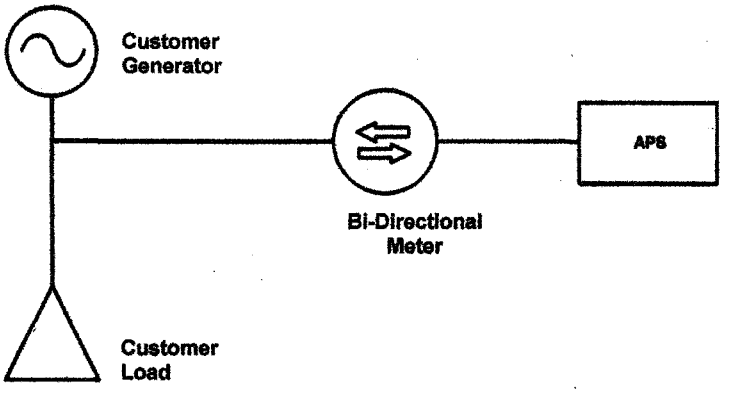
DELIVERY SERVICES	
Customer Charge	7.00
Summer - 1st 500 kWh 440 @ $0.046925	20.65
POWER SUPPLY CHARGES	
Summer - kWh 440 @ $0.033198	14.61
PPFAC - kWh 440 @ $0.00	
GREEN ENERGY CHARGES	
Renewable Energy Standard Tariff	3.20
DSM Surcharge - kWh 440 @ $0.001249	0.55
TAXES AND ASSESSMENTS	
ACC Assessment	0.08
RUCO Assessment	0.02
City Franchise Fee	1.04
State Sales Tax	3.17
County Sales Tax	0.24
City Sales Tax	0.92
City Public Utility Tax	0.81
Total Electric Service Charges	52.29

$79.2

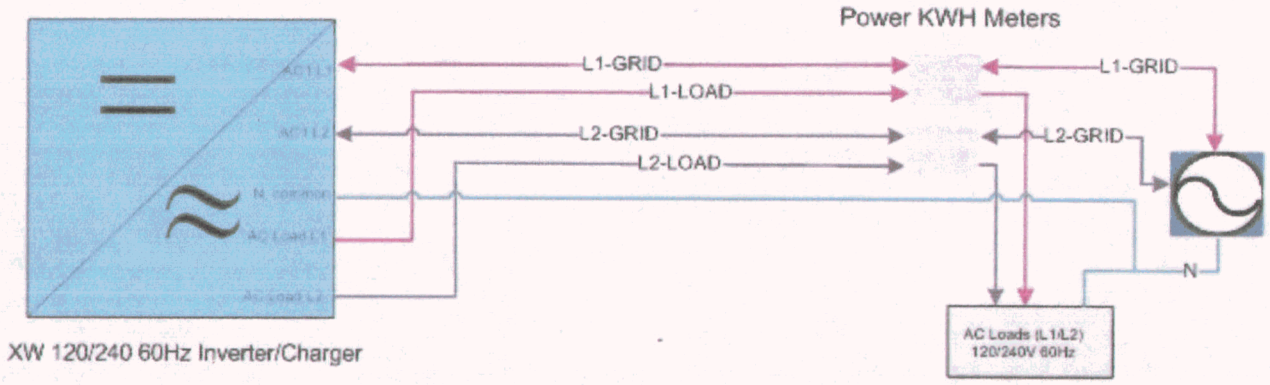
NOTES:
MODE: GLID SJAR/LOADSIMU 29/7
AV. TEM 106F - 4 TON AC 24/7
DAILY COST $1.743
AC SETTING @ 78F 29/7

Meter	Unit of Measure	Next Read Date	Current Read Date	Prior Read Date	Days	Current Reading	- Prior Reading	= Reading Difference	x Multiplier	= Usage
XH-331582	KWH	8-30	7-29	6-29	30	8174	8130	44	10	440

METERING CONFIGURATION



KWH Metering on XW 120/240 60Hz Inverter/Charger



This metering configuration will spin the KWH meter forward when power is being "sold" back to the utility grid from an AE source connected to the battery. The meter will also spin forward when the inverter is powering loads from the battery (such as during a power outage). It will spin backwards when the battery is being charged (i.e. subtracting the power being stored). AC loads which are being powered from the utility grid through the inverter will not cause the meter to spin in either direction.

Recommended KWH Meter Model:
Self-Contained Polyphase KWH meter
Model # R-12S-1513
120 VAC 60 AMP "5 Jaw" Type (also available in 100 amp and 200 amp versions)

Development Services Department

201 N. Stone Avenue
PO Box 27210
Tucson, Arizona 85726-7210
Tel. (520) 791-5550

RESIDENTIAL PHOTOVOLTAIC TEMPLATE
ELECTRICAL ELEMENT

APPLICABILITY

- Residential photovoltaic systems.
- Simple systems consisting of photovoltaic arrays, inverter, AC grid-tie.

FUNDAMENTAL REQUIREMENTS

- Minimum font size of 1/8-inch (all upper case). Reference 2006 International Building Code, 106.1.1.
- Standardized 11" X 17" sheets.
- Design per National Electrical Code and local amendments, with special emphasis on Article 690.
- Letter from utility company acknowledging grid-tie PV system, unless the project SunShare
- PV Panel Cut Sheets with clear identification of exact equipment selected, clear identification of all design-pertinent information (highlight rated power, rated voltage/voltage at maximum power, rated current/current at maximum power, open circuit voltage, short circuit current, series fuse rating, maximum system voltage), and documentation of listing of equipment
- Inverter Cut Sheets with clear identification of exact equipment selected, clear identification of all design-pertinent information (highlight nominal output power, input voltage range, maximum input voltage, maximum input current, nominal AC voltage, operating AC voltage range, maximum output current, overcurrent protection, ground fault protection, zero feedback documentation, positive/negative grounding requirements (if applicable), and documentation of listing of equipment
- Cut sheets for all manufactured devices

Tucson Electric Power Company
One South Church Ave., P. O. Box 711
Tucson, Arizona 85702

June 14, 2010

Victor Polivka
4675 S. Harrison Road, 82
Tucson, AZ 85730

Re: Arizona Corporation Commission Complaint # 2010-86551

Dear Mr. Polivka:

Tucson Electric Power Company ("TEP") is in receipt of the complaint you filed with the Arizona Corporation Commission on April 26, 2010. Jenny Gomez, Consumer Services Division, Arizona Corporation Commision, has requested on your behalf copies of the TEP On-Grid and Off-Grid applications that you submitted. Enclosed please find copies of these applications.

Sincerely,

Melody Gilkey
Regulatory Attorney

cc: Jenny Gomez/Arizona Corporation Commission

OPTION #2 ● Attach Agreement ●

ACC APPROVED - 4/10/08

* Animal in yard *

TUCSON ELECTRIC POWER COMPANY
OFF-GRID
RESIDENTIAL SOLAR ELECTRIC APPLICATION

SunShare

Customer Information

Name (As it appears on utility bill) VIKTOR P POLIVKA

Mailing Address 4675 S. HARRISON RD. LOT #82

City TUCSON, AZ Zip Code 85730

Street Address (if different from above) _____

Daytime Phone Number 520-303-7308

E-mail Address PPOLIVKA1@COX.NET Account Number 4110 4176 52

Operating Agent (If different from Customer) _____

Solar - PV System Information

Module Supplier Name KYOCERA/SUNTE Nameplate DC Rating 210 watts

Module Manufacturer KYOCERA Type KD210GX Quantity of Modules 24

Module Warranty 20 years (Copy of warranty must be on file with Tucson Electric Power)

Inverter Make and Model Number XANTREX, XW4024-120/240-60

Inverter Warranty 5 years (Copy of inverter warranty must be on file with Tucson Electric Power)

Total Cost 49,334.60 PV Cost 18,705.50 Labor Cost SELF INSTALL

Estimated Installation Date MARCH 1, 2010

System Qualifications

The system must meet the requirements outlined in Attachment A and Attachment B of the Off-Grid Residential Solar Up Front Incentive or Performance Based Incentive Agreements.

Rebate Calculation

UFI Calculation for residential projects with a 20 year or longer module warranty and a 10 year or longer inverter warranty.

Nameplate DC Rating 210 Watts x Quantity of Panels 24 = System Size 5040

Rebate Calculation: _____ kW (System Size) x $2.00 = _____ (UFI)

Rebate Calculation for Self-Install: _____ kW (System Size) x $2.00 x 70% = _____

UFI – Residential BIPV 5 kW DC or less

Rebate Calculation: _____kW (System Size) x $2.00 x 90% = _____ (UFI)

TEP rebate cannot be more than 60% of system cost. Customer must pay at least 15% of system cost.

Customer Reservation Bid

Customer may elect to use maximum PBI payback listed in the Project Incentive Matrix or choose a smaller PBI amount that will be more competitive in the period ranking system.

Project Information

Has a City/County Permit been secured? ✓ Yes _____ ✓ No

Is this an application for Net Metering: ✓ Yes _____ No (Net metering applies to systems 10 kW AC or less)

Does this installation meet all ACC Interconnection/REST requirements? ✓ Yes _____ No

Installer Information

Installer/Company Name _____

Business Address _____

Arizona Registrar of Contractors (AZROC) License Information _____

AZROC License Number _____ Class _____ Expiration Date _____

Assignment of Payment

I authorize Tucson Electric Power (TEP) to issue, on my behalf, my full rebate to the following installer/dealer as payment toward the cost and/or installation of my PV system. I acknowledge that the payment made to the below named installer satisfies the financial obligation to me in connection with the Agreement signed by myself and TEP.

Company Name _____

Contact Person _____

Business Address _____

Customer Signature _____ Date _____

Demo # 1 ● Mobile Home ●
Option # 1 ~~Acct Agreement Needed~~

* Animal in yard *

ACC APPROVED 4/10/08

TUCSON ELECTRIC POWER COMPANY
ON-GRID RESIDENTIAL SOLAR ELECTRIC APPLICATION

SunShare

Customer Information

Name (As it appears on utility bill) Viktor P. Pocivka
Mailing Address 4675 S. Harrison Rd Lot #82
City Tucson , AZ Zip Code 85730
Street Address (If different from above) _____
Daytime Phone Number 520-303-7308
E-mail Address: PPocivka1@Cox.Net Account Number #1104717652
Operating Agent (If different from Customer) _____

Solar - PV System Information

Module Supplier Name Kyocera/Alte Nameplate DC Rating 210 watts
Module Manufacturer Kyocera Type KD210GX-LP Quantity of Modules 24
Module Warranty 20 year (Copy of warranty must be on file with Tucson Electric Power.)
Inverter Make and Model Number Xantrex XW4024-120/240-60
Inverter Warranty 5 years (Copy of inverter warranty must be on file with Tucson Electric Power).
Total Cost 49,344.60 PV Cost 18,705.50 Labor Cost Self Instal
Estimated Installation Date March 1, 2010

System Qualifications

The system must meet the requirements outlined in Attachment A and Attachment B of the On-Grid Residential Solar Up Front Incentive (UFI) or Performance Based Incentive (PBI) Agreements.

Rebate Calculation

Rebate Calculation: Nameplate DC Rating 210 Watts x Quantity of Panels 24 = System Size 5040W

UFI Calculation for residential projects with a 10 year inverter warranty.
Rebate Calculation: 5040 kW (System Size) x $3.00 per W = 15,120 KM
Rebate Calculation for Self-Install: _____ kW (System Size) x $3.00 x 70% = _____

UFI – Residential BIPV 5 kW DC or less

Rebate Calculation: _____kW (System Size) x $_____ x 90% = _____ (UFI)

PBI Calculation for residential projects with less than a 20 year module warranty or less than a 10 year inverter warranty or for residential projects with a BIPV system over 5 kW.

Estimated annual energy production of system _____kwh x PBI amount _____$/kwh = _____PBI

TEP rebate cannot be more than 60% of system cost. Customer must pay at least 15% of system cost.

Customer Reservation Bid

Customer may elect to use maximum PBI payback listed in the Project Incentive Matrix or choose a smaller PBI amount that will be more competitive in the period ranking system.

Project Information

Has a City/County Permit been secured? _____Yes ___✓___No

Is this an application for Net Metering: ____Yes ___✓___ No (Net metering applies to systems 10 kW AC or less)

Does this installation meet all ACC Interconnection/REST requirements? ___✓___Yes ____No

Installer Information

Installer/Dealer Name _____

_____

_____

Business Address _____

Arizona Registrar of Contractors (AZROC) License Information

AZROC License Number _____ Class _____ Expiration Date _____

Assignment of Payment

I authorize Tucson Electric Power (TEP) to issue, on my behalf, my full rebate to the following installer/dealer as payment toward the cost and/or installation of my PV system. I acknowledge that the payment made to the below named installer satisfies the financial obligation to me in connection with the Agreement signed by myself and TEP.

Company Name_____

Contact Person _____

Business Address _____

Customer Signature_____ Date _____

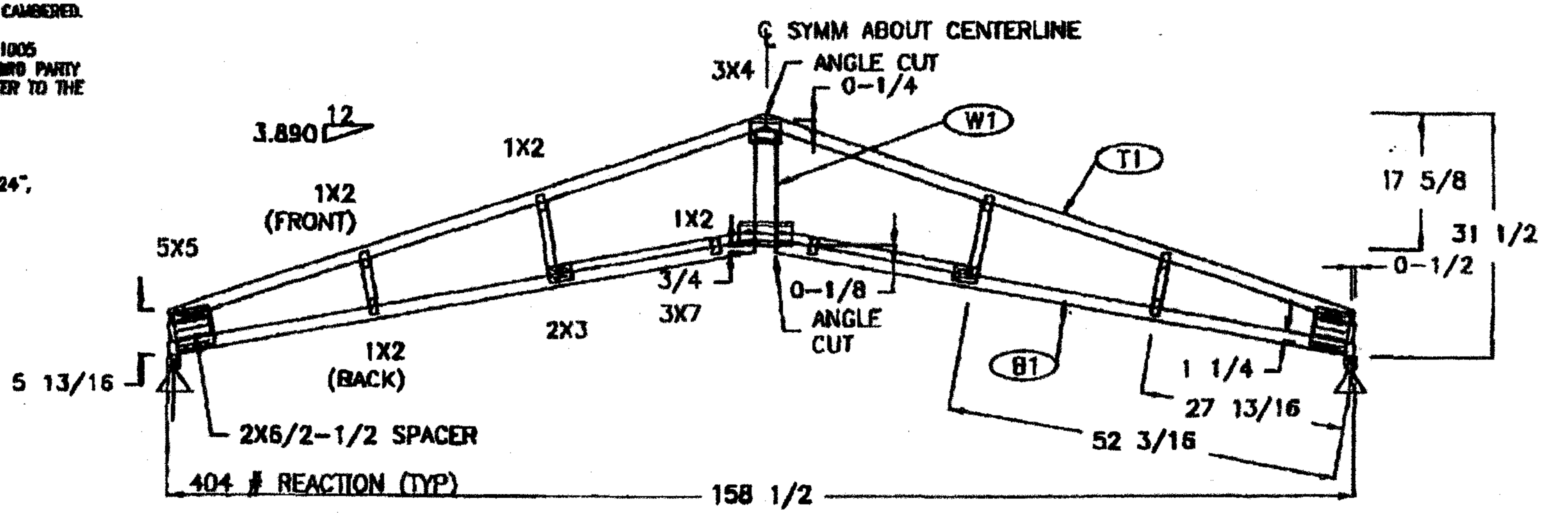
#1 NOTE: THE MH WAS A 30# ROOF, PITCH @ 16°

#2 NOTE: THE RAIL FOOTING WAS MOUNTED TO "MISS" THE TRUSS - SO AS A 3/8" LAG BOLT MISSES TRUSS, TO PREVENT SPLITTING OF 2X2. ALSO WILL INSTALL TENSION BRACES / CABLES TO ADD RESISTANCE IN WIND LOAD - THE WEIGHT OF MODULES IS NEGLIGIBLE. SINCE IT ONLY PLACES A 2# PER SQ FT LOAD/WEIGHT ON ROOF - P. POLLAK

NOTES:
1) ALL DIMENSIONS IN INCHES UNLESS NOTE OTHERWISE.
2) ALL CONNECTOR PLATES ARE TO BE INSTALLED ON BOTH SIDES UNLESS OTHERWISE INDICATED.
3) ALL PLATES TO BE PLACED SYMMETRICALLY ON JOINTS UNLESS NOTED OTHERWISE.
4) PLACE PLATE SO THAT ELONGATED PUNCH HOLES ARE PARALLEL WITH LINES INDICATED ON DRAWING.
5) BEARING ARROW INDICATES 1-1/2" BEARING UNLESS OTHERWISE INDICATED.
6) TOP CHORD OVERHANG AND/OR SOFFIT BLOCK MAY BE CUT BACK TO THE HEEL OF THE TRUSS. OVERHANG MAY BE MFG. AT ANY LENGTH UP TO THE MAXIMUM SHOWN.
7) THIS DESIGN ASSUMES THE TOP & BOTTOM CHORDS ARE CONTINUOUSLY BRACED BY PROPERLY APPLIED RIGID SHEATHING (PLYWOOD DECKING OR DRYWALL).
8) TRUSS MEMBERS SHALL NOT BE CUT, DRILLED, SLICED, NOTCHED OR OTHERWISE ALTERED WITHOUT WRITTEN APPROVAL OF THE DESIGN ENGINEER.
9) INDICATED TRUSS PITCH IS APPROXIMATE. ALWAYS REFER TO THE ACTUAL DIMENSIONS BEFORE CUTTING.
10) FIELD CONNECTIONS TO SECURE THE TRUSS TO OTHER FRAMING MEMBERS ARE THE RESPONSIBILITY OF THE HOME BUILDER OR OTHERS.
11) TOP AND BOTTOM CHORDS TO BE EQUALLY CAMBERED.
12) SERVICE CONTRACTS: PFS NO. 85-523; HWC MHT-002; NTA 93/1005
13) TRUSSES SHALL BE PRODUCED UNDER A THIRD PARTY APPROVED QUALITY CONTROL PROGRAM. REFER TO THE U.F.P.I. QUALITY CONTROL MANUAL.
14) BASED ON S0572R01
15) INCREASE HEIGHT FROM 29", INCREASE DEPTH FROM 14 1/8", INCREASE ON CENTER SPACING FROM 24", INCREASE GRADE OF LUMBER, DECREASE LENGTH FROM 162 1/2", INCREASE HEEL HEIGHT FROM 5 5/8".

ENGINEER APPROVAL	THIRD PARTY APPROVAL
COMMONWEALTH OF PENNSYLVANIA — JOHN P. KOZAL — 12/13/01	UFP BTN 00-1 7/15/98 PFS LISTED ®

DEC 13 2001



\AeGroup\Trusses\Support\MasterBlocks\Mobile01.dwt (10/02/01)

THIS TRUSS WAS DESIGNED IN ACCORDANCE WITH: MHCSS SEC. 3280.303, 3280.304, 3280.305, 3280.402.

LUMBER COMPONENTS			MARK
TOP CHD	1-5/8X1-1/2 STUD	SPF	(T1)
TOP CHD			(T2)
BOT CHD	1-5/8X1-1/2 NO.2	SPF	(B1)
BOT CHD			(B2)
WEBS	2-3/4X1-1/2 STUD	SPF	(W1)
WEBS			(W2)
WEBS			(W3)
WEBS	1-3/16X1-1/2 STUD	SPF	OTHERS

GRAVITY LOADS			UPLIFT	Z-I	Z-II	Z-III
[illegible]	24.5	16.5	[illegible]	N/A	N/A	N/A
TCLL PSF	20.0	30.0	TCLL PSF	N/A	N/A	N/A
TCDL PSF	6.0	9.0	[illegible]	N/A	N/A	N/A
BCLL PSF	0.0	0.0	BCDL PSF	N/A	N/A	N/A
BCDL PSF	4.0	6.0				

RECOMMENDED CAMBER: 1/4"

CODE: NON-DEST. — DATE: 12/12/01 — DRAWN BY: MA — SCALE: 3/4=1

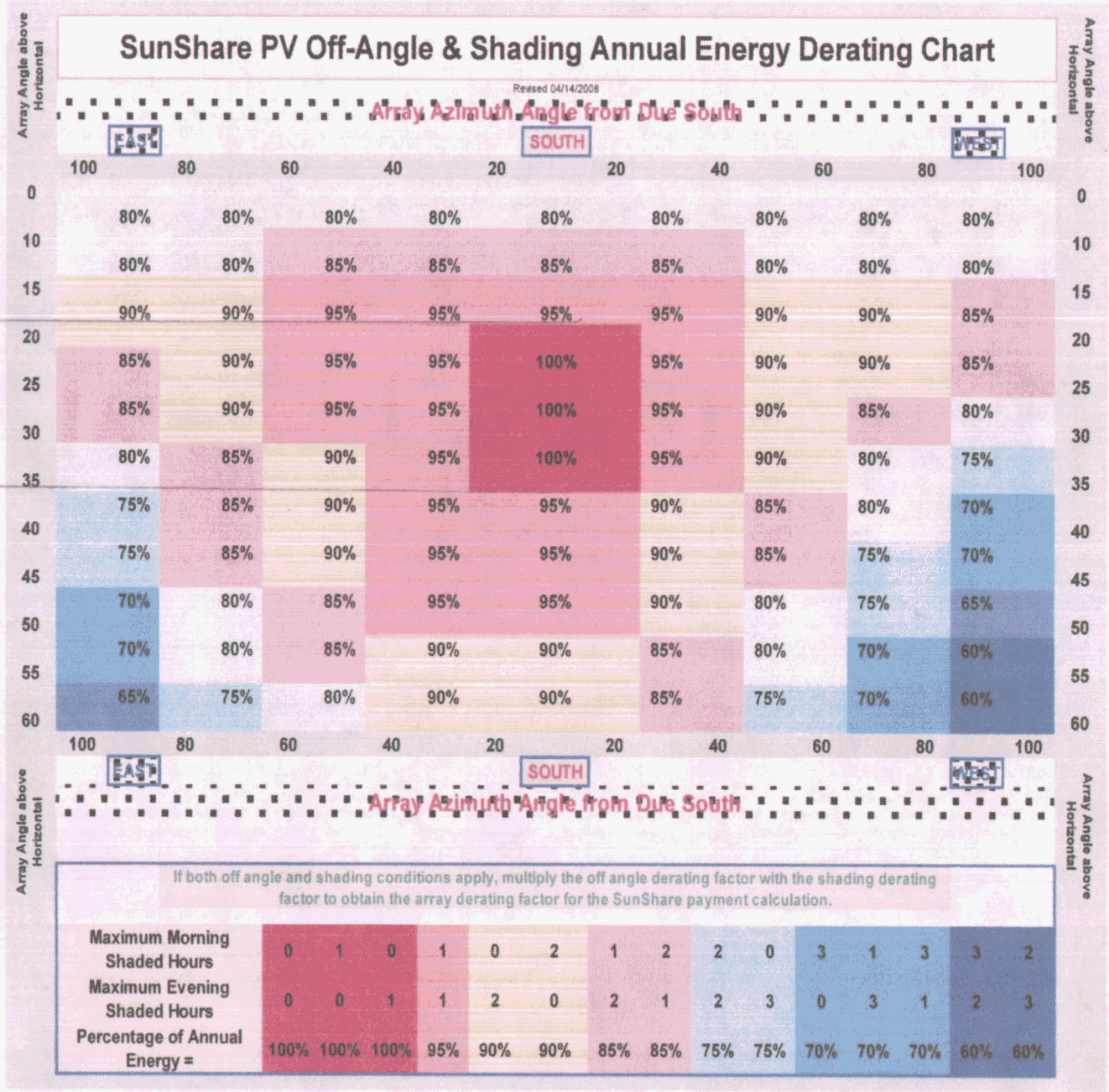
© COPYRIGHT 2001 BY: UNIVERSAL FOREST PRODUCTS, INC. COMPONENTS ENGINEERING

CUSTOMER: CAVCO — MFG. PLANT #: 233 — DWG. NO.: S0572R04 — JOB NUMBER: 18108 — CA-10R-[illegible]

12/17/01

[illegible] 20/20

ATTACHMENT B
SunShare Solar Electric Off-Angle & Shading Annual Energy Derating Chart

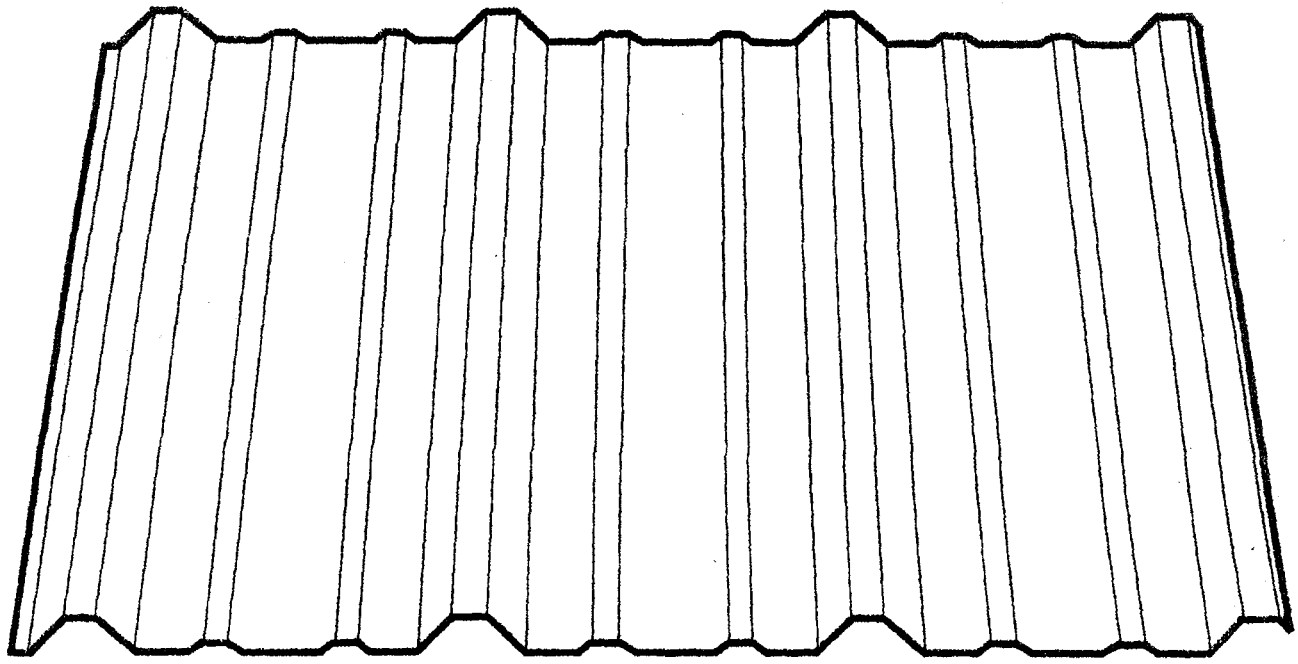


Qualifying systems using Building Integrated Photovoltaic (BIPV) modules of total array capacity of 5 kWdc or less shall receive 90% of the UFI incentive value for PV systems listed in Attachment A. Systems using BIPV modules of total array capacity of greater than 5 kWdc shall be derated based on heating unless the applicant can demonstrate optimal performance.

WESTERN STATES DECKING, INC.

901 W. Watkins • Phoenix, AZ 85007 • (602) 495-0048 • FAX: (602) 261-7726

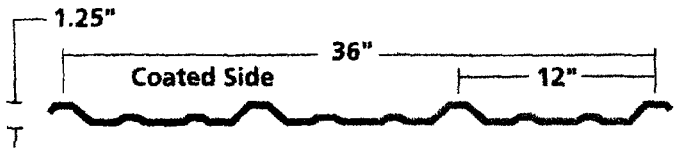
PBR PANEL



Features:

* 36" coverage with 1 1/4" high ribs
* Panel lengths up to 42 feet are available.
* Available in 22, 24, 26, and 29 gauge Zincalume, Galvalume, or Galvanized
* PBR panel is available in a wide variety of finishes and colors in 24, 26 or 29 gauge
* Great for self storage, commercial/industrial roof and wall applications, equipment screens, agricultural and residential construction.
* Matching Zincalume, Galvalume, Galvanized or pre-painted finishes are available for flashings and flat stock.
* Self- sealing fasteners are available for wood or steel applications. Painted or Galvanized

NPB PANEL:



PBR PANEL: