4 CSR 240-22.050 Appendix C

Distributed Generation Evaluation Study

November 30, 2007

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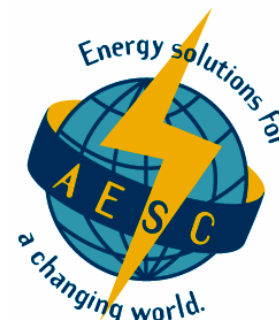
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1   Executive Summary

As part of its 2008 Integrated Resource Plan (IRP), AmerenUE is complying with the rules in Chapter 22 of the Missouri Department of Economic Development's Public Service Commission to identify and analyze the cost effectiveness of distributed generation (DG) technologies. AmerenUE contracted Alternative Energy Systems Consulting, Inc. (AESC) to assist in the identification, screening and analysis of DG technologies.

AESC, in coordination with AmerenUE, developed an approach that included; DG technology characterization, screening and market analysis.

First a comprehensive list of DG technologies were characterized in terms of their commercial availability, capacity size range, performance and economics.

The characterized DG technologies were then screened based upon the following criteria:

- Technology maturity and commercial availability

- Fuel availability in AmerenUE's service territory

- Applicability to customer segments; operating characteristics, siting requirements, environmental permitting requirements, etc.

- Present value levelized cost ($/kWh) versus customer cost for grid electricity

The screening identified Farm Anaerobic Digestion (Farm AD) as the candidate technology for an incentive program within AmerenUE's service territory. All other DG technologies, including energy storage, were found to be too costly to provide reasonable incentives to improve their customer economics.

The market potential, adoption rate and incentive program costs were developed. These are shown in the following chart.
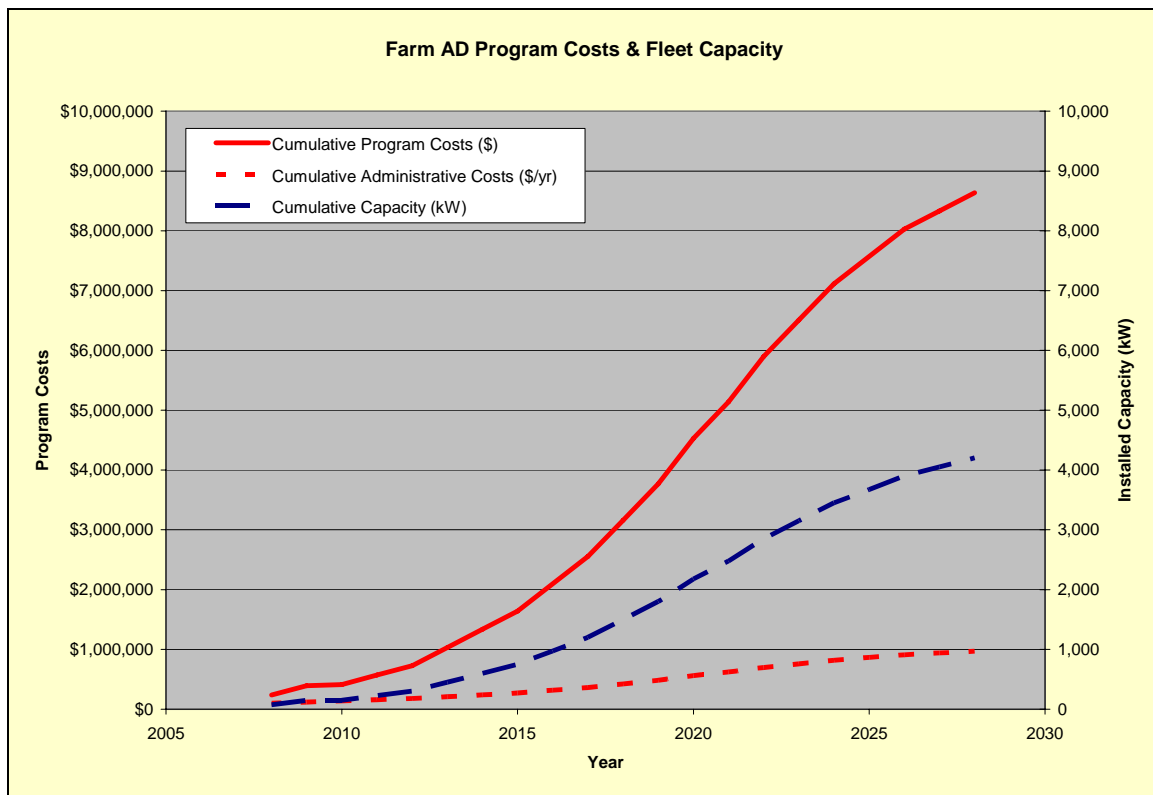
Figure 1-1 Program and Administrative Costs

Below are the conclusions of this study.

- Farm AD systems are the best DG candidate for an incentive program within AmerenUE's service territory.

- The market potential for Farm AD systems within AmerenUE's service territory 5.2 MW, most of which is at swine farms.

- We believe the best program design is a capacity based lump sum incentive paid upon project completion and startup.

- An incentive of approximately $1,665/kW will make the levelized cost of electricity from Farm AD equal to retail grid electric purchases. Farm AD systems have additional benefits of odor and run-off control.

- A survey of DG program costs shows that administrative costs can vary from 2% to 24%. In this study we assume a base 10% administrative cost with a $100,000 first year start up costs and a minimum $20,000 annual cost. This results in a total program cost of $9 million and an administrative cost of nearly $1 million over the life of the program, 20 years.

Our recommendations are –

- Analyze the cost of the Farm AD capacity and determine if it is cost effective versus other demand-side management (DSM) and supply-side options.

- If Farm AD is found to be cost effective, develop incentive program details, including marketing and outreach as well as program materials and assign responsibility for implementation of the program.

- Regardless of the cost effectiveness of Farm AD, monitor its progress as well as the performance and economics of –

    o Small run of the river hydroelectric

    o Onsite Wind Turbine Technology

    o Natural Gas Reciprocation ICE CHP

- Additional DG technologies that warrant tracking because of their potential for improved economics and green house gas mitigation.

    o Solar Dish Stirling technology

    o High temperature Molten Carbonate and Solid Oxide fuel cells

    o Advanced photovoltaics such as multi-junction and dye sensitized cells

2   Study Objective & Approach

As part of its 2008 Integrated Resource Plan (IRP), AmerenUE is complying with the rules in Chapter 22 of the Missouri Department of Economic Development's Public Service Commission to identify and analyze the cost effectiveness of distributed generation (DG) technologies. More specifically the IRP Rule [4 CSR 240-22] contains provisions, within the sections governing the identification of Demand Side Management measures, for the inclusion of distributed generation within the IRP process –

> *… The analysis of demand-side resources shall begin with the development of a menu of energy efficiency and energy management measures that provide broad coverage of—*
>
> *(A) All major customer classes, including at least residential, commercial, industrial and interruptible;*
>
> *(B) All significant decision-makers, including at least those who choose building design features and thermal integrity levels, equipment and appliance efficiency levels, and utilization levels of the energy-using capital stock;*
>
> *(C) All major end uses, including at least lighting, refrigeration, space cooling, space heating, water heating and motive power; and*
>
> *(D) Renewable energy sources and energy technologies that substitute for electricity at the point of use*
>
> *[4 CSR 240-22.050 Demand-Side Resource Analysis]*

AmerenUE contracted with Alternative Energy Systems Consulting, Inc. (AESC) to assist in the identification, screening and analysis of DG technologies.

AESC, in coordination with AmerenUE, developed an approach that included; DG technology characterization, screening and market analysis. In addition, the approach included a survey of existing DG programs and development of a prototype program for screened technologies. The following flowchart illustrates the approach sequence.
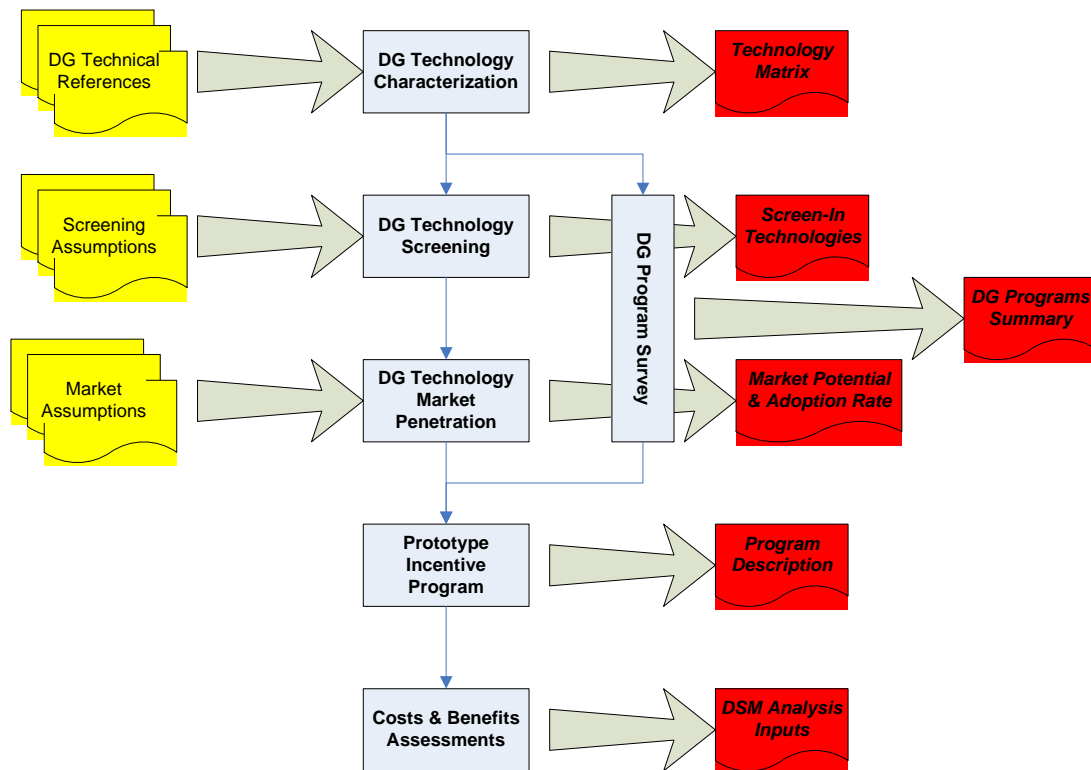
Figure 2-1 DG Study Approach

A detailed description of each step and results are presented in the following report sections.

3   DG Technology Characterization

The purpose of the technology characterization is to identify candidate DG technologies and to determine their performance and economic parameters. AESC relied on open literature and interviews of technology manufacturers to document the characterization parameters.

First, AESC established a definition of DG applications to help guide the identification of appropriate technologies. For the purpose of this study DG is defined as –

> Generators located and operated on AmerenUE customer property to serve customer electric load (a.k.a., self-generation).

This definition is compatible with the PSC IRP rules requiring that "…technologies [are to be considered] that substitute for electricity at the point of use."

Working with AmerenUE and using the definition of DG as a guide, AESC assembled the following list of DG technologies.

Table 3-1 Comprehensive DG Technologies

Reciprocating I/Cs	Stirling Engines (fossil fueled)
Diesel	**Solar Electric**
Otto (Spark Ignition)	Photovoltaics
Biomass Fuel Generators	Dish Stirling
Farm Based Anaerobic Digestion	**Small Wind Turbines**
Small Modular Biomass	**Small Hydroelectric**
Gas Turbines	**Energy Storage**
Micro-Turbines	Thermal Energy Storage
Small Gas Turbines	Batteries
Fuel Cells	Flywheels
Molten Carbonate	
Phosphoric Acid	
Proton Exchange Membrane	
Solid Oxide	

Note that the list of DG technologies includes energy storage. This was included because of the potential demand reduction resulting from customer energy storage, displacing central power plant capacity.

The following characteristics were documented for each of the technologies.

- Available capacity range & rated minimum load,

- Operating modes (dispatchability, fuel following, load following, base loaded),

- Useable thermal output for CHP applications,

- Compatible fuels, including natural gas, landfill gas, digester gas and biomass where appropriate.

- Required installation space,

- Environmental (emissions characteristics, noise, water consumption, waste water production, hazardous materials)

- Performance characteristics (including net heat rate, expected availability, typical forced outage rate, load ramp rate capability, etc.),

- Economics (installed capital cost, fixed O&M, variable non-fuel O&M, power plant life, construction lead time, etc.)

- Energy storage (stored energy capacity, discharge/charge efficiency, stand-by losses, time-to-charge)

These parameters were compiled into a technology matrix, which is included in Appendix A of this report. This study primarily uses the performance and economic parameters to screen and evaluate markets of candidate DG technologies.

The following sections briefly describe each technology.

3.1   Reciprocating Internal Combustion Engines

Reciprocating engine generators are similar to the gasoline engines in automobiles. They burn fuel in cylinders that drive pistons to turn a shaft. Natural gas fuel engine generators use a spark ignition system to begin the combustion process. Reciprocating engine generators are established technologies. They have made recent improvements in raising energy efficiency and reducing air emissions by operating very lean (i.e., high air to fuel ratio). Lean burn machines have lower emissions and are more efficient, but are slightly more expensive.

Engine generators can also be used in combined heat and power applications, producing useable thermal energy as well as electricity. Figure 3-1 shows an engine generator combined heat and power (CHP) system.

Figure 3-1 Waukesha VGF18GSID (280 kW) Reciprocating Engine CHP

6.2.2   Gas Turbines

Gas turbine generators are jet engines adapted as stationary power plants. Some gas turbine generators are actually aircraft engines that have been modified to drive a generator. Other gas turbines are designed as industrial stationary power plants. Small gas turbines (<1.5 MW) are conventional technologies and have wide application as generators and propulsion systems. They have low capital cost, but are not as efficient as other technologies. The high temperature waste heat makes them ideal for cogeneration applications requiring low or high-pressure steam. They require high-pressure natural gas (~100 psig). Figure 3-2 shows a Kawasaki GPB151X Gas Turbine.

Figure 3-2 Kawasaki GPB151X Gas Turbine Installation

Microturbines are a smaller version of gas turbines and are similar to automotive and auxiliary power unit turbine technology. Microturbines are typically less than 500 kW and some are as small as 30 kW. Most of them have low compressor ratios which permit the use of relatively low-pressure natural gas or other gaseous fuels, which results in low combustor temperatures reducing the production of prompt NOx. However, low combustor temperature also results in low efficiency. Many microturbines are recuperated to improve thermal efficiency.

Microturbines, like larger gas turbines, are good technologies for combined heat and power applications. Microturbine waste heat can be collected from the turbine exhaust (typically after the recuperator) and ducted to a heat exchanger. Microturbine waste heat recovery is used to produce hot water for space heating, process heating, domestic hot water, and space cooling (with thermally driven absorption/adsorption chillers). Occasionally, microturbine exhaust is directly used for process heating, boiler feedwater preheating or combustion air heating.

An example microturbine is shown in the following figure.

Figure 3-3 Ingersoll-Rand 250 kW Microturbine Generating Unit

3.2   Biomass Fuel Generators

There is no universally accepted definition of "biomass" fuels. USDOE appears to limit the definition of biomass to "… plant and plant-derived material"[1] However, we expand that definition to -

> *Biomass – Material derived from living materials including; wood and wood waste (forest thinnings), agricultural crops/residues, animal wastes.*

Biomass is a domestic, renewable resource that can be used to generate or manufacture electricity, heat, transportation/portable fuels, and other value-added products.

This study specifically focused on onsite sources of biomass fuels including farm based anaerobic digestion of animal waste and gasification of agricultural residue.

Animal waste anaerobic digestion or "Farm AD" systems convert collected waste material to a medium BTU biogas. The resulting biogas is 60% to 70% methane (550 to 650 Btu/scf HHV) depending on the type of anaerobic digester technology utilized and the type of waste feedstock. Anaerobic digestion is a biochemical process where organic material is broken down by bacteria in an oxygen deprived environment resulting primarily in the production of methane and carbon dioxide gases.

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[1] http://www1.eere.energy.gov/biomass/biomass_feedstocks.html

There are four primary types of digester technologies; covered lagoons, complete mix, plug flow and fixed film. The characteristics of each technology are summarized below.

Table 3-2 Farm Anaerobic Digester Technology Characteristics[2]

Characteristics	Covered Lagoon	Complete Mix Digester	Plug Flow Digester	Fixed Film
Digestion Vessel	Deep Lagoon	Round/Square In/Above-Ground Tank	Rectangular In-Ground Tank	Above Ground Tank
Level of Technology	Low	Medium	Low	Medium
Supplemental Heat	No	Yes	Yes	No
Total Solids	0.5 - 3%	3 - 10%	11 - 13%	3%
Solids Characteristics	Fine	Coarse	Coarse	Very Fine
HRT* (days)	40 - 60	15+	15+	2-3
Farm Type	Dairy, Hog	Dairy, Hog	Dairy Only	Dairy, Hog
Optimum Location	Temperate and Warm Climates	All Climates	All Climates	Temperate and Warm

* Hydraulic Retention Time (HRT) is the average number of days a volume of manure remains in the digester.

Digester biogas can be used in any electric generating technology that can utilize medium Btu gaseous fuels. However, reciprocating engine generators are the most prevalent technology used with farm anaerobic digester systems.

Gasification of agricultural residue involves the breaking down of the feedstock materials into a combustible gas by heating the feedstock in an oxygen-starved environment. Biomass fuels conducive to gasification include dry materials such as wood, charcoal, rice husks and coconut shells. Gasification is a thermo chemical process, versus anaerobic digestion, which is a biological process.

Biomass gasification systems primarily consist of a reactor into which the agricultural residue is fed along with a limited (much less than stoichiometric) supply of air. Heat for gasification is generated through partial combustion of the feed material. The resulting chemical breakdown of the fuel results in a combustible gas usually called producer gas. Producer gas consists of a mixture of hydrogen, carbon monoxide, methane, carbon dioxide and nitrogen. Depending on the feedstock and specific gasifier design, biomass producer gas has a higher heating value of 100 to 150 BTU/scf.

Smaller biomass gasifiers are typically fixed-bed types. Larger biomass gasifiers are usually fluidized-bed or entrained-flow type. Fixed-bed reactor types are

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[2] EPA AgSTAR Handbook, Second Edition

characterized by the direction of gas flow through the reactor (upward, downward, or horizontal).

Gasifier types

	Moving beds		Fluid beds		Entrained beds
	Co-current	Counter current	dense	circulating	
T°C	700-1200	700-900	< 900	< 900	≃1500
tars	low	very high	intermediate	intermediate	absent
control	easy	very easy	intermediate	intermediate	very complex
scale	< 5 MW$_t$	< 20 M$_t$	10<MW$_t$<100	20<MW$_t$<?	> 100 MW$_t$
feedstock	very critical	critical	less critical	less critical	very fine particles

Figure 3-4 Types of Biomass Gasifiers[3]

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[3] Biomass Technology Group BV

3.3   Fuel Cells

Fuel cells produce electricity electrochemically, similar to batteries, but fuel cells are continuously supplied fuel and oxidizer. Specifically, an oxidizer and a fuel are used to induce an electrochemical reaction, where ionic current flows between the cathode and anode through the electrolyte, and electron current flows from the cathode to anode through an external load.
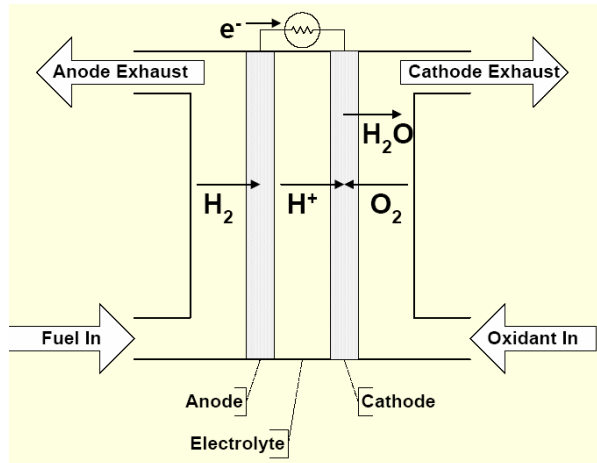
Fuel cells are classified by the type of electrolyte they use. Although they all may be fueled by hydrogen, some fuel cells can use other fuels as well. Hydrogen fuel is typically made within a fuel processor located with the fuel cell power plant using natural gas or some other feedstock. In addition, the direct current electricity is converted to line grade alternating current using an inverter. Early commercial fuel cells technologies include the UTC Phosphoric Acid Fuel Cell (PAFC, ~200 kW) , the PlugPower Proton Exchange Membrane (PEM, ~10 kW) fuel cell, the Fuel Cell Energy Molten Carbonate Fuel Cell (MCFC, ~350 to 1,200 kW) and the Bloom Energy (a.k.a. Ion America, ~100 kW) planar Solid Oxide Fuel Cell (pSOFC).

Fuel cell power plants are nearly zero air emission generators and have high fuel to electric conversion efficiency (40% to 50%) relative to other generators of similar size. An MCFC power plant is illustrated below.
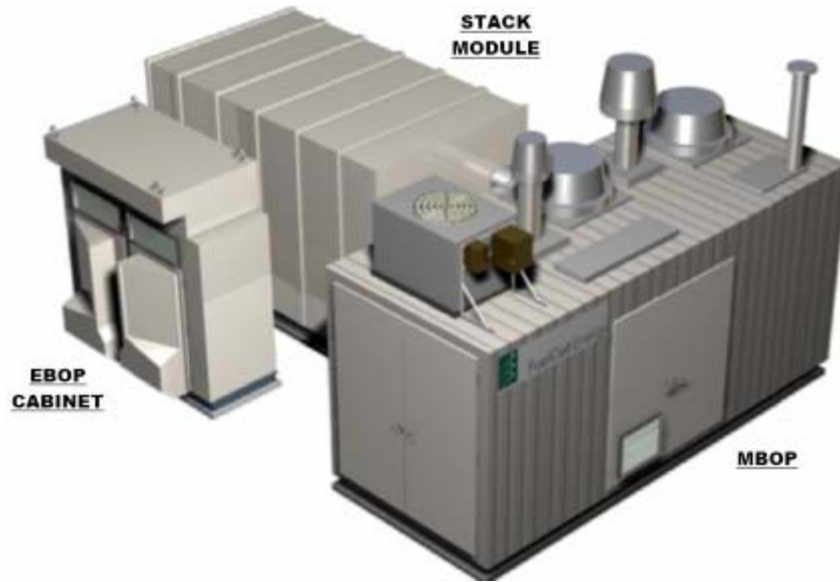
Figure 3-5 Fuel Cell Energy 300 kW Molten Carbonate Fuel cell

3.4   Stirling Engines (Fossil Fueled)

The modern Stirling Engine utilizes internal pistons which are supplied heat from outside the engine and transferred through heat exchangers to the piston volumes. This drives the pistons, resulting in mechanical work that is then converted to electricity. The primary advantage of Stirling Engines is their ability to us any source of heat. The external combustion aspect enables a Stirling Engine to operate equally well on multiple types of fuel, such as natural gas, propane, biogas, gasoline, diesel, ethanol85, bio-diesel or even heat from the sun.

One product, Whispergen, is being tested in Australia and Europe as a micro combined heat and power system. This unit utilizes natural gas or propane fuels. The Whispergen is not available in the United States.

Figure 3-6 WhisperGen 0.85 kW Stirling Generator

3.5   Solar Electric

Dish Stirling systems use solar energy to make electricity. These systems are typically 25 kW in size and use a two axis tracking mirrored dish collector to focus solar radiation on the Stirling Engine receiver.

Figure 3-7 Dish Stirling Technology Testing

Photovoltaics (PV) directly convert sunlight into direct current (DC) electricity. PVs are made of thin semiconductor materials and constructed into individual "cells". The cells are packaged into modules which are used, in the field, to be assembled into arrays. PV arrays feed direct current electricity to one or more inverters to produce line compatible alternating current electricity.

Figure 3-8 PV Array and Inverters

PV systems can be as small as a few watts to over 1 MW in capacity and can be installed in grid isolated as well as grid parallel applications.

3.6   Small Wind Turbines

Wind power systems use the energy in the wind to turn a rotor that converts the winds energy into rotational shaft energy driving a generator. The nacelle and rotor are supported by a tower, which is typically 80 or 120 feet tall. Smaller 1 kW to 10 kW wind turbines are used in residential applications. As a rule of thumb a 10 mph or greater wind resource is needed for economic installation of this technology in residential applications.

Figure 3-9 Small Wind Turbine

In a grid parallel residential application, the home is served simultaneously by the wind turbine and the local utility grid. Power output increases with increasing wind speed. As with solar electric, wind turbines can be net energy metered, which means they are allowed to turn customer meters backwards when generating more power than the local load can use.

A residential wind turbine can be a relatively large device and a property size of one acre or more is desirable.

3.7   Small Hydroelectric

Hydropower systems use the energy in flowing water to produce electricity. The water flows via channel or penstock to a turbine causing the shaft of the turbine to rotate an alternator or generator converting the motion of the shaft into electrical energy. Small hydroelectric plants can be developed at existing dams and in connection with river and lake water-level control, and irrigation schemes.

In this study we primarily focused on run of the river hydroelectric generators. "Low head" hydro-electric plants are power plants which generally utilize heads of only a few meters or less. Power plants of this type may utilize a low dam or weir to channel water, or no dam and simply use the "run of the river". Run of the river generating stations cannot store water, thus their electric output varies with seasonal flows of water in a river. A large volume of water must pass through a low head hydro plant's turbines in order to produce a useful amount of power. Hydro-electric facilities with a capacity of less than about 25 MW (1 MW = 1,000,000 Watts) are generally referred to as "small hydro", although hydro-electric technology is basically the same regardless of generating capacity.

Small run-of-river projects are free from many of the environmental problems associated with large-scale dam hydropower projects because they use the natural flow of the river, and thus produce relatively little change in the stream channel and flow.

There are three main elements of a run-of-river hydro scheme:

Intake Structure - The intake structure is a small weir situated high up in the river catchment area where a proportion of the river flow is channelled into a pipeline that leads down the hillside.

Penstock - The penstock carries the water down the hillside from the intake to the powerhouse.

Powerhouse - Contains a turbine, generator and transformer that uses the flow of the water to generate the electricity which is then fed into the local distribution network. Once the water from the pipeline has passed through the turbine, it is returned to the river from which it was taken.

These elements are illustrated in the following figure.
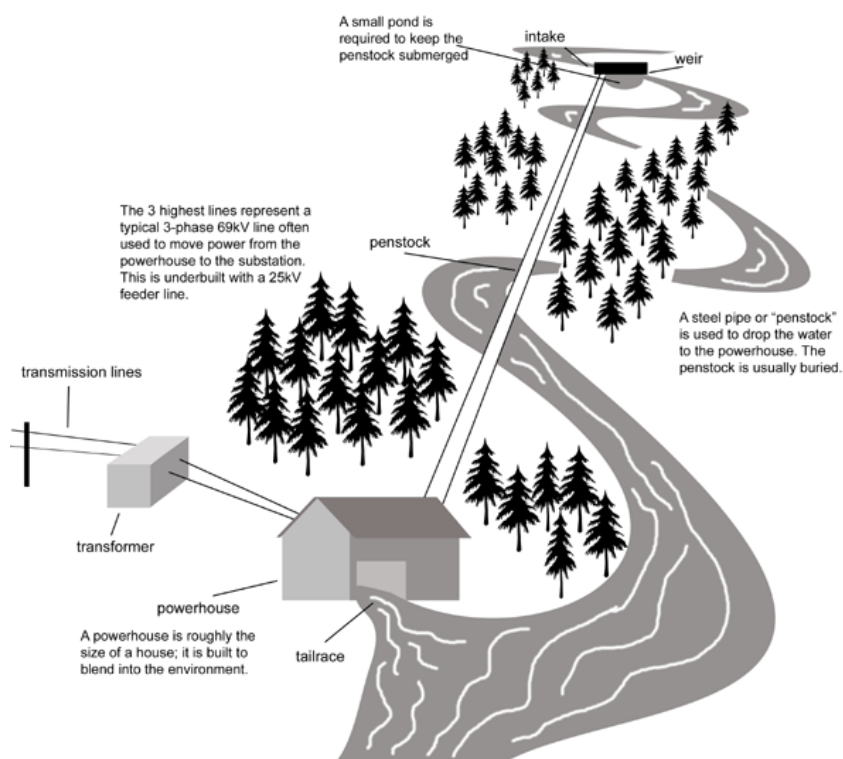
Figure 3-10 Typical Run of the River Hydroelectric[4]

3.8   Energy Storage

Energy storage can be accomplished in many ways. This study focuses on three energy storage technologies; batteries, flywheels and thermal energy storage. The

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[4] http://www.hydromaxenergy.com

primary value of energy storage is the capability of reducing utility customer peak load and shifting it to off-peak periods. This reduces the electric supply capacity necessary to serve those customers.

3.8.1   Batteries

Batteries use an electro-chemical reaction used to store electricity. Types of batteries considered appropriate for distributed generation applications include flooded lead acid, valve regulated lead acid (VRLA), Nickel Cadmium (NiCd), Zinc Bromide (ZnBr) and Vanadium Redox batteries. Batteries are typically used for power portable equipment and uninterruptible power supplies (UPS). Due to its short cycle life its application is primarily for UPS but batteries can be used for load shifting. DG energy storage duration is typically between ½ hour to 4 hours.

Figure 3-11 Utility Scale Battery Energy Storage System

Figure 3-12 NaS Peak Shaving Battery System[5]

3.8.2   Flywheels

Flywheel energy storage systems consist of a massive rotating cylinder that is substantially supported on a stator by magnetically levitated bearings. Operated in a low vacuum environment to reduce drag, the flywheel is connected to a

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[5] NGK Insulators, Ltd

motor/generator that, through power electronics, operates in parallel with the utility grid.

Flywheel systems are mostly found in power quality applications and usually have limited energy storage, ~15 minutes or less.

Figure 3-13 Beacon Flywheel Energy Storage System

3.8.3   Thermal Energy Storage

Thermal energy storage (TES) systems shift cooling energy use from on-peak to off-peak periods. They chill storage media such as water, ice, or a phase-change material during periods of low cooling demand for use later to meet air-conditioning loads. Operating strategies are generally classified as either full storage or partial storage, referring to the amount of cooling load transferred from on-peak to off-peak. TES systems are applicable in most commercial and industrial facilities, but certain criteria must be met for economic feasibility. A system can be appropriate when maximum cooling load is significantly higher than average load.

TES technology stores chilled water, ice or another phase change material to provide space or process cooling during on-peak periods. A typical system consists of tanks that contain water or eutectic salts and are used to produce ice or chilled water; and a chiller or other cooling system is used to "charge" the TES system during off-peak.

The heat transfer medium in most TES systems is glycol and the refrigerant is cooled by a chiller thereby lending itself to use with larger commercial/industrial air conditioning systems. However, a recent addition to the TES market is the Ice Bear system. This is an ice on coil system that utilizes Freon as the refrigerant and matching up to light commercial air conditioning systems. The Ice Bear uses a separate roof top, high efficiency, condensing unit (SEER = 13) to make ice, that ties in directly with the refrigerant loop of the existing roof top or split system

A/C unit (SEER=10)[6]. These systems are smaller in size than most glycol based TES systems. A single Ice Bear unit provides 6 tons of cooling over an 8 hour period which equates to 48 ton-hours. A typical light commercial application may have seven of these units on the roof for a total of 336 ton-hours. A typical large commercial building employing a glycol based TES system would have 4200 ton-hours of cooling.

In this study, chilled water, encapsulated ice, internal melt ice (ice on coil), ice harvester, and eutectic systems were evaluated.
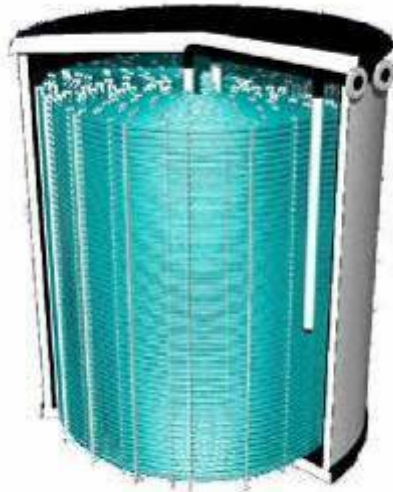
Figure 3-14 CALMAC Ice-on-Coil Thermal Energy Storage System

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[6] Estimate of existing rooftop A/C system efficiency. Based upon a conversation with Gary Kaiser of Ice Energy Inc. July 3rd 2007.

4   DG Technology Screening

The characterized DG technologies were then screened based upon the following criteria:

- <u>Technology maturity and commercial availability</u> – Only technologies that were commercially available and mature were included in further analysis. "Mature" means that the technology could be obtained through normal procurement channels and not as part of a research and development, or technology demonstration.

- <u>Fuel availability in AmerenUE's service territory</u> – Technologies that utilized fuels that were not available in AmerenUE's service territory were screened out of the candidate list.

- <u>Applicability to customer segments; operating characteristics, siting requirements, environmental permitting requirements, etc.</u> – Technologies not applicable to AmerenUE customers because of customer characteristics versus technology attributes, were also screened out.

- <u>Present value levelized cost ($/kWh) versus customer cost for grid electricity</u> – This customer cost will include capital recovery cost, fuel cost, non-fuel O&M, and financing cost. Only technologies whose present value levelized cost could be made cost effective for the customer through utility rebates or subsidies were screened into the candidate list. This analysis is discussed in more detail in the following section.

4.1   Customer Economic Analysis

A key component to the technology screening is the customer economic analysis. This analysis is the utility customer's present value levelized cost of electricity ($/kWh) assuming they are paying for the equipment, installation, financing, fuel, operation and maintenance of the DG technology. The levelized cost is compared to the levelized cost of grid electricity from AmerenUE.

Included in the DG levelized cost of electricity was –

- Installed capital cost of the equipment
- Waste heat credit for CHP applications
- Financing
- Property tax
- Depreciation
- Fixed & Variable O&M
- Cost of fuel

- Federal investment tax credits were included where appropriate[7]

The following financial and escalation assumptions were also used.

- Natural Gas Fuel Escalation = 2.5%

- On-Peak Retail Electric Rate Escalation = 2.5%

- Discount Rate = 5.1%

- Federal Tax Rate = 35.0%

- State Tax Rate = 6.5%

- Sales Tax = 7.6% of Price

- Property Tax = 2% of Book Value

- Boiler Efficiency = 80%

- Variable O&M Cost Escalation = 4%

- Fixed O&M Cost Escalation =   4%

- Equity = 10%

- Financing Rate = 8.3%

Other assumptions (e.g. equipment life, efficiency, etc.) were technology or customer type dependent.

For energy storage technologies, the fuel is off-peak electricity and heat rate for the battery and TES technologies was based on the charge/discharge efficiency of the system.

4.2   Rate Analysis

The screening analysis of the energy storage technologies was conducted using the AmerenUE Small Primary Service Rate. With this rate it is possible under Rider E for customers that are seeking to Self Generate to get Supplementary Service in the event their Distributed Generation system goes out of service. There is no additional service fee for Supplementary Service.

4.3   Screening Results

The technology screening was conducted in two steps. The first step looked at the technology's commercial availability, fuel availability within AmerenUE's service territory and applicability to AmerenUE customers. Those results are shown in the next table.

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[7] Federal ITC's are scheduled to sunset end of 2008.

Table 4-1 Initial Feasibility Screening of DG Technologies

DG Technology	Assumed Fuel	Assumed Configuration	Commercial Availability	Fuel Availability	Applicability to Customers	Screened-In Technologies
Reciprocating I/Cs						
Diesel	Diesel	CHP	X	X	X	**X**
Otto (Spark Ignition)	Nat. Gas.	CHP	X	X	X	**X**
Biomass Fuel Generators						
Farm Based Anaerobic Digestion	BioGas	Simple Cycle	X	X	X	**X**
Small Modular Biomass	Producer Gas	CHP	8	X	X	**X**
Gas Turbines						
Micro-Turbines	Nat. Gas.	CHP	X	X	X	**X**
Small Gas Turbines	Nat. Gas.	CHP	X	X	X	**X**
Fuel Cells						
Molten Carbonate	Nat. Gas.	CHP	X	X	X	**X**
Phosphoric Acid	Nat. Gas.	CHP	X	X	X	**X**
Proton Exchange Membrane	Nat. Gas.	CHP		X	X	
Solid Oxide	Nat. Gas.	CHP		X	X	
Stirling Engines (fossil fueled)	Nat. Gas.	CHP		X	X	
Solar Electric						
Photovoltaics	Solar	Fuel Following	X	X	X	**X**
Dish Stirling	Solar	Fuel Following	9	X	X	**X**
Small Wind Turbines	Wind	Fuel Following	X	X	X	**X**
Small Hydroelectric	Water	Fuel Following	X	X	X	**X**
Energy Storage						
Thermal Energy Storage	On-Peak Electricity	Peak Shifting	X	X	X	**X**
Batteries	On-Peak Electricity	Peak Shifting	X	X	X	**X**
Flywheels	On-Peak Electricity	Peak Shifting	X	X	X	**X**

[8] There is a commercially available agricultural residue gasification system. However, the manufacturer of that system asked to not be included in this analysis. Without detailed O&M costs, AESC could not perform the levelized cost analysis critical to technology identification.

[9] Although there are discussions of utility scale projects, these have not resulted in actual large scale installations yet. It is our opinion that solar dish Stirling technology is in late development and is not yet suitable for mainstream commercial use.

The second step in the screening process, the present value levelized cost for each DG technology that passed the initial screening was calculated. That was compared to the present value retail electric rate for the type of customer that would utilize the technology. Finally the ratio of present valued DG levelized cost and the retail cost of electricity was calculated, rank ordered and charted. The chart below summarizes the results of the present value levelized cost. Note that CHP analysis included with and without thermal energy credits. Details of the economic analysis can be found in Appendix B.

DG Levelized Cost of Electricity to Retail Cost of Electricity Ratio

Y-axis: DG LEC to Retail Electric Ratio

Technology	Ratio
Farm Based AD	1.60
Small Hydro	2.48
Comm. Wind Turbine	3.17
Nat Gas ICE	3.23
Nat Gas ICE wo thermal credit	3.51
Res. Wind Turbine	3.87
Diesel ICE	3.88
Microturbine+ITC	3.96
Ice on Coil	3.98
Chilled Water TES	4.07
Gas Turbine	4.15
Ice Bear	4.15
MCFC+ITC	4.21
Diesel ICE wo thermal credit	4.58
MCFC wo thermal credit	4.66
PAFC+ITC	4.79
Encapsulated Ice TES	4.90
PAFC wo thermal credit	4.92
Gas Turbine wo thermal credit	4.97
Microturbine wo thermal credit	4.99
Microturbine wo thermal credit	4.99
Ice Harvester	5.60
Flooded Batteries	5.99
Eutectic System	7.24
VRLA Batteries	8.24
Residential PV+ITC	8.91
Commercial PV+ITC	9.51
ZnBR Batteries	9.98

Figure 4-1 Summary of DG Technology Economic Screening

This analysis reveals that farm based anaerobic systems are closest to cost effectiveness. All other technologies are at least 2.48 times higher than grid electric power.

5   DG Technology Market Penetration

As a result of the initial screening, farm based anaerobic digester systems were found to be within reach of an incentive program that can effectively increase market penetration of the technology. The next step was the market potential analysis and establishing an adoption rate.

Farm AD is most cost effective in dairy and swine farm operations, where collection of manure through wash down is most prevalent. In addition, dairy farms must have a minimum 500 head of cattle and swine farms a minimum 8,000 head of pigs or hogs. The 2002 Census of Agriculture[10] for Missouri was used to determine the number farms and head of animals per farm within AmerenUE's service territory. The results by county are shown below.
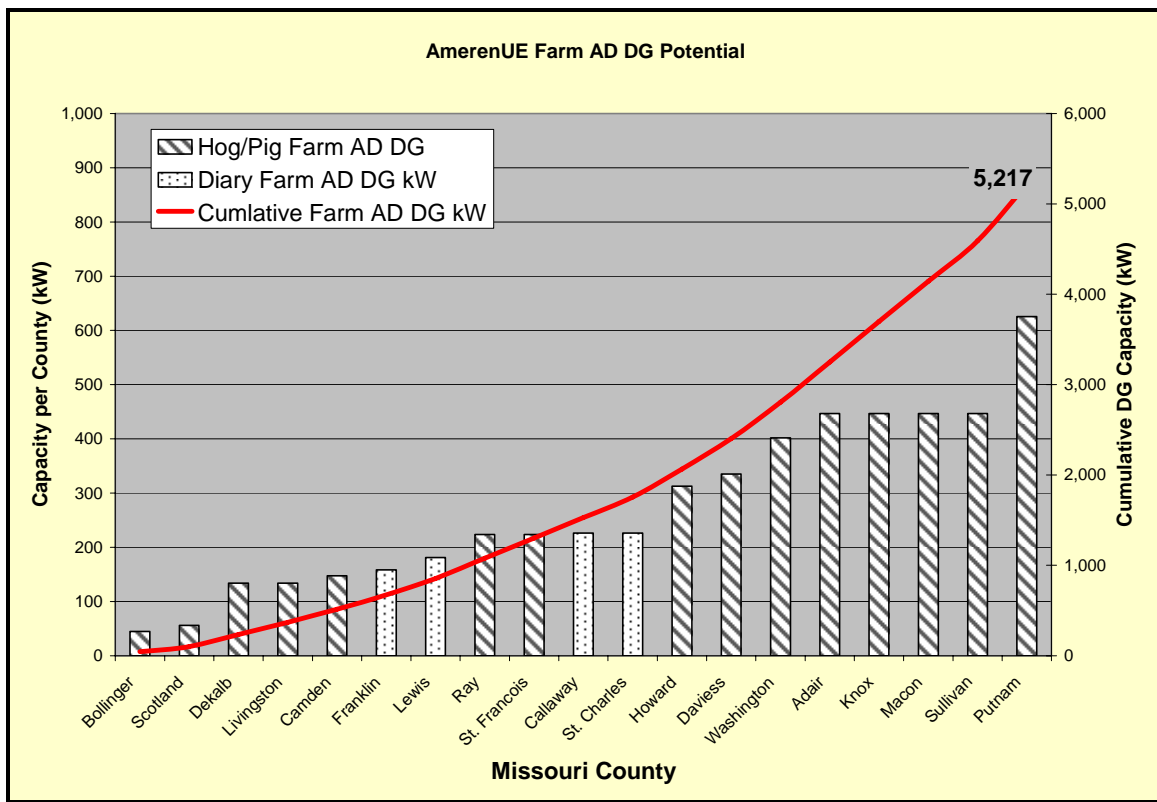
Figure 5-1 Farm AD Market Potential by County

As shown there is approximately 5.2 MW of farm AD generating capacity within AmerenUE's service territory. Most of the capacity (85%) is in swine farms and remaining 15% are in dairy farms.

Farm AD promotion and incentive programs have reported poor market penetration. There are three farm AD programs currently active; USEPA AgStar

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[10] Released June 3, 2004, by the National Agricultural Statistics Service (NASS), Agricultural Statistics Board, U.S. Department of Agriculture.

program, California's Dairy Power Production Program, and the We Energies Biogas Buy-Back Rate. The EPA program reports a 1% national market penetration for the last 13 years and the California program has had 1% California market penetration in the last 6 years. The WE Energies Biogas Buy-Back Rate programs reports that 3 digesters have been installed in their territory since the rate was introduced last year and none have chosen to take the tariff.

This poor market adoption rate can be attributed for a number of reasons; resistance to incorporate new technologies, perceived risk of the farm AD technology, and lack of knowledge regarding farm AD benefits.

Using the historical performance of existing programs would result in only one farm adoption anaerobic digester technology every 20 years. Instead, for this study we chose to develop an adoption curve that reflects an optimistic case. While this may appear to be optimistic, the population of target customers is relatively small and a focused campaign with the incentive program should be able to capture most of these customers.

We do this by using an S-curve commonly found in adoption models and assign scaling factors to the components of the equation.[11]

$$Mp = S/(1 + 81^{((H+T/2-Y)/T)})$$

Where:

Mp ≡ Market Penetration, fraction of market potential that has adopted the technology

S ≡ Saturation, maximum expected penetration after the product becomes mainstream (i.e. the value that the top of the s-curve will reach)

H ≡ Hypergrowth, the year that the penetration will be 10% of the saturation value, and it will start to grow rapidly.

T ≡ Takeover Time, period it will take for the product to "catch on". The assumption in the formula is that this number of years after the start of hypergrowth, the product would have reached 90% of the saturation value and will start to slow down.

Y ≡ Year

For farm AD, we made the follow assumptions.[12]

Saturation percentage =   90%

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[11] This equation is derived from the sigmoid function $P(t) = 1/(1 + e^{-t})$
[12] These assumptions are based on a successful incentive program resulting in a steady and increasing adoption rate to 2023.

Hypergrowth (year) = 2013

Takeover Time (years) = 15
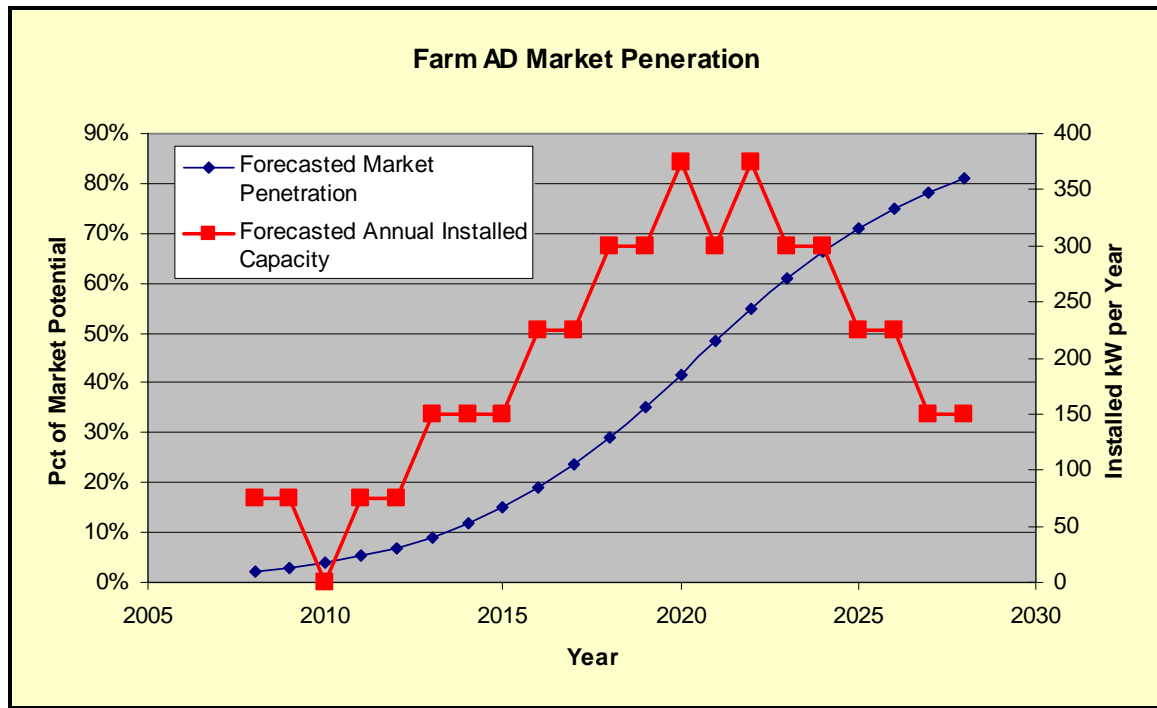
Figure 5-2 Farm AD Market Adoption Rate

Note that this leaves about 20% of the market that has not adopted the farm AD technology. This is realistic since some farmers will resist the technology regardless of the potential benefits.

6   DG Program Survey

There many renewable and non-renewable on-site generation programs in the United States. Some programs are administered by the state while others by local utilities as illustrated in the map below.
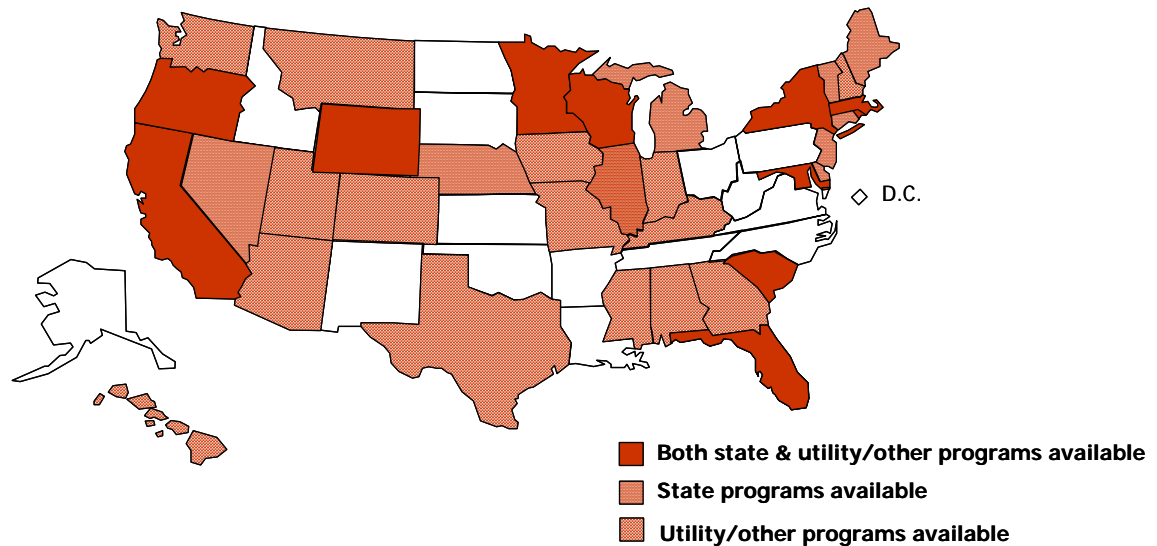
Figure 6-1 U.S. Distributed Generation Incentive Programs[13]

Program identification and information gathering was conducted through four primary sources –

- Database of State Incentives for Renewables & Efficiency (DSIRE), project of the North Carolina Solar Center and the Interstate Renewable Energy Council (IREC) funded by the U.S. Department of Energy.

- Energy and Environmental Analysis, Inc. (EEA), Regulatory Requirements Database for Small Electric Generators

- DOE, "State, Utility, and Local Distributed Generation Incentives Matrix", June 2004

- ACEEE, State Opportunities for Action: Update of States' Combined Heat and Power Activities, October 2003

A comprehensive list of programs may be found in Appendix C. This list focuses on programs administered by investor owned utilities, but includes significant programs administered by publicly owned utilities and states.

Financial incentive programs can be categorized as described below.[14]

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[13] www.dsireusa.org

- Tax Incentives
  Corporate & personal tax incentives allow corporations to receive credits or deductions ranging from 10% to 35% against the cost of equipment or installation to promote renewable energy equipment. In some cases, the incentive decreases over time. In most cases, there is no maximum limit imposed on the amount of the deductible or credit for corporations. However, personal income tax credits may be limited up to a certain percentage or predetermined dollar amount for the cost or installation or renewable energy equipment. Eligible technologies may include solar and photovoltaic energy systems, geothermal energy, wind energy, biomass, hydroelectric, and alternative fuel technologies.
  Property tax incentives typically follow one of three basic structures: exemptions, exclusions, and credits. The majority of the property tax provisions for renewable energy follow a simple model that provides the added value of the renewable device is not included in the valuation of the property for taxation purposes. That is, if a renewable energy heating system costs $1,500 to install versus $1000 for a conventional heating system, then the renewable energy system is assessed at $1000. Property taxes are collected locally, so some states allow the local authorities the option of providing a property tax incentive for renewable energy devices. Six states have such provisions: Connecticut, Iowa, Maryland, New Hampshire, Vermont, and Virginia.
  Sales tax incentives typically provide an exemption from the state sales tax for the cost of renewable energy equipment.

- Grant & Rebate Programs
  Some States offer grant programs to encourage the use and development of renewable energy technologies. Most programs offer support for a broad range of renewable energy technologies, while some states focus on promoting one particular type of renewable energy such as wind technology or alternative fuels.
  Rebate programs are offered at the state, local, and utility levels to promote the installation of renewable energy equipment. Most programs are available from state agencies and municipally-owned utilities and support solar water heating and/or photovoltaic systems. Eligible sectors usually include residents and businesses, although some programs are available to industry, institutions, and government agencies as well. Rebates range from $300 to well over $1 million.

- Industry Recruitment Incentives
  This category focuses on special efforts and programs designed to attract renewable energy equipment manufacturers to locate within a state or city. Renewable energy industrial recruitment usually consists of financial incentives like tax credits, grants, or a commitment to purchase a specific amount of the product for use by a government agency.

- Leasing/Lease Purchase and Loan Programs
  Utility leasing programs target remote power customers for which line extension would be very costly. The customers can lease the technology, e.g., photovoltaics, from the utility, and in some cases, the customer can opt to purchase the system after a specified number of years.
  Loan programs offer financing for the purchase of renewable energy equipment. Low-interest or no-interest loans for energy efficiency are a very common strategy for demand-side management by utilities. State governments also offer loans to assist in the purchase of renewable energy equipment. A broad range of renewable energy technologies are eligible. In many states, loans are available to residential, commercial,

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[14] Summarized from the DSIRE definitions.

industrial, transportation, public, and nonprofit sectors. Repayment schedules vary; while most are determined on an individual project basis, some offer a 7-10 year loan term.

- Production Incentives
  Production incentives provide project owners with cash payments based on electricity production on a $/kWh basis, as is the case with the Federal Renewable Energy Production Incentive, or based on the volume of renewable fuels produced on a $/gallon basis, as is the case with a number of state ethanol production incentives. Payments based on performance rather than capital investments can often be a more effective mechanism for ensuring quality projects.

The number of programs by incentive type is summarized in the table below.

Table 6-1 Number of Programs by Incentive Type

Incentive Type	Federal	State & Utility
Tax Incentives		
Personal Tax	3	28
Corp. Tax	4	29
Sales Tax	NA	24
Prop. Tax	NA	41
Rebates & Grants		
Rebates	0	182
Grants	2	55
Leases, Loans & Bonds	3	84
Industry Recruit.	0	12
Production Incentives	1	33

For Farm AD and the DG technologies that were in the top 20% of the economic screening, the most likely incentive program designs are rebated based on installed capacity or production incentives (i.e., performance based incentives).

Capacity based rebate incentives have the advantage of provide needed capital early in the operating life of the DG investment. This is a critical feature for program participants who may not have access to significant capital financing. In addition, these types of programs tend to be simpler to administrate. However, lump sum incentives can lead to poor performing systems in later years because customers abandon the system or neglect maintenance. Some programs have attempted to mitigate this issue by requiring extended warranties (5 to 10 years) for replacement (parts and labor) of all components.[15] From the research

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[15] The California Self-Generation Incentive Program has such a warranty requirement.

conducted DG rebate program incentives typically range from $1.00/W to $6.25/W depending on program & technology. Cleaner renewables tend to garner the higher rebate incentive rates. For Thermal Energy Storage the incentive is $100/kW to $400/kW of demand reduction.

Production incentives encourage that DG systems be operated in a manner that generates benefits for both the customer and funding ratepayers. This improves the persistence of the technology. However, production incentives are typically paid out over some period of time (some programs are five years or longer). This may limit participants to those who have access to inexpensive capital funding, typically limited to large corporations. Production incentives range from $.10/kWh to $.75/kWh depending on program & technology and payout period, which can be one to five years.

There is a huge range in the types of activities and structure of DG incentive programs in the US, which results in a large variation in the costs to administer such programs. Administration costs are defined here as the staffing, overhead, and other costs needed to oversee and administer the program. In general, the administrative costs increase in relation to the complexity of those programs. The number of allocations a program makes can also increase administrative costs. For example, the administrative costs of a program that is used to buy-down many small-scale projects would probably be higher than a fund used to support one or two large grid-tied renewable projects. Another factor is economies of scale; small programs have fewer economies of scale than very large funds, and therefore the proportion of the fund that is spent on administrative costs tends to be larger with small funds. As shown, in the table below, the administrative costs can range significantly, 2% to 24%.

Table 6-2 Survey of Program Administrative Costs[16]

U.S. State	Amount of Program Budget	Description of Programs Funded	# of Full Time Employees (40 hrs/wk)	% of Fund Spent on Admin.
CA	$135 M	• Tendering process for new renewables • Production incentive for existing renewables • Rebate program for small scale distributed resources • Customer rebate for renewable purchases • RE education	13-15	2-3%
NY	$14 M	• Small scale renewable support • Wholesale large scale renewable support • Green marketing/customer education • Market mechanisms research and analysis	7-10	7%

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[16] Wingate, Meredith, "A Survey of the Administrative Costs to Government of Implementing a RPS, Feed-in Law, Competitive Tender, and Public Benefits Fund", Center for Resource Solutions, June 2003

U.S. State	Amount of Program Budget	Description of Programs Funded	# of Full Time Employees (40 hrs/wk)	% of Fund Spent on Admin.
OR	$10.2 M	• Wind data collection assistance • Grid-tied RE production incentive for wind, solar, biomass, geothermal • Open-ended solicitation for financial assistance related to renewable energy projects • Market and resource potential analysis	2-4	20%
MA	$26 M	• Green building program (Distributed PV and energy efficiency) • Premium power (fuel cell support program) • Wind development support program	20-25	24%

7   Prototype Incentive Program

Initial screening of the characterized DG technologies resulted in Farm AD as the single DG technology that appears to be a good candidate for incentives to increase the number of systems within AmerenUE's service territory. Market analysis reveals that the potential of Farm AD is approximately 5.2 MW of capacity. Market penetration analysis shows that the number of annual installations, optimistically, would be 75 to 375 kW per year over a twenty year period.

The survey of DG incentive programs revealed several types of incentive structures including capacity based rebates and production credits. Both of these types of incentive structures are appropriate for Farm AD, however, the capacity based incentive is probably best for agricultural customers, because it will minimize the amount of debt that the customer needs to carry through the projects life.

To determine the appropriate amount of incentive, the screening calculator was modified to include incentives in the calculator. Sufficient incentives were included to make the present value levelized cost of electricity from the Farm DG technology equal in cost to grid power. We believe this is a reasonable approach since Farm AD brings additional benefits such as odor and run-off control. This analysis resulted in an incentive amount of approximately $1,665/kW. The analysis is detailed in the following table.

Table 7-1 Incentive Calculation for Farm AD Program

FARM BASED ANAEROBIC DIGESTER
SPARK IGNITION INTERNAL COMBUSTION ENGINE

Customer Parameters

		Escalation
Digester Gas Fuel Cost =	$0.00 /MMBtu	2.5%
Retail Electric Rate =	$0.0528 /kWh	2.5%
Discount Rate =	5.1%	
Federal Tax Rate =	35.0%	
State Tax Rate =	6.5%	
Sales Tax =	7.6% of Price	
Property Tax =	2% of Book Value	
Boiler Efficiency =	80%	

Grid Electric

Externality Adder =	$0.000 /kWh

Self Gen Parameters

Plant Capacity =	500 kW	
Installed Capital Cost =	$6,000 /kW	
Variable O&M Costs =	$0.020 /kWh	4%
Fixed O&M Costs =	$0 /kW-yr	4%
Generator Heat Rate =	11,000 Btu/kWh	
Heat Recovery =	2,571 Btu/kWh	
Capacity Factor =	90% of potential	
Generation Sold =	0% of production	
Plant Life =	20 years	
Self Gen Externality =	$0.000 /kWh	
Boiler Externality =	$0.000 /kWh	

Financing

Equity =	10%
Financing Rate =	8.3%
Loan Term =	20 Years

Tax Incentives

Int. Deduct. Or Dep. =	0 (1=Resid, 0=Corp)
Investment Tax Credit =	$0
Book Life =	7 years

Program Incentives

Buy Down =	$1,665 /kW	
PBI =	$0.000 /kWH	5 yrs
Program Costs =	$1,000,998	

Operational Results

Electric Generated =	3,942,000 kWh/yr	208138
Electric Sold =	0	
Electric Avoided =	3,942,000	
Generator Fuel =	43,362 MMBtu/yr	
TER = 0.75		
FER = 2.90		
T/T' = 0.62	PURPA minimum	
Generator Fuel Cost =	$0 /yr	
Avoided Boiler Fuel =	7,840 MMBtu/yr	
Avd Boiler Fuel Cost =	$0 /yr	

Cost of Electricity

Cost =	$5,111,570
Benefit =	$1,877,696
Net Cost =	$3,233,875
COE =	$0.0410

Present Value of Grid Electric

Avoided Grid Electric =	$3,233,506
PV Grid Rate =	$0.0410

COSTS

Year	Capital	Principal	Payment	Interest	Property Tax	Depreciation	Variable	Fixed	Fuel	Self Gen Externality Adder	PV Factor
0	$233,115	$2,098,032	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$2,053,439	$217,680	$173,088	$62,640	$428,700	$81,994	$0	$0	$0	0.951
2	$0	$2,005,168	$217,680	$169,409	$62,640	$734,700	$85,273	$0	$0	$0	0.905
3	$0	$1,952,914	$217,680	$165,426	$62,640	$524,700	$88,684	$0	$0	$0	0.861
4	$0	$1,896,350	$217,680	$161,115	$62,640	$374,700	$92,232	$0	$0	$0	0.820
5	$0	$1,835,119	$217,680	$156,449	$62,640	$267,900	$95,921	$0	$0	$0	0.780
6	$0	$1,768,836	$217,680	$151,397	$62,640	$267,600	$99,758	$0	$0	$0	0.742
7	$0	$1,697,085	$217,680	$145,929	$62,640	$267,900	$103,748	$0	$0	$0	0.706
8	$0	$1,619,415	$217,680	$140,010	$62,640	$133,800	$107,898	$0	$0	$0	0.672
9	$0	$1,535,337	$217,680	$133,602	$62,640	$0	$112,214	$0	$0	$0	0.639
10	$0	$1,444,322	$217,680	$126,665	$62,640	$0	$116,702	$0	$0	$0	0.608
11	$0	$1,345,798	$217,680	$119,157	$62,640	$0	$121,371	$0	$0	$0	0.579
12	$0	$1,239,147	$217,680	$111,028	$62,640	$0	$126,225	$0	$0	$0	0.551
13	$0	$1,123,697	$217,680	$102,230	$62,640	$0	$131,274	$0	$0	$0	0.524
14	$0	$998,722	$217,680	$92,705	$62,640	$0	$136,525	$0	$0	$0	0.498
15	$0	$863,436	$217,680	$82,395	$62,640	$0	$141,986	$0	$0	$0	0.474
16	$0	$716,990	$217,680	$71,233	$62,640	$0	$147,666	$0	$0	$0	0.451
17	$0	$558,461	$217,680	$59,152	$62,640	$0	$153,572	$0	$0	$0	0.429
18	$0	$386,854	$217,680	$46,073	$62,640	$0	$159,715	$0	$0	$0	0.408
19	$0	$201,090	$217,680	$31,915	$62,640	$0	$166,104	$0	$0	$0	0.389
20	$0	($0)	$217,680	$16,590	$62,640	$0	$172,748	$0	$0	$0	0.370
21	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.352
22	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.335
23	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.319
24	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.303
25	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.288
26	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.274
27	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.261
28	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.248
29	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.236
30	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.225
PV=	$233,115		$2,689,919	$1,550,180	$774,056		$1,414,481	$0	$0	$0	

BENEFITS

Year	Program Incentives	Thermal Credit	Federal	State	Avoided Externality	Avoided Grid Electric	PV Factor
0	$832,500	$0	$0	$0	$0	$0	1.000
1	$0	$0	$150,045	$27,866	$0	$213,341	0.951
2	$0	$0	$257,145	$47,756	$0	$218,675	0.905
3	$0	$0	$183,645	$34,106	$0	$224,141	0.861
4	$0	$0	$131,145	$24,356	$0	$229,745	0.820
5	$0	$0	$93,765	$17,414	$0	$235,489	0.780
6	$0	$0	$93,660	$17,394	$0	$241,376	0.742
7	$0	$0	$93,765	$17,414	$0	$247,410	0.706
8	$0	$0	$46,830	$8,697	$0	$253,595	0.672
9	$0	$0	$0	$0	$0	$259,935	0.639
10	$0	$0	$0	$0	$0	$266,434	0.608
11	$0	$0	$0	$0	$0	$273,095	0.579
12	$0	$0	$0	$0	$0	$279,922	0.551
13	$0	$0	$0	$0	$0	$286,920	0.524
14	$0	$0	$0	$0	$0	$294,093	0.498
15	$0	$0	$0	$0	$0	$301,445	0.474
16	$0	$0	$0	$0	$0	$308,981	0.451
17	$0	$0	$0	$0	$0	$316,706	0.429
18	$0	$0	$0	$0	$0	$324,624	0.408
19	$0	$0	$0	$0	$0	$332,739	0.389
20	$0	$0	$0	$0	$0	$341,058	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$832,500	$0	$881,490	$163,705	$0	$3,233,506	

Also assuming that the administrative costs are 10% of the total program costs, the first year administrative cost is $100,000 and the bare minimum administrative cost in any year is $20,000, the total cost over the life of the program is nearly $9 million and administrative costs nearly $1 million.
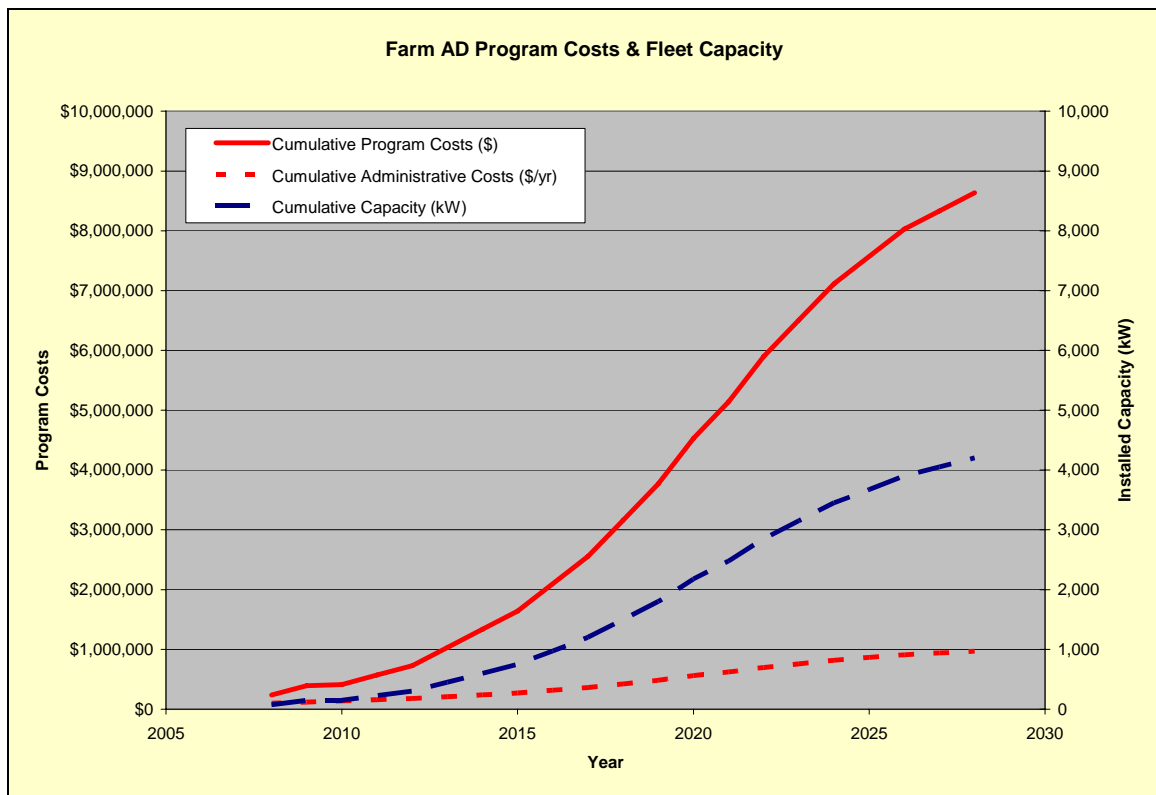
Figure 7-1 Program and Administrative Costs

8   Conclusions & Recommendations

Due to the low cost of retail electricity in AmerenUE's service territory many DG technology options failed to be competitive and were screened out with levelized cost of electricity to retail cost of electricity ratios of 2.48 or higher. Farm Based Anaerobic Digestion was the most competitive of the DG technologies with a levelized cost of electricity of $0.0658/kWh and a levelized cost of electricity to retail cost of electricity ratio of 1.60. Further analysis was conducted around the development of this DG option in Ameren UE service territory. Below are the conclusions of this study.

- Farm AD systems are the best DG candidate for an incentive program within AmerenUE's service territory.

- The market potential for Farm AD systems within AmerenUE's service territory is 5.2 MW, most of which is at swine farms.

- We believe the best program design is a capacity based lump sum incentive paid upon project completion and startup.

- An incentive of approximately $1,665/kW is 28% of the installed capital cost and will make the levelized cost of electricity from Farm AD equal to retail grid electric purchases. Farm AD systems have additional benefits of odor and run-off control.

- A survey of DG program costs shows that administrative costs can vary from 2% to 24%. In this study we assume a base 10% administrative cost with a $100,000 first year start up costs and a minimum $20,000 annual cost. This results in a total program cost of $9 million and an administrative cost of nearly $1 million over the life of the program, which is assumed to be 20 years.

Our recommendations are –

- Analyze the cost of the Farm AD capacity and determine if it is cost effective versus other demand-side management (DSM) and supply-side options.

- If Farm AD is found to be cost effective, develop incentive program details, including market and outreach, program materials and assign responsibility for implementation of the program.

- Regardless of the present cost effectiveness of Farm AD, monitor its progress as well as the performance and economics of –

    o Small run of the river hydroelectric plants

    o Onsite Wind Turbine Technology

- o Natural Gas Reciprocating Internal Combustion Engine Combined Heat and Power applications

- Additional DG technologies that warrant tracking because of their potential for improved economics and green house gas mitigation.

  - o Solar Dish Stirling technology

  - o High temperature Molten Carbonate and Solid Oxide fuel cells

  - o Advanced photovoltaics such as multi-junction and dye sensitized cells

Appendix A – DG Technology Characteristic Matrix

		OPERATION						SITING & ENVIRONMENTAL									
	Rated Full Load Net Capacity (kWe)	Rated Minimum Load (%FL)	Useable Thermal Output (Btu/kWh)	Dispatch-able?	Practical Load Duty (Base, Interm., Peak)	Compatible Fuel(s)	Power Plant Size Footprint (sqft/kW)	Air Emissions (lb/kWh, unless indicated otherwise)						Noise (dB @ ? ft)	Water Consumption (Gal./kWh)	Waste Water Production (Gal./kWh)	Hazardous Materials
								CO2	CO	NOx	SOx	UHC	PM10				
GENERATION																	
Reciprocating I/Cs																	
Diesel	125 - 2000	50	2090 - 4383	Yes	B,I,P	Diesel	.22	1.4355	.0074	0.015 - 0.021	0.0088	0.0008	.0009	80 dB @ 23 ft	Nearly Zero Reported	Zero Reported	None Reported
Otto (Spark Ignition)	100 - 5000	50	3,332 - 5,600	Yes	B,I,P	Biogas, Natural Gas, Propane	.22 - .31	1.078 - 1.345	0.0074 - 0.037	0.0016 - 0.046	0.0	0.0016 - 0.0022	0.0002	100 db @ 3.3 ft	Nearly Zero Reported	Zero Reported	None Reported
Farm Based Anaerobic Digestion	80 - 500	50	Not Reported	No	B	Digester gas	261 / 1634	Not Avail.	Not Avail.	Not Avail.	Not Avail.	Not Avail.	Not Avail.	100 db @ 3.3 ft	Nearly Zero Reported	Zero Reported	None Reported
Small Modular Biomass	See Note																
Gas Turbines																	
Micro-Turbines	25 - 250	0 - 50	4660 - 6200	Yes	B,I,P	Nat. Gas, Diesel, Propane, Multi-fuel	0.15 - 1.5	1.535 - 1.765	0.00027 - 0.00151	0.00045 - 0.00125	Negligible	3 - 9 ppm	Negl.	<60 dB @ 33 ft	Zero Reported	Zero Reported	None Reported
Small Gas Turbines	1000 - 40,000	10 - 50	3,183 - 6,700	Yes	B,I,P	Nat. Gas, Distillate, Biogas	.02 - .61	1.080 - 1.825	0.0004 - 0.0007	0.0008 - 0.0024	Negligible	<15 - 25 ppm	Negl.	80 - 85 @ 23 ft / 85 dB @ 3 ft	Zero Reported	Zero Reported	None Reported
Fuel Cells																	
Molten Carbonate	1,000	25 - 30	1,400	Yes	B,I	Nat. Gas	1.72	0.785 - 0.9	<10 ppmv	<0.3 ppmv	<0.01 ppmv	Negligible	Negligible	72db @ 10 feet.	0.21	0.102	None Reported
Phosphoric Acid	200	0	3400	Yes	B,I	Nat. Gas, Propane	4	1.135	0.00005	0.00004	0	0.00001	0	62 dB @ 30 ft	Zero Reported	Zero Reported	None Reported
Proton Exchange Membrane	1 - 10	0 - 33	4000	Yes	B,I,P	Nat. Gas, Propane, Butane, Diesel	0.6 - 3	1.360	0.00007	0.0001	0	0	0	50 dB @ 6 ft / 65 dB @10 ft	0 - 0.2	Zero Reported	Zero Reported
Solid Oxide	100 - 250	25	1900	Yes	B,I	Nat. Gas	1.1 - 1.2	0.91	0.00004	0.00005	0	0.00001	0	60 dB @ 30 ft	Zero Reported	Zero Reported	Spent Desulfurizer Reagent

	OPERATION							SITING & ENVIRONMENTAL									
	Rated Full Load Net Capacity (kWe)	Rated Minimum Load (%FL)	Useable Thermal Output (Btu/kWh)	Dispatch-able?	Practical Load Duty (Base, Interm., Peak)	Compatible Fuel(s)	Power Plant Size Footprint (sqft/kW)	Air Emissions (lb/kWh, unless indicated otherwise)						Noise (dB @ ? ft)	Water Consumption (Gal/kWh)	Waste Water Production (Gal/kWh)	Hazardous Materials
								CO_2	CO	NOx	SOx	UHC	PM10				
Stirling Engines (fossil fueled)	1	See Note	40,000	No follows thermal load	See Note	Nat. Gas, Propane	See Note	See Note	See Note	See Note	See Note	See Note	See Note	54 db @ 3.28 ft	Zero Reported	0.264	None Reported
Solar Electric																	
Photovoltaics	10 - 10,000	0	0	No	P	Solar	538	0	0	0	0	0	0	0	0	0	None
Dish Stirling	5 - 25	1	10,000	No	I	Solar	140	N/A	N/A	N/A	N/A	N/A	N/A	<68 dB @ 3.3 ft	0	0	Hydrogen
Wind Turbines	10 - 100	1	0	No	P (w/ storage)	Wind	1.0 - 9.0	N/A	N/A	N/A	N/A	N/A	N/A	55 dB @ 200 ft	0	0	None
Small Hydro	50 - 10,000	25	0	Yes	B	Water	0.053	N/A	N/A	N/A	N/A	N/A	N/A	90 dB @ 3.3 ft	0	0	None
STORAGE																	
Thermal Energy Storage																	
Batteries	100 - 2000	0	0	Yes	I,P	Electricity	1	See Note						See Note	0	0	Flooded, VRLA & MBC Batteries
Flywheels	2 - 20,000	0 - 10	0	Yes	P	Electricity	1	See Note						45 dB @ 3 ft	0	0	None

	Net Electric Heat Rate (HHV Btu/kWh) Full Load (100% FL)	PERFORMANCE			Installed Capital Cost ($/kW)	ECONOMICS					ENERGY STORAGE				OTHER ATTRIBUTES
		Expected Availability (%)	Typical Forced Outage Rate (%)	Load Ramp Rate (kW/min)		Fixed O&M ($/kW-yr)	Variable Non-Fuel O&M ($/kWh)	Power Plant Life (yrs)	Construction Lead Time (months)	Stored Energy Capacity (kWh)	Discharge/ Charge Efficiency (%)	Stand-By Losses (% cap/hr)	Time-to-Charge (hrs)	
GENERATION															
Reciprocating I/Cs															
Diesel	9,723 - 11,984	90	1	Not Reported	420 - 750	14	0.007 - 0.015	20	3 - 12	N/A	N/A	N/A	N/A	Emissions data from EPA & Caterpillar
Otto (Spark Ignition)	9,213 - 11,500	96	1	250 - 1,000	2410 Fossil fueled 2510 Renewable fueled	1.1 - 10	0.008 - 0.017	20	8 - 9	N/A	N/A	N/A	N/A	Average SGIP Installed Cap. Cost Data.
Farm Based Anaerobic Digestion	10,000 - 12,000	90 - 95	5 - 10	50	5000 - 6000	Not Reported	0.02	30	8 - 14	N/A	N/A	N/A	N/A	No emissions data available from the manufacturer
Small Modular Biomass														No response from the manufacturer.
Gas Turbines															
Micro-Turbines	13,127 - 15,071	95 - 98+	1 - 5	25 - 250	3330 Fossil fueled 4330 Renewable fueled	See Note	0.01 - 0.02	10	0 - 1	N/A	N/A	N/A	N/A	Average SGIP Installed Cap. Cost Data. Emissions data at 15% O₂.
Small Gas Turbines	9,220 - 15,580	98	1 - 3		3070	5 - 40	0.0035 - 0.0045	20	3 - 16	N/A	N/A	N/A	N/A	Average SGIP Installed Cap. Cost Data. Includes Advanced Simple Cycle GT Data. Emissions data at 15% O2.
Fuel Cells															
Molten Carbonate	7966	>95%	<5%	7 - 285	5000 - 6000	350	.01	20	12	N/A	N/A	N/A	N/A	Gas clean up equipment costs an additional 1000 - 1500 $/kW. Installation does not include the cost of land, transformer, switchgear and project development. Fixed O&M includes cost of major overhauls every five years.
Phosphoric Acid	9480	95.4	1.2	80 kW instantaneous step load change increase while operating grid independent	5000	6.5	0.0087	10	7	N/A	N/A	N/A	N/A	$5000/kW is based upon a quote by UTC Power. Actual installed capital costs reported for PAFC and MCFC installations by the SGIP is $7780/kW
Proton Exchange Membrane	11,370	>95	<1	0.5	55,000	18.0	0.0121	15 -25	1	N/A	N/A	N/A	N/A	1 KW residential unit being commercialized by Ebarra Ballard in Tokyo Gas territory. Product specifications as follows: Performance Generation capacity 1kW. Generation efficiency Over 31% (HHV). Heat recovery efficiency Over 40% (HHV). Hot water storage capacity 200 liters. Fuel City Gas Supply. Goal is to reduce price to $10,000/kW in 2010.
Solid Oxide	7,580	94	4		N/A	N/A	N/A	24	3 - 6	N/A	N/A	N/A	N/A	SOFC technology to be commercially available in 2009. Hybrid SOFC technology to be commercially available in 2011.

	PERFORMANCE				ECONOMICS					ENERGY STORAGE				OTHER ATTRIBUTES
	Net Electric Heat Rate (HHV Btu/kWh) Full Load (100% FL)	Expected Availability (%)	Typical Forced Outage Rate (%)	Load Ramp Rate (kW/min)	Installed Capital Cost ($/kW)	Fixed O&M ($/kW-yr)	Variable Non-Fuel O&M ($/kWh)	Power Plant Life (yrs)	Construction Lead Time (months)	Stored Energy Capacity (kWh)	Discharge/ Charge Efficiency (%)	Stand-By Losses (% cap/hr)	Time-to-Charge (hrs)	
Stirling Engines (fossil fueled)	See Note	See Note	See Note	See Note	See Note	See Note	See Note	See Note	See Note	N/A	N/A	N/A	N/A	Currently only sold in Europe. May be marketed in North America in the next two to three years. Very little data available from the manufacturer on this technology.
Solar Electric														
Photovoltaics	22,780 solar to electric	99	1	N/A	8670	168	.001 - .004	20	3 - 12	N/A	N/A	N/A	N/A	Average SGIP Installed Cap. Cost Data.
Dish Stirling	13,600	85	N/A	N/A	6000	See Note	See Note	20	6	N/A	N/A	N/A	N/A	Hybrid design can also use fossil fuels, such as natural gas. Commercially available in 2009.
Wind Turbines	N/A	98	0 - 1	N/A	4000 - 5310	7.5 - 80	See note	20 - 30	2.5 - 6	N/A	N/A	N/A	N/A	O&M primarily fixed.
Small Hydro	N/A	95% Dam & Res. 65% Run of River	2-3	N/A	2500 - 4500	98	See note	50	20	N/A	N/A	N/A	N/A	O&M primarily fixed.
STORAGE														
Thermal Energy Storage														Please see TES tab.
Batteries	N/A	See Note	See Note	Nearly Instantaneous to Full load	825 - 2625	5 - 20	See Note	5 - 10	2 - 2.5	400 - 8000 kWh assuming 4 hours of storage	60 - 75	0 - 1	Depends on voltage source	No numbers were found for forced outage rate, availability or noise of battery systems. Emissions from battery systems are negligible. Variable O&M not reported.
Flywheels	N/A	97.6%	0	Nearly Instantaneous to Full Load	1000 expected mature tech. cost in 3 - 5 yrs	5	See Note	20	9 - 10	6 - 5000 assuming 15 min of storage	85	<1	0.25	System not currently commercially available. 20 MW units will be available in September 2007. 100 kW units demonstrated in New York and California.

Technology	Mfg/Developer	Name	Telephone #	Website	City	State
Fuel Cells	UTC Power	George Brandt	860.727.2200	www.utcpower.com	South Windsor	CT
	Fuel Cell Energy	Joe Heinzmann	925.586.5142	www.fce.com	Concord	CA
	Siemens	Chris Forbes	412.256.2022	www.powergeneration.siemens.com	Pittsburgh	PA
	Ballard Generation Systems, Inc.	Katherine Reed	604.454.0900	www.ballard.com	Burnaby B.C.	Canada
Dish Stirling	Science Applications International Corp.	Rob Taylor	858.826.9124	www.saic.com	San Diego	CA
Batteries	Engles Power Products	Rob Engles	510.719.2464	www.englespower.com	Oakland	CA
Flywheels	Beacon Power	Chet Lyons	978.661.2831	www.beaconpower.com	Wilmington	MA
Wind Turbines	Northern Power Systems	Bret Pingree	802.583.7342	www.distributed-energy.com	Barre	VT
	Bergey Windpower Company	Michael Bergey	405.364.4212	www.bergey.com	Norman	OK
Reciprocating Engines	Alturdyne	Frank Verbeke	619.569.6141	www.alturdyne.com	San Diego	CA
	Power Generation Engineering Inc.	Ed Reith	209.840.1763	www.pgei.net	Oakdale	CA
	Holt	Scott Moore	916.373.4190	www.holtca.com	West Sacramento	CA
Small Hydro	Alstom Power	Dominique Bruneau	450.746.6500 ext 5135	www.alstom.com	Quebec	Canada
	EES Consulting	Jack Snider	425.889.2700	www.eesconsulting.com	Kirkland	WA
Anaerobic Digestion	RCM International	Mark Moser	510.834.4568	www.rcmdigesters.com	Oakland	CA
Thermal Energy Storage	Chicago Bridge & Iron Co.	Al Green	815.439.6575	www.cbi.com	Plainfield	IL
	Cryogel	Victor Ott	858.457.1837	www.cryogel.com	San Diego	CA
	Ice Energy Inc.	Gary Kaiser	970.545.3630	www.ice-energy.com	Windsor	CO
	Calmac	Paul Valenta	724.625.1220	www.calmac.com	Fair Lawn	NJ
Fossil Fueled Stirling Engines	Whispergen	Loren Madden	643.363.9610	www.whispergen.com		New Zealand

Other Sources of Information

Reciprocating Engines	Gas Fired Distributed Energy Resource Technology Characterizations by GRI and NREL. 2003. NREL/TP-620-34783
Microturbines	California Statewide Self Generation Incentive Program Data. http://www.energycenter.org/uploads/Selfgen_Statewide_Data_Apr07.xls
Small Gas Turbines	
Fuel Cells	
Photovoltaics	California Statewide Self Generation Incentive Program Data. http://www.energycenter.org/uploads/Selfgen_Statewide_Data_Apr07.xls
Dish Stirling	Installed Capital Cost information from http://www.sandia.gov/news/resources/releases/2004/renew-energy-batt/Stirling.html.
Diesel Engines	Handbook for Cogeneration and Combined Cycle Power Plants. Meherwan P. Boyce. ASME Press. 2004
	Caterpillar website spec sheets for diesel engines. http://www.cat.com/cda/components/fullArticle/?m=39280&x=7&id=215813&languageId=7
PEM Fuel Cells	www.fuelcellsworks.com/Supppage5614.htm
Batteries	http://www.apcmedia.com/salestools/SADE-5TNQZT_R2_EN.pdf.
	http://www1.eere.energy.gov/ba/pdfs/appendix.pdf.
	Long- vs. short term energy storage technologies analysis. A life cycle cost study. By Susan M. Schoenung & William V. Hassenzahl. Sandia Natl. Labs. SAND2003-2783
Internal Combustion Technologies	http://www.epa.gov/ttn/chief/ap42/ch03/index.html
Thermal Energy Storage	Cool Thermal Energy Storage. Roth, K. et al. ASHRAE Journal Vol. 48. September 2006.

Thermal Energy Storage Costs

Storage Medium->	H2O	Melt Ice	Ice Harvester	Encapsulated Ice	Phase Change Mat.		
Charging Chiller*	330	330	1320	330	300 $/ton	low
	440	660	1760	660	400 $/ton	high
Installed Tank Cost	33	55	22	55	100 $/ton-hour	low
	110	77	33	77	150 $/ton-hour	high
Conventional Chiller	0.6	0.6	0.6	0.6	0.6 kW/ton	low
	0.7	1.4	1.3	1.2	0.7 kW/ton	high
Piping & Controls	$0	$0	$0	$0	$0 $/ton-hour	low
	$0	$0	$0	$0	$0 $/ton-hour	high
Charging Material Cost	0	0	0	33	100 $/ton-hour	
Chrg/Dischrg Period	8	8	8	8	8 hrs	
Installed Cost	990	1283	2493	1723	3167 $/kW	low
	1886	911	1557	1283	3429 $/kW	high
	1438	1097	2025	1503	3298 $/kW	average

Maintenance Cost
20 $/Ton-yr
0.6 kW/Ton
33.33 $/kW-yr

Ice Bear

Installed system cost	1700	$/ton
Efficiency	1.026	kw/ton
Chrg/Dischrg Period	8	hrs
Installed cost	1656.92	$/kW

Thermal Energy Storage Operational Parameters

Parameter	Chilled Water TES	Encapsulated Ice	Ice Harvester	Eutectic System	Ice-on-Coil	Ice Bear	Units	
Combined cost of off-peak electricity	0.0404	0.0404	0.0404	0.0404	0.0404	0.0404	$/kWh	Fuel Cost
Combined cost of off-peak electricity as fuel	11.855	11.855	11.855	11.855	11.855	11.855	$/MMBtu	
Ton Hours of Stored Cooling	4200	4200	4200	4200	4200	336	Ton-hrs	
Off-peak charging period (hrs)	8	8	8	8	8	8		
Chiller charging Eff.	0.8	1.2	1.1	0.8	1	1.026	kW/ton	
Off-Peak Electric for Charging	3360	5040	4620	3360	4200	344.736	kWh	
Standby Loss Rate	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	Ton/Ton-hrs ORNL	
Standby Losses	10.08	10.08	10.08	10.08	10.08	0.8064	Ton-hrs	
On-peak discharging period (hrs)	8	8	8	8	8	8	Hours	
Displaced Chiller Eff.	0.6	0.6	0.6	0.6	0.6	1.333	kW/ton	
TES Discharge Rate	523.74	523.74	523.74	523.74	523.74	41.899	tons	
TES Avoided On-Peak Demand	314.244	314.244	314.244	314.244	314.244	55.852	kW	
Displaced On-Peak Electricity	2513.952	2513.952	2513.952	2513.952	2513.952	446.813	kWh	
Heat Rate	4560	6824	6255	4549	5687	2626	Btu/kWh	
only fuel cost	0.0541	0.0809	0.0742	0.0539	0.0674	0.0311	$/kWh	fuel cost only
Efficiency	0.75	0.50	0.55	0.75	0.60	1.30		

Appendix B – DG Technology Screening
RESIDENTIAL
PHOTOVOLTAIC

Customer Parameters   **Escalation**
Solar Fuel Cost =	$0.00	/MMBtu	2.5%
Retail Electric Rate =	$0.0652	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric
Externality Adder =	$0.000	/kWh

Self Gen Parameters
Plant Capacity =	2.5	kW	
Installed Capital Cost =	$11,000	/kW	
Variable O&M Costs =	$0.001	/kWh	4%
Fixed O&M Costs =	$168	/kW-yr	4%
Generator Heat Rate =	0	Btu/kWh	
Heat Recovery =	0	Btu/kWh	
Capacity Factor =	18%	of potential	
Generation Sold =	0%	of production	
Plant Life =	20	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing
Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	10	Years

Tax Incentives
Int. Deduct. Or Dep. =	1	(1=Resid, 0=Corp)
Investment Tax Credit =	$2,000	30%
Book Life =	5	years

Program Incentives
Buy Down =	$0	/kW	
PBI =	$0.000	/kWH	5 yrs
Program Costs =	$0		

Operational Results
Electric Generated =	3,942	kWh/yr
Electric Sold =	0	
Electric Avoided =	3,942	
Generator Fuel =	0	MMBtu/yr
TER = 0.00		
FER = 0.00		
T/T' = 0.00		PURPA minimum
Generator Fuel Cost =	$0	/yr
Avoided Boiler Fuel =	0	MMBtu/yr
Avd Boiler Fuel Cost =	$0	/yr

Cost of Electricity
Cost =	$45,804	
Benefit =	$10,212	
Net Cost =	$35,592	
COE =	$0.4514	/kWh

Present Value of Grid Electric
Avoided Grid Electric =	$3,993	
PV Grid Rate =	$0.0506	/kWh

Year	COSTS Capital	Financing/Recovery Principal	Payment	Interest	Property Tax	Depreciation	O&M Variable	Fixed	Fuel	Self Gen Externality Adder	PV Factor
0	$2,958	$26,619	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$24,803	$4,012	$2,196	$574	$0	$4	$437	$0	$0	0.951
2	$0	$22,837	$4,012	$2,046	$574	$0	$4	$454	$0	$0	0.905
3	$0	$20,710	$4,012	$1,884	$574	$0	$4	$472	$0	$0	0.861
4	$0	$18,406	$4,012	$1,709	$574	$0	$5	$491	$0	$0	0.820
5	$0	$15,913	$4,012	$1,519	$574	$0	$5	$511	$0	$0	0.780
6	$0	$13,214	$4,012	$1,313	$574	$0	$5	$531	$0	$0	0.742
7	$0	$10,292	$4,012	$1,090	$574	$0	$5	$553	$0	$0	0.706
8	$0	$7,130	$4,012	$849	$574	$0	$5	$575	$0	$0	0.672
9	$0	$3,706	$4,012	$588	$574	$0	$6	$598	$0	$0	0.639
10	$0	($0)	$4,012	$306	$574	$0	$6	$622	$0	$0	0.608
11	$0	($0)	$0	($0)	$0	$0	$6	$647	$0	$0	0.579
12	$0	($0)	$0	($0)	$0	$0	$6	$672	$0	$0	0.551
13	$0	($0)	$0	($0)	$0	$0	$7	$699	$0	$0	0.524
14	$0	($0)	$0	($0)	$0	$0	$7	$727	$0	$0	0.498
15	$0	($0)	$0	($0)	$0	$0	$7	$756	$0	$0	0.474
16	$0	($0)	$0	($0)	$0	$0	$7	$787	$0	$0	0.451
17	$0	($0)	$0	($0)	$0	$0	$8	$818	$0	$0	0.429
18	$0	($0)	$0	($0)	$0	$0	$8	$851	$0	$0	0.408
19	$0	($0)	$0	($0)	$0	$0	$8	$885	$0	$0	0.389
20	$0	($0)	$0	($0)	$0	$0	$9	$920	$0	$0	0.370
21	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.352
22	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.335
23	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.319
24	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.303
25	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.288
26	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.274
27	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.261
28	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.248
29	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.236
30	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.225
PV=	$2,958		$30,828	$11,025	$4,412		$71	$7,535	$0	$0	

| Year | BENEFITS | | | | | | |
| | Program Incentives | Thermal Credit | Tax Benefits | | Avoided Externality | Avoided Grid Electric | PV Factor |
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$0	$2,970	$2,180	$0	$263	0.951
2	$0	$0	$917	$170	$0	$270	0.905
3	$0	$0	$860	$160	$0	$277	0.861
4	$0	$0	$799	$148	$0	$284	0.820
5	$0	$0	$732	$136	$0	$291	0.780
6	$0	$0	$660	$123	$0	$298	0.742
7	$0	$0	$583	$108	$0	$306	0.706
8	$0	$0	$498	$93	$0	$313	0.672
9	$0	$0	$407	$76	$0	$321	0.639
10	$0	$0	$308	$57	$0	$329	0.608
11	$0	$0	($0)	($0)	$0	$337	0.579
12	$0	$0	($0)	($0)	$0	$346	0.551
13	$0	$0	($0)	($0)	$0	$354	0.524
14	$0	$0	($0)	($0)	$0	$363	0.498
15	$0	$0	($0)	($0)	$0	$372	0.474
16	$0	$0	($0)	($0)	$0	$382	0.451
17	$0	$0	($0)	($0)	$0	$391	0.429
18	$0	$0	($0)	($0)	$0	$401	0.408
19	$0	$0	($0)	($0)	$0	$411	0.389
20	$0	$0	$0	$0	$0	$421	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$0	$7,306	$2,906	$0	$3,993	

COMMERCIAL
PHOTOVOLTAIC

Customer Parameters			**Escalation**
Solar Fuel Cost =	$0.00	/MMBtu	2.5%
Retail Electric Rate =	$0.0528	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	10,000	kW	
Installed Capital Cost =	$8,670	/kW	
Variable O&M Costs =	$0.001	/kWh	4%
Fixed O&M Costs =	$168	/kW-yr	4%
Generator Heat Rate =	0	Btu/kWh	
Heat Recovery =	0	Btu/kWh	
Capacity Factor =	18%	of potential	
Generation Sold =	0%	of production	
Plant Life =	20	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	20	Years

Tax Incentives

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$26,010,000	30%
Book Life =	5	years

Program Incentives

Buy Down =	$0	/kW	
PBI =	$0.000	/kWH	5 yrs
Program Costs =	$0		

Operational Results

Electric Generated =	15,768,000	kWh/yr
Electric Sold =	0	
Electric Avoided =	15,768,000	
Generator Fuel =	0	MMBtu/yr
TER = 0.00		
FER = 0.00		
T/T' = 0.00		PURPA minimum
Generator Fuel Cost =	$0	/yr
Avoided Boiler Fuel =	0	MMBtu/yr
Avd Boiler Fuel Cost =	$0	/yr

Cost of Electricity

Cost =	$169,715,590	
Benefit =	$46,719,477	
Net Cost =	$122,996,113	
COE =	$0.3900	/kWh

Present Value of Grid Electric

Avoided Grid Electric =	$12,934,022	
PV Grid Rate =	$0.0410	/kWh

	COSTS										
		Financing/Recovery					O&M			Self Gen Externality Adder	PV Factor
Year	Capital	Principal	Payment	Interest	Property Tax	Depreciation	Variable	Fixed	Fuel		
0	$9,324,585	$83,921,265	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$82,137,571	$8,707,198	$6,923,504	$1,810,296	$12,138,000	$16,399	$1,747,200	$0	$0	0.951
2	$0	$80,206,722	$8,707,198	$6,776,350	$1,810,296	$19,420,800	$17,055	$1,817,088	$0	$0	0.905
3	$0	$78,116,579	$8,707,198	$6,617,055	$1,810,296	$11,652,480	$17,737	$1,889,772	$0	$0	0.861
4	$0	$75,853,998	$8,707,198	$6,444,618	$1,810,296	$6,991,488	$18,446	$1,965,362	$0	$0	0.820
5	$0	$73,404,755	$8,707,198	$6,257,955	$1,810,296	$6,991,488	$19,184	$2,043,977	$0	$0	0.780
6	$0	$70,753,449	$8,707,198	$6,055,892	$1,810,296	$3,495,744	$19,952	$2,125,736	$0	$0	0.742
7	$0	$67,883,410	$8,707,198	$5,837,160	$1,810,296	$0	$20,750	$2,210,765	$0	$0	0.706
8	$0	$64,776,593	$8,707,198	$5,600,381	$1,810,296	$0	$21,580	$2,299,196	$0	$0	0.672
9	$0	$61,413,464	$8,707,198	$5,344,069	$1,810,296	$0	$22,443	$2,391,164	$0	$0	0.639
10	$0	$57,772,876	$8,707,198	$5,066,611	$1,810,296	$0	$23,340	$2,486,810	$0	$0	0.608
11	$0	$53,831,940	$8,707,198	$4,766,262	$1,810,296	$0	$24,274	$2,586,283	$0	$0	0.579
12	$0	$49,565,877	$8,707,198	$4,441,135	$1,810,296	$0	$25,245	$2,689,734	$0	$0	0.551
13	$0	$44,947,863	$8,707,198	$4,089,185	$1,810,296	$0	$26,255	$2,797,323	$0	$0	0.524
14	$0	$39,948,864	$8,707,198	$3,708,199	$1,810,296	$0	$27,305	$2,909,216	$0	$0	0.498
15	$0	$34,537,447	$8,707,198	$3,295,781	$1,810,296	$0	$28,397	$3,025,585	$0	$0	0.474
16	$0	$28,679,588	$8,707,198	$2,849,339	$1,810,296	$0	$29,533	$3,146,608	$0	$0	0.451
17	$0	$22,338,455	$8,707,198	$2,366,066	$1,810,296	$0	$30,714	$3,272,473	$0	$0	0.429
18	$0	$15,474,180	$8,707,198	$1,842,923	$1,810,296	$0	$31,943	$3,403,372	$0	$0	0.408
19	$0	$8,043,601	$8,707,198	$1,276,620	$1,810,296	$0	$33,221	$3,539,507	$0	$0	0.389
20	$0	($0)	$8,707,198	$663,597	$1,810,296	$0	$34,550	$3,681,087	$0	$0	0.370
21	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.352
22	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.335
23	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.319
24	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.303
25	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.288
26	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.274
27	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.261
28	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.248
29	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.236
30	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.225
PV=	$9,324,585		$107,596,740	$62,007,197	$22,370,221		$282,896	$30,141,148	$0	$0	

	BENEFITS						
	Program Incentives	Thermal Credit	Tax Benefits		Avoided Externality	Avoided Grid Electric	PV Factor
Year			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$0	$30,258,300	$788,970	$0	$853,364	0.951
2	$0	$0	$6,797,280	$1,262,352	$0	$874,698	0.905
3	$0	$0	$4,078,368	$757,411	$0	$896,566	0.861
4	$0	$0	$2,447,021	$454,447	$0	$918,980	0.820
5	$0	$0	$2,447,021	$454,447	$0	$941,954	0.780
6	$0	$0	$1,223,510	$227,223	$0	$965,503	0.742
7	$0	$0	$0	$0	$0	$989,641	0.706
8	$0	$0	$0	$0	$0	$1,014,382	0.672
9	$0	$0	$0	$0	$0	$1,039,741	0.639
10	$0	$0	$0	$0	$0	$1,065,735	0.608
11	$0	$0	$0	$0	$0	$1,092,378	0.579
12	$0	$0	$0	$0	$0	$1,119,688	0.551
13	$0	$0	$0	$0	$0	$1,147,680	0.524
14	$0	$0	$0	$0	$0	$1,176,372	0.498
15	$0	$0	$0	$0	$0	$1,205,781	0.474
16	$0	$0	$0	$0	$0	$1,235,926	0.451
17	$0	$0	$0	$0	$0	$1,266,824	0.429
18	$0	$0	$0	$0	$0	$1,298,494	0.408
19	$0	$0	$0	$0	$0	$1,330,957	0.389
20	$0	$0	$0	$0	$0	$1,364,231	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$0	$43,278,139	$3,441,338	$0	$12,934,022	

RESIDENTIAL
WIND TURBINE

Customer Parameters			Escalation
Wind Fuel Cost =	$0.00	/MMBtu	2.5%
Retail Electric Rate =	$0.0652	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	2	kW	
Installed Capital Cost =	$8,300	/kW	
Variable O&M Costs =	$0.000	/kWh	4%
Fixed O&M Costs =	$8	/kW-yr	4%
Generator Heat Rate =	0	Btu/kWh	
Heat Recovery =	0	Btu/kWh	
Capacity Factor =	25%	of potential	
Generation Sold =	0%	of production	
Plant Life =	25	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	20	Years

Tax Incentives

Int. Deduct. Or Dep. =	1	(1=Resid, 0=Corp)
Investment Tax Credit =	$0	
Book Life =	5	years

Program Incentives

Buy Down =	$0	/kW	
PBI =	$0.000	/kWH	5 yrs
Program Costs =	$0		

Operational Results

Electric Generated =	3,942	kWh/yr
Electric Sold =	0	
Electric Avoided =	3,942	
Generator Fuel =	0	MMBtu/yr
TER = 0.00		
FER = 0.00		
T/T' = 0.00		PURPA minimum
Generator Fuel Cost =	$0	/yr
Avoided Boiler Fuel =	0	MMBtu/yr
Avd Boiler Fuel Cost =	$0	/yr

Cost of Electricity

Cost =	$24,298
Benefit =	$6,034
Net Cost =	$18,264
COE =	$0.1853

Present Value of Grid Electric

Avoided Grid Electric =	$4,716
PV Grid Rate =	$0.0479

Year	Capital	Financing/Recovery			Property Tax	Depreciation	O&M		Fuel	Self Gen Externality Adder	PV Factor
		Principal	Payment	Interest			Variable	Fixed			
0	$1,607	$14,461	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$14,154	$1,500	$1,193	$312	$0	$0	$14	$0	$0	0.951
2	$0	$13,821	$1,500	$1,168	$312	$0	$0	$15	$0	$0	0.905
3	$0	$13,461	$1,500	$1,140	$312	$0	$0	$15	$0	$0	0.861
4	$0	$13,071	$1,500	$1,111	$312	$0	$0	$16	$0	$0	0.820
5	$0	$12,649	$1,500	$1,078	$312	$0	$0	$16	$0	$0	0.780
6	$0	$12,192	$1,500	$1,044	$312	$0	$0	$17	$0	$0	0.742
7	$0	$11,698	$1,500	$1,006	$312	$0	$0	$18	$0	$0	0.706
8	$0	$11,162	$1,500	$965	$312	$0	$0	$18	$0	$0	0.672
9	$0	$10,583	$1,500	$921	$312	$0	$0	$19	$0	$0	0.639
10	$0	$9,955	$1,500	$873	$312	$0	$0	$20	$0	$0	0.608
11	$0	$9,276	$1,500	$821	$312	$0	$0	$21	$0	$0	0.579
12	$0	$8,541	$1,500	$765	$312	$0	$0	$22	$0	$0	0.551
13	$0	$7,745	$1,500	$705	$312	$0	$0	$22	$0	$0	0.524
14	$0	$6,884	$1,500	$639	$312	$0	$0	$23	$0	$0	0.498
15	$0	$5,951	$1,500	$568	$312	$0	$0	$24	$0	$0	0.474
16	$0	$4,942	$1,500	$491	$312	$0	$0	$25	$0	$0	0.451
17	$0	$3,849	$1,500	$408	$312	$0	$0	$26	$0	$0	0.429
18	$0	$2,666	$1,500	$318	$312	$0	$0	$27	$0	$0	0.408
19	$0	$1,386	$1,500	$220	$312	$0	$0	$28	$0	$0	0.389
20	$0	($0)	$1,500	$114	$312	$0	$0	$30	$0	$0	0.370
21	$0	($0)	$0	($0)	$0	$0	$0	$31	$0	$0	0.352
22	$0	($0)	$0	($0)	$0	$0	$0	$32	$0	$0	0.335
23	$0	($0)	$0	($0)	$0	$0	$0	$33	$0	$0	0.319
24	$0	($0)	$0	($0)	$0	$0	$0	$35	$0	$0	0.303
25	$0	($0)	$0	($0)	$0	$0	$0	$36	$0	$0	0.288
26	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.274
27	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.261
28	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.248
29	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.236
30	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.225
PV=	$1,607		$18,541	$10,685	$3,855		$0	$295	$0	$0	

Confidential

| Year | BENEFITS | | | | | | |
| | Program Incentives | Thermal Credit | Tax Benefits | | Avoided Externality | Avoided Grid Electric | PV Factor |
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$0	$527	$98	$0	$263	0.951
2	$0	$0	$518	$96	$0	$270	0.905
3	$0	$0	$508	$94	$0	$277	0.861
4	$0	$0	$498	$92	$0	$284	0.820
5	$0	$0	$487	$90	$0	$291	0.780
6	$0	$0	$474	$88	$0	$298	0.742
7	$0	$0	$461	$86	$0	$306	0.706
8	$0	$0	$447	$83	$0	$313	0.672
9	$0	$0	$431	$80	$0	$321	0.639
10	$0	$0	$415	$77	$0	$329	0.608
11	$0	$0	$397	$74	$0	$337	0.579
12	$0	$0	$377	$70	$0	$346	0.551
13	$0	$0	$356	$66	$0	$354	0.524
14	$0	$0	$333	$62	$0	$363	0.498
15	$0	$0	$308	$57	$0	$372	0.474
16	$0	$0	$281	$52	$0	$382	0.451
17	$0	$0	$252	$47	$0	$391	0.429
18	$0	$0	$220	$41	$0	$401	0.408
19	$0	$0	$186	$35	$0	$411	0.389
20	$0	$0	$149	$28	$0	$421	0.370
21	$0	$0	($0)	($0)	$0	$432	0.352
22	$0	$0	($0)	($0)	$0	$442	0.335
23	$0	$0	($0)	($0)	$0	$454	0.319
24	$0	$0	($0)	($0)	$0	$465	0.303
25	$0	$0	$0	$0	$0	$476	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$0	$5,089	$945	$0	$4,716	

COMMERCIAL
WIND TURBINE

Customer Parameters			Escalation
Wind Fuel Cost =	$13.53	/MMBtu	2.5%
Retail Electric Rate =	$0.0528	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	100	kW	
Installed Capital Cost =	$4,000	/kW	
Variable O&M Costs =	$0.000	/kWh	4%
Fixed O&M Costs =	$80	/kW-yr	4%
Generator Heat Rate =	0	Btu/kWh	
Heat Recovery =	0	Btu/kWh	
Capacity Factor =	25%	of potential	
Generation Sold =	0%	of production	
Plant Life =	25	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	20	Years

Tax Incentives

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$0	
Book Life =	5	years

Program Incentives

Buy Down =	$0	/kW	
PBI =	$0.000	/kWH	5 yrs
Program Costs =	$0		

Operational Results

Electric Generated =	219,000	kWh/yr
Electric Sold =	0	
Electric Avoided =	219,000	
Generator Fuel =	0	MMBtu/yr
TER = 0.00		
FER = 0.00		
T/T' = 0.00		PURPA minimum
Generator Fuel Cost =	$0	/yr
Avoided Boiler Fuel =	0	MMBtu/yr
Avd Boiler Fuel Cost =	$0	/yr

Cost of Electricity

Cost =	$817,572
Benefit =	$144,812
Net Cost =	$672,760
COE =	$0.1229

Present Value of Grid Electric

Avoided Grid Electric =	$212,156
PV Grid Rate =	$0.0387

Year	Capital	Financing/Recovery			Property Tax	Depreciation	O&M		Fuel	Self Gen Externality Adder	PV Factor
		Principal	Payment	Interest			Variable	Fixed			
0	$43,020	$387,180	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$378,951	$40,172	$31,942	$8,352	$80,000	$0	$8,320	$0	$0	0.951
2	$0	$370,043	$40,172	$31,263	$8,352	$128,000	$0	$8,653	$0	$0	0.905
3	$0	$360,399	$40,172	$30,529	$8,352	$76,800	$0	$8,999	$0	$0	0.861
4	$0	$349,961	$40,172	$29,733	$8,352	$46,080	$0	$9,359	$0	$0	0.820
5	$0	$338,661	$40,172	$28,872	$8,352	$46,080	$0	$9,733	$0	$0	0.780
6	$0	$326,429	$40,172	$27,940	$8,352	$23,040	$0	$10,123	$0	$0	0.742
7	$0	$313,188	$40,172	$26,930	$8,352	$0	$0	$10,527	$0	$0	0.706
8	$0	$298,854	$40,172	$25,838	$8,352	$0	$0	$10,949	$0	$0	0.672
9	$0	$283,338	$40,172	$24,655	$8,352	$0	$0	$11,386	$0	$0	0.639
10	$0	$266,542	$40,172	$23,375	$8,352	$0	$0	$11,842	$0	$0	0.608
11	$0	$248,360	$40,172	$21,990	$8,352	$0	$0	$12,316	$0	$0	0.579
12	$0	$228,678	$40,172	$20,490	$8,352	$0	$0	$12,808	$0	$0	0.551
13	$0	$207,372	$40,172	$18,866	$8,352	$0	$0	$13,321	$0	$0	0.524
14	$0	$184,308	$40,172	$17,108	$8,352	$0	$0	$13,853	$0	$0	0.498
15	$0	$159,342	$40,172	$15,205	$8,352	$0	$0	$14,408	$0	$0	0.474
16	$0	$132,316	$40,172	$13,146	$8,352	$0	$0	$14,984	$0	$0	0.451
17	$0	$103,061	$40,172	$10,916	$8,352	$0	$0	$15,583	$0	$0	0.429
18	$0	$71,392	$40,172	$8,503	$8,352	$0	$0	$16,207	$0	$0	0.408
19	$0	$37,110	$40,172	$5,890	$8,352	$0	$0	$16,855	$0	$0	0.389
20	$0	($0)	$40,172	$3,062	$8,352	$0	$0	$17,529	$0	$0	0.370
21	$0	($0)	$0	($0)	$0	$0	$0	$18,230	$0	$0	0.352
22	$0	($0)	$0	($0)	$0	$0	$0	$18,959	$0	$0	0.335
23	$0	($0)	$0	($0)	$0	$0	$0	$19,718	$0	$0	0.319
24	$0	($0)	$0	($0)	$0	$0	$0	$20,506	$0	$0	0.303
25	$0	($0)	$0	($0)	$0	$0	$0	$21,327	$0	$0	0.288
26	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.274
27	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.261
28	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.248
29	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.236
30	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.225
PV=	$43,020		$496,409	$286,077	$103,207		$0	$174,935	$0	$0	

| Year | BENEFITS | | | | | | |
| | Program Incentives | Thermal Credit | Tax Benefits | | Avoided Externality | Avoided Grid Electric | PV Factor |
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$0	$28,000	$5,200	$0	$11,852	0.951
2	$0	$0	$44,800	$8,320	$0	$12,149	0.905
3	$0	$0	$26,880	$4,992	$0	$12,452	0.861
4	$0	$0	$16,128	$2,995	$0	$12,764	0.820
5	$0	$0	$16,128	$2,995	$0	$13,083	0.780
6	$0	$0	$8,064	$1,498	$0	$13,410	0.742
7	$0	$0	$0	$0	$0	$13,745	0.706
8	$0	$0	$0	$0	$0	$14,089	0.672
9	$0	$0	$0	$0	$0	$14,441	0.639
10	$0	$0	$0	$0	$0	$14,802	0.608
11	$0	$0	$0	$0	$0	$15,172	0.579
12	$0	$0	$0	$0	$0	$15,551	0.551
13	$0	$0	$0	$0	$0	$15,940	0.524
14	$0	$0	$0	$0	$0	$16,338	0.498
15	$0	$0	$0	$0	$0	$16,747	0.474
16	$0	$0	$0	$0	$0	$17,166	0.451
17	$0	$0	$0	$0	$0	$17,595	0.429
18	$0	$0	$0	$0	$0	$18,035	0.408
19	$0	$0	$0	$0	$0	$18,486	0.389
20	$0	$0	$0	$0	$0	$18,948	0.370
21	$0	$0	$0	$0	$0	$19,421	0.352
22	$0	$0	$0	$0	$0	$19,907	0.335
23	$0	$0	$0	$0	$0	$20,405	0.319
24	$0	$0	$0	$0	$0	$20,915	0.303
25	$0	$0	$0	$0	$0	$21,438	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$0	$122,131	$22,681	$0	$212,156	

INDUSTRIAL
SMALL HYDRO

Customer Parameters			**Escalation**
Hydro Fuel Cost =	$0.00	/MMBtu	2.5%
Retail Electric Rate =	$0.0393	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	10,000	kW	
Installed Capital Cost =	$3,500	/kW	
Variable O&M Costs =	$0.000	/kWh	4%
Fixed O&M Costs =	$98	/kW-yr	4%
Generator Heat Rate =	0	Btu/kWh	
Heat Recovery =	0	Btu/kWh	
Capacity Factor =	40%	of potential	
Generation Sold =	0%	of production	
Plant Life =	30	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	20	Years

Tax Incentives

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$0	
Book Life =	15	years

Program Incentives

Buy Down =	$0	/kW	
PBI =	$0.000	/kWH	5 yrs
Program Costs =	$0		

Operational Results

Electric Generated =	35,040,000	kWh/yr
Electric Sold =	0	
Electric Avoided =	35,040,000	
Generator Fuel =	0	MMBtu/yr
TER = 0.00		
FER = 0.00		
T/T' = 0.00		PURPA minimum
Generator Fuel Cost =	$0	/yr
Avoided Boiler Fuel =	0	MMBtu/yr
Avd Boiler Fuel Cost =	$0	/yr

Cost of Electricity

Cost =	$81,310,371	
Benefit =	$10,078,895	
Net Cost =	$71,231,475	
COE =	$0.0678	/kWh

Present Value of Grid Electric

Avoided Grid Electric =	$28,682,421	
PV Grid Rate =	$0.0273	/kWh

	COSTS										
		Financing/Recovery					O&M			Self Gen Externality	PV
Year	Capital	Principal	Payment	Interest	Property Tax	Depreciation	Variable	Fixed	Fuel	Adder	Factor
0	$3,764,250	$33,878,250	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$33,158,189	$3,515,017	$2,794,956	$730,800	$1,750,000	$0	$1,019,200	$0	$0	0.951
2	$0	$32,378,723	$3,515,017	$2,735,551	$730,800	$3,325,000	$0	$1,059,968	$0	$0	0.905
3	$0	$31,534,951	$3,515,017	$2,671,245	$730,800	$2,992,500	$0	$1,102,367	$0	$0	0.861
4	$0	$30,621,568	$3,515,017	$2,601,633	$730,800	$2,695,000	$0	$1,146,461	$0	$0	0.820
5	$0	$29,632,831	$3,515,017	$2,526,279	$730,800	$2,425,500	$0	$1,192,320	$0	$0	0.780
6	$0	$28,562,523	$3,515,017	$2,444,709	$730,800	$2,180,500	$0	$1,240,013	$0	$0	0.742
7	$0	$27,403,914	$3,515,017	$2,356,408	$730,800	$2,065,000	$0	$1,289,613	$0	$0	0.706
8	$0	$26,149,720	$3,515,017	$2,260,823	$730,800	$2,065,000	$0	$1,341,198	$0	$0	0.672
9	$0	$24,792,056	$3,515,017	$2,157,352	$730,800	$2,068,500	$0	$1,394,846	$0	$0	0.639
10	$0	$23,322,384	$3,515,017	$2,045,345	$730,800	$2,065,000	$0	$1,450,639	$0	$0	0.608
11	$0	$21,731,464	$3,515,017	$1,924,097	$730,800	$2,068,500	$0	$1,508,665	$0	$0	0.579
12	$0	$20,009,293	$3,515,017	$1,792,846	$730,800	$2,065,000	$0	$1,569,012	$0	$0	0.551
13	$0	$18,145,043	$3,515,017	$1,650,767	$730,800	$2,068,500	$0	$1,631,772	$0	$0	0.524
14	$0	$16,126,992	$3,515,017	$1,496,966	$730,800	$2,065,000	$0	$1,697,043	$0	$0	0.498
15	$0	$13,942,453	$3,515,017	$1,330,477	$730,800	$2,068,500	$0	$1,764,925	$0	$0	0.474
16	$0	$11,577,688	$3,515,017	$1,150,252	$730,800	$1,032,500	$0	$1,835,522	$0	$0	0.451
17	$0	$9,017,831	$3,515,017	$955,159	$730,800	$0	$0	$1,908,942	$0	$0	0.429
18	$0	$6,246,785	$3,515,017	$743,971	$730,800	$0	$0	$1,985,300	$0	$0	0.408
19	$0	$3,247,129	$3,515,017	$515,360	$730,800	$0	$0	$2,064,712	$0	$0	0.389
20	$0	($0)	$3,515,017	$267,888	$730,800	$0	$0	$2,147,301	$0	$0	0.370
21	$0	($0)	$0	($0)	$0	$0	$0	$2,233,193	$0	$0	0.352
22	$0	($0)	$0	($0)	$0	$0	$0	$2,322,520	$0	$0	0.335
23	$0	($0)	$0	($0)	$0	$0	$0	$2,415,421	$0	$0	0.319
24	$0	($0)	$0	($0)	$0	$0	$0	$2,512,038	$0	$0	0.303
25	$0	($0)	$0	($0)	$0	$0	$0	$2,612,520	$0	$0	0.288
26	$0	($0)	$0	($0)	$0	$0	$0	$2,717,020	$0	$0	0.274
27	$0	($0)	$0	($0)	$0	$0	$0	$2,825,701	$0	$0	0.261
28	$0	($0)	$0	($0)	$0	$0	$0	$2,938,729	$0	$0	0.248
29	$0	($0)	$0	($0)	$0	$0	$0	$3,056,278	$0	$0	0.236
30	$0	($0)	$0	($0)	$0	$0	$0	$3,178,530	$0	$0	0.225
PV=	$3,764,250		$43,435,824	$25,031,740	$9,030,654			$0 $25,079,643	$0	$0	

Year	BENEFITS						
	Program Incentives	Thermal Credit	Tax Benefits		Avoided Externality	Avoided Grid Electric	PV Factor
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$0	$612,500	$113,750	$0	$1,411,499	0.951
2	$0	$0	$1,163,750	$216,125	$0	$1,446,786	0.905
3	$0	$0	$1,047,375	$194,513	$0	$1,482,956	0.861
4	$0	$0	$943,250	$175,175	$0	$1,520,030	0.820
5	$0	$0	$848,925	$157,658	$0	$1,558,031	0.780
6	$0	$0	$763,175	$141,733	$0	$1,596,981	0.742
7	$0	$0	$722,750	$134,225	$0	$1,636,906	0.706
8	$0	$0	$722,750	$134,225	$0	$1,677,829	0.672
9	$0	$0	$723,975	$134,453	$0	$1,719,774	0.639
10	$0	$0	$722,750	$134,225	$0	$1,762,769	0.608
11	$0	$0	$723,975	$134,453	$0	$1,806,838	0.579
12	$0	$0	$722,750	$134,225	$0	$1,852,009	0.551
13	$0	$0	$723,975	$134,453	$0	$1,898,309	0.524
14	$0	$0	$722,750	$134,225	$0	$1,945,767	0.498
15	$0	$0	$723,975	$134,453	$0	$1,994,411	0.474
16	$0	$0	$361,375	$67,113	$0	$2,044,271	0.451
17	$0	$0	$0	$0	$0	$2,095,378	0.429
18	$0	$0	$0	$0	$0	$2,147,762	0.408
19	$0	$0	$0	$0	$0	$2,201,456	0.389
20	$0	$0	$0	$0	$0	$2,256,493	0.370
21	$0	$0	$0	$0	$0	$2,312,905	0.352
22	$0	$0	$0	$0	$0	$2,370,728	0.335
23	$0	$0	$0	$0	$0	$2,429,996	0.319
24	$0	$0	$0	$0	$0	$2,490,746	0.303
25	$0	$0	$0	$0	$0	$2,553,015	0.288
26	$0	$0	$0	$0	$0	$2,616,840	0.274
27	$0	$0	$0	$0	$0	$2,682,261	0.261
28	$0	$0	$0	$0	$0	$2,749,317	0.248
29	$0	$0	$0	$0	$0	$2,818,050	0.236
30	$0	$0	$0	$0	$0	$2,888,502	0.225
PV=	$0	$0	$8,500,273	$1,578,622	$0	$28,682,421	

COMMERCIAL
SPARK IGNITION INTERNAL COMBUSTION ENGINE
WITHOUT THERMAL CREDIT

Customer Parameters			Escalation
Nat. Gas Fuel Cost =	$13.50	/MMBtu	2.5%
Retail Electric Rate =	$0.0528	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	1,000	kW	
Installed Capital Cost =	$2,410	/kW	
Variable O&M Costs =	$0.009	/kWh	4%
Fixed O&M Costs =	$4	/kW-yr	4%
Generator Heat Rate =	10,035	Btu/kWh	
Heat Recovery =	3,700	Btu/kWh	
Capacity Factor =	60%	of potential	
Generation Sold =	0%	of production	
Plant Life =	20	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	20	Years

Tax Incentives

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$0	
Book Life =	15	years

Program Incentives

Buy Down =	$0	/kW	
PBI =	$0.000	/kWH	5 yrs
Program Costs =	$0		

Operational Results

Electric Generated =	5,256,000	kWh/yr
Electric Sold =	0	
Electric Avoided =	5,256,000	
Generator Fuel =	52,744	MMBtu/yr
TER = 1.08		
FER = 2.65		
T/T' = 0.00		PURPA minimum
Generator Fuel Cost =	$712,043	/yr
Avoided Boiler Fuel =	0	MMBtu/yr
Avd Boiler Fuel Cost =	$0	/yr

Cost of Electricity

Cost =	$15,807,087
Benefit =	$694,004
Net Cost =	$15,113,083
COE =	$0.1438

Present Value of Grid Electric

Avoided Grid Electric =	$4,311,341
PV Grid Rate =	$0.0410

Year	COSTS										
	Capital	Financing/Recovery			Property Tax	Depreciation	O&M		Fuel	Self Gen Externality Adder	PV Factor
		Principal	Payment	Interest			Variable	Fixed			
0	$259,196	$2,332,760	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$2,283,178	$242,034	$192,453	$50,321	$120,500	$46,463	$4,160	$729,845	$0	0.951
2	$0	$2,229,506	$242,034	$188,362	$50,321	$228,950	$48,322	$4,326	$748,091	$0	0.905
3	$0	$2,171,407	$242,034	$183,934	$50,321	$206,055	$50,254	$4,499	$766,793	$0	0.861
4	$0	$2,108,514	$242,034	$179,141	$50,321	$185,570	$52,265	$4,679	$785,963	$0	0.820
5	$0	$2,040,432	$242,034	$173,952	$50,321	$167,013	$54,355	$4,867	$805,612	$0	0.780
6	$0	$1,966,734	$242,034	$168,336	$50,321	$150,143	$56,529	$5,061	$825,752	$0	0.742
7	$0	$1,886,955	$242,034	$162,256	$50,321	$142,190	$58,791	$5,264	$846,396	$0	0.706
8	$0	$1,800,595	$242,034	$155,674	$50,321	$142,190	$61,142	$5,474	$867,556	$0	0.672
9	$0	$1,707,110	$242,034	$148,549	$50,321	$142,431	$63,588	$5,693	$889,245	$0	0.639
10	$0	$1,605,913	$242,034	$140,837	$50,321	$142,190	$66,131	$5,921	$911,476	$0	0.608
11	$0	$1,496,366	$242,034	$132,488	$50,321	$142,431	$68,777	$6,158	$934,263	$0	0.579
12	$0	$1,377,783	$242,034	$123,450	$50,321	$142,190	$71,528	$6,404	$957,619	$0	0.551
13	$0	$1,249,416	$242,034	$113,667	$50,321	$142,431	$74,389	$6,660	$981,560	$0	0.524
14	$0	$1,110,459	$242,034	$103,077	$50,321	$142,190	$77,364	$6,927	$1,006,099	$0	0.498
15	$0	$960,037	$242,034	$91,613	$50,321	$142,431	$80,459	$7,204	$1,031,251	$0	0.474
16	$0	$797,207	$242,034	$79,203	$50,321	$71,095	$83,677	$7,492	$1,057,033	$0	0.451
17	$0	$620,942	$242,034	$65,770	$50,321	$0	$87,024	$7,792	$1,083,458	$0	0.429
18	$0	$430,136	$242,034	$51,228	$50,321	$0	$90,505	$8,103	$1,110,545	$0	0.408
19	$0	$223,588	$242,034	$35,486	$50,321	$0	$94,126	$8,427	$1,138,308	$0	0.389
20	$0	$0	$242,034	$18,446	$50,321	$0	$97,891	$8,764	$1,166,766	$0	0.370
21	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.225
PV=	$259,196		$2,990,867	$1,723,614	$621,825		$801,539	$71,765	$11,061,896	$0	

| Year | BENEFITS | | | | | | |
| | Program Incentives | Thermal Credit | Tax Benefits | | Avoided Externality | Avoided Grid Electric | PV Factor |
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$0	$42,175	$7,833	$0	$284,455	0.951
2	$0	$0	$80,133	$14,882	$0	$291,566	0.905
3	$0	$0	$72,119	$13,394	$0	$298,855	0.861
4	$0	$0	$64,950	$12,062	$0	$306,327	0.820
5	$0	$0	$58,455	$10,856	$0	$313,985	0.780
6	$0	$0	$52,550	$9,759	$0	$321,834	0.742
7	$0	$0	$49,767	$9,242	$0	$329,880	0.706
8	$0	$0	$49,767	$9,242	$0	$338,127	0.672
9	$0	$0	$49,851	$9,258	$0	$346,580	0.639
10	$0	$0	$49,767	$9,242	$0	$355,245	0.608
11	$0	$0	$49,851	$9,258	$0	$364,126	0.579
12	$0	$0	$49,767	$9,242	$0	$373,229	0.551
13	$0	$0	$49,851	$9,258	$0	$382,560	0.524
14	$0	$0	$49,767	$9,242	$0	$392,124	0.498
15	$0	$0	$49,851	$9,258	$0	$401,927	0.474
16	$0	$0	$24,883	$4,621	$0	$411,975	0.451
17	$0	$0	$0	$0	$0	$422,275	0.429
18	$0	$0	$0	$0	$0	$432,831	0.408
19	$0	$0	$0	$0	$0	$443,652	0.389
20	$0	$0	$0	$0	$0	$454,744	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$0	$585,305	$108,699	$0	$4,311,341	

COMMERCIAL
SPARK IGNITION INTERNAL COMBUSTION ENGINE

Customer Parameters			Escalation
Nat. Gas Fuel Cost =	$13.50	/MMBtu	2.5%
Retail Electric Rate =	$0.0528	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	1,000	kW	
Installed Capital Cost =	$2,410	/kW	
Variable O&M Costs =	$0.009	/kWh	4%
Fixed O&M Costs =	$4	/kW-yr	4%
Generator Heat Rate =	10,035	Btu/kWh	
Heat Recovery =	3,700	Btu/kWh	
Capacity Factor =	60%	of potential	
Generation Sold =	0%	of production	
Plant Life =	20	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	20	Years

Tax Incentives

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$0	
Book Life =	15	years

Program Incentives

Buy Down =	$0	/kW
PBI =	$0.000	/kWH 5 yrs
Program Costs =	$0	

Operational Results

Electric Generated =	5,256,000	kWh/yr
Electric Sold =	0	
Electric Avoided =	5,256,000	
Generator Fuel =	52,744	MMBtu/yr
TER = 1.08		
FER = 2.65		
T/T' = 0.23		PURPA minimum
Generator Fuel Cost =	$712,043	/yr
Avoided Boiler Fuel =	5,603	MMBtu/yr
Avd Boiler Fuel Cost =	$75,637	/yr

Cost of Electricity

Cost =	$15,807,087
Benefit =	$1,869,055
Net Cost =	$13,938,032
COE =	$0.1326

Present Value of Grid Electric

Avoided Grid Electric =	$4,311,341
PV Grid Rate =	$0.0410

Year	COSTS Capital	Financing/Recovery Principal	Payment	Interest	Property Tax	Depreciation	O&M Variable	Fixed	Fuel	Self Gen Externality Adder	PV Factor
0	$259,196	$2,332,760	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$2,283,178	$242,034	$192,453	$50,321	$120,500	$46,463	$4,160	$729,845	$0	0.951
2	$0	$2,229,506	$242,034	$188,362	$50,321	$228,950	$48,322	$4,326	$748,091	$0	0.905
3	$0	$2,171,407	$242,034	$183,934	$50,321	$206,055	$50,254	$4,499	$766,793	$0	0.861
4	$0	$2,108,514	$242,034	$179,141	$50,321	$185,570	$52,265	$4,679	$785,963	$0	0.820
5	$0	$2,040,432	$242,034	$173,952	$50,321	$167,013	$54,355	$4,867	$805,612	$0	0.780
6	$0	$1,966,734	$242,034	$168,336	$50,321	$150,143	$56,529	$5,061	$825,752	$0	0.742
7	$0	$1,886,955	$242,034	$162,256	$50,321	$142,190	$58,791	$5,264	$846,396	$0	0.706
8	$0	$1,800,595	$242,034	$155,674	$50,321	$142,190	$61,142	$5,474	$867,556	$0	0.672
9	$0	$1,707,110	$242,034	$148,549	$50,321	$142,431	$63,588	$5,693	$889,245	$0	0.639
10	$0	$1,605,913	$242,034	$140,837	$50,321	$142,190	$66,131	$5,921	$911,476	$0	0.608
11	$0	$1,496,366	$242,034	$132,488	$50,321	$142,431	$68,777	$6,158	$934,263	$0	0.579
12	$0	$1,377,783	$242,034	$123,450	$50,321	$142,190	$71,528	$6,404	$957,619	$0	0.551
13	$0	$1,249,416	$242,034	$113,667	$50,321	$142,431	$74,389	$6,660	$981,560	$0	0.524
14	$0	$1,110,459	$242,034	$103,077	$50,321	$142,190	$77,364	$6,927	$1,006,099	$0	0.498
15	$0	$960,037	$242,034	$91,613	$50,321	$142,431	$80,459	$7,204	$1,031,251	$0	0.474
16	$0	$797,207	$242,034	$79,203	$50,321	$71,095	$83,677	$7,492	$1,057,033	$0	0.451
17	$0	$620,942	$242,034	$65,770	$50,321	$0	$87,024	$7,792	$1,083,458	$0	0.429
18	$0	$430,136	$242,034	$51,228	$50,321	$0	$90,505	$8,103	$1,110,545	$0	0.408
19	$0	$223,588	$242,034	$35,486	$50,321	$0	$94,126	$8,427	$1,138,308	$0	0.389
20	$0	$0	$242,034	$18,446	$50,321	$0	$97,891	$8,764	$1,166,766	$0	0.370
21	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.225
PV=	$259,196		$2,990,867	$1,723,614	$621,825		$801,539	$71,765	$11,061,896	$0	

| Year | BENEFITS | | | | | | |
| | Program Incentives | Thermal Credit | Tax Benefits | | Avoided Externality | Avoided Grid Electric | PV Factor |
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$77,528	$42,175	$7,833	$0	$284,455	0.951
2	$0	$79,466	$80,133	$14,882	$0	$291,566	0.905
3	$0	$81,453	$72,119	$13,394	$0	$298,855	0.861
4	$0	$83,489	$64,950	$12,062	$0	$306,327	0.820
5	$0	$85,576	$58,455	$10,856	$0	$313,985	0.780
6	$0	$87,716	$52,550	$9,759	$0	$321,834	0.742
7	$0	$89,908	$49,767	$9,242	$0	$329,880	0.706
8	$0	$92,156	$49,767	$9,242	$0	$338,127	0.672
9	$0	$94,460	$49,851	$9,258	$0	$346,580	0.639
10	$0	$96,822	$49,767	$9,242	$0	$355,245	0.608
11	$0	$99,242	$49,851	$9,258	$0	$364,126	0.579
12	$0	$101,723	$49,767	$9,242	$0	$373,229	0.551
13	$0	$104,266	$49,851	$9,258	$0	$382,560	0.524
14	$0	$106,873	$49,767	$9,242	$0	$392,124	0.498
15	$0	$109,545	$49,851	$9,258	$0	$401,927	0.474
16	$0	$112,283	$24,883	$4,621	$0	$411,975	0.451
17	$0	$115,090	$0	$0	$0	$422,275	0.429
18	$0	$117,968	$0	$0	$0	$432,831	0.408
19	$0	$120,917	$0	$0	$0	$443,652	0.389
20	$0	$123,940	$0	$0	$0	$454,744	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$1,175,051	$585,305	$108,699	$0	$4,311,341	

COMMERCIAL
COMPRESSION IGNITION INTERNAL COMBUSTION ENGINE
WITHOUT THERMAL CREDITS

Customer Parameters			Escalation
Diesel Fuel Cost =	$19.93	/MMBtu	2.5%
Retail Electric Rate =	$0.0528	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	1,000	kW	
Installed Capital Cost =	$600	/kW	
Variable O&M Costs =	$0.011	/kWh	4%
Fixed O&M Costs =	$14	/kW-yr	4%
Generator Heat Rate =	10,854	Btu/kWh	
Heat Recovery =	3,237	Btu/kWh	
Capacity Factor =	60%	of potential	
Generation Sold =	0%	of production	
Plant Life =	20	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	20	Years

Tax Incentives

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$0	
Book Life =	15	years

Program Incentives

Buy Down =	$0	/kW	
PBI =	$0.000	/kWH	5 yrs
Program Costs =	$0		

Operational Results

Electric Generated =	5,256,000	kWh/yr
Electric Sold =	0	
Electric Avoided =	5,256,000	
Generator Fuel =	57,049	MMBtu/yr
TER =	0.95	
FER =	2.86	
T/T' =	0.00	PURPA minimum
Generator Fuel Cost =	$1,136,979	/yr
Avoided Boiler Fuel =	0	MMBtu/yr
Avd Boiler Fuel Cost =	$0	/yr

Cost of Electricity

Cost =	$19,915,868
Benefit =	$172,781
Net Cost =	$19,743,087
COE =	$0.1878

Present Value of Grid Electric

Avoided Grid Electric =	$4,311,341
PV Grid Rate =	$0.0410

	COSTS										
		Financing/Recovery					O&M			Self Gen Externality Adder	PV Factor
Year	Capital	Principal	Payment	Interest	Property Tax	Depreciation	Variable	Fixed	Fuel		
0	$64,530	$580,770	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$568,426	$60,257	$47,914	$12,528	$30,000	$60,129	$14,560	$1,165,404	$0	0.951
2	$0	$555,064	$60,257	$46,895	$12,528	$57,000	$62,534	$15,142	$1,194,539	$0	0.905
3	$0	$540,599	$60,257	$45,793	$12,528	$51,300	$65,035	$15,748	$1,224,402	$0	0.861
4	$0	$524,941	$60,257	$44,599	$12,528	$46,200	$67,637	$16,378	$1,255,012	$0	0.820
5	$0	$507,991	$60,257	$43,308	$12,528	$41,580	$70,342	$17,033	$1,286,387	$0	0.780
6	$0	$489,643	$60,257	$41,909	$12,528	$37,380	$73,156	$17,714	$1,318,547	$0	0.742
7	$0	$469,781	$60,257	$40,396	$12,528	$35,400	$76,082	$18,423	$1,351,511	$0	0.706
8	$0	$448,281	$60,257	$38,757	$12,528	$35,400	$79,125	$19,160	$1,385,299	$0	0.672
9	$0	$425,007	$60,257	$36,983	$12,528	$35,460	$82,290	$19,926	$1,419,931	$0	0.639
10	$0	$399,812	$60,257	$35,063	$12,528	$35,400	$85,582	$20,723	$1,455,429	$0	0.608
11	$0	$372,539	$60,257	$32,985	$12,528	$35,460	$89,005	$21,552	$1,491,815	$0	0.579
12	$0	$343,016	$60,257	$30,734	$12,528	$35,400	$92,565	$22,414	$1,529,110	$0	0.551
13	$0	$311,058	$60,257	$28,299	$12,528	$35,460	$96,268	$23,311	$1,567,338	$0	0.524
14	$0	$276,463	$60,257	$25,662	$12,528	$35,400	$100,119	$24,243	$1,606,522	$0	0.498
15	$0	$239,013	$60,257	$22,808	$12,528	$35,460	$104,123	$25,213	$1,646,685	$0	0.474
16	$0	$198,475	$60,257	$19,719	$12,528	$17,700	$108,288	$26,222	$1,687,852	$0	0.451
17	$0	$154,591	$60,257	$16,374	$12,528	$0	$112,620	$27,271	$1,730,048	$0	0.429
18	$0	$107,088	$60,257	$12,754	$12,528	$0	$117,125	$28,361	$1,773,299	$0	0.408
19	$0	$55,665	$60,257	$8,835	$12,528	$0	$121,810	$29,496	$1,817,632	$0	0.389
20	$0	$0	$60,257	$4,592	$12,528	$0	$126,682	$30,676	$1,863,073	$0	0.370
21	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.225
PV=	$64,530		$744,614	$429,116	$154,811		$1,037,286	$251,176	$17,663,451	$0	

Year	BENEFITS						
	Program Incentives	Thermal Credit	Tax Benefits		Avoided Externality	Avoided Grid Electric	PV Factor
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$0	$10,500	$1,950	$0	$284,455	0.951
2	$0	$0	$19,950	$3,705	$0	$291,566	0.905
3	$0	$0	$17,955	$3,335	$0	$298,855	0.861
4	$0	$0	$16,170	$3,003	$0	$306,327	0.820
5	$0	$0	$14,553	$2,703	$0	$313,985	0.780
6	$0	$0	$13,083	$2,430	$0	$321,834	0.742
7	$0	$0	$12,390	$2,301	$0	$329,880	0.706
8	$0	$0	$12,390	$2,301	$0	$338,127	0.672
9	$0	$0	$12,411	$2,305	$0	$346,580	0.639
10	$0	$0	$12,390	$2,301	$0	$355,245	0.608
11	$0	$0	$12,411	$2,305	$0	$364,126	0.579
12	$0	$0	$12,390	$2,301	$0	$373,229	0.551
13	$0	$0	$12,411	$2,305	$0	$382,560	0.524
14	$0	$0	$12,390	$2,301	$0	$392,124	0.498
15	$0	$0	$12,411	$2,305	$0	$401,927	0.474
16	$0	$0	$6,195	$1,151	$0	$411,975	0.451
17	$0	$0	$0	$0	$0	$422,275	0.429
18	$0	$0	$0	$0	$0	$432,831	0.408
19	$0	$0	$0	$0	$0	$443,652	0.389
20	$0	$0	$0	$0	$0	$454,744	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$0	$145,719	$27,062	$0	$4,311,341	

COMMERCIAL
COMPRESSION IGNITION INTERNAL COMBUSTION ENGINE

Customer Parameters			Escalation
Diesel Fuel Cost =	$19.93	/MMBtu	2.5%
Retail Electric Rate =	$0.0528	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	1,000	kW	
Installed Capital Cost =	$600	/kW	
Variable O&M Costs =	$0.011	/kWh	4%
Fixed O&M Costs =	$14	/kW-yr	4%
Generator Heat Rate =	10,854	Btu/kWh	
Heat Recovery =	3,237	Btu/kWh	
Capacity Factor =	60%	of potential	
Generation Sold =	0%	of production	
Plant Life =	20	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	20	Years

Tax Incentives

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$0	
Book Life =	15	years

Program Incentives

Buy Down =	$0	/kW	
PBI =	$0.000	/kWH	5 yrs
Program Costs =	$0		

Operational Results

Electric Generated =	5,256,000	kWh/yr
Electric Sold =	0	
Electric Avoided =	5,256,000	
Generator Fuel =	57,049	MMBtu/yr
TER = 0.95		
FER = 2.86		
T/T' = 0.46		PURPA minimum
Generator Fuel Cost =	$1,136,979	/yr
Avoided Boiler Fuel =	9,719	MMBtu/yr
Avd Boiler Fuel Cost =	$193,701	/yr

Cost of Electricity

Cost =	$19,915,868
Benefit =	$3,182,008
Net Cost =	$16,733,860
COE =	$0.1592

Present Value of Grid Electric

Avoided Grid Electric =	$4,311,341
PV Grid Rate =	$0.0410

Distributed Generation Evaluation Study for AmerenUE - November 2007
Appendix B

Year	Capital	Principal	Payment	Interest	Property Tax	Depreciation	Variable	Fixed	Fuel	Self Gen Externality Adder	PV Factor
	COSTS	Financing/Recovery					O&M				
0	$64,530	$580,770	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$568,426	$60,257	$47,914	$12,528	$30,000	$60,129	$14,560	$1,165,404	$0	0.951
2	$0	$555,064	$60,257	$46,895	$12,528	$57,000	$62,534	$15,142	$1,194,539	$0	0.905
3	$0	$540,599	$60,257	$45,793	$12,528	$51,300	$65,035	$15,748	$1,224,402	$0	0.861
4	$0	$524,941	$60,257	$44,599	$12,528	$46,200	$67,637	$16,378	$1,255,012	$0	0.820
5	$0	$507,991	$60,257	$43,308	$12,528	$41,580	$70,342	$17,033	$1,286,387	$0	0.780
6	$0	$489,643	$60,257	$41,909	$12,528	$37,380	$73,156	$17,714	$1,318,547	$0	0.742
7	$0	$469,781	$60,257	$40,396	$12,528	$35,400	$76,082	$18,423	$1,351,511	$0	0.706
8	$0	$448,281	$60,257	$38,757	$12,528	$35,400	$79,125	$19,160	$1,385,299	$0	0.672
9	$0	$425,007	$60,257	$36,983	$12,528	$35,460	$82,290	$19,926	$1,419,931	$0	0.639
10	$0	$399,812	$60,257	$35,063	$12,528	$35,400	$85,582	$20,723	$1,455,429	$0	0.608
11	$0	$372,539	$60,257	$32,985	$12,528	$35,460	$89,005	$21,552	$1,491,815	$0	0.579
12	$0	$343,016	$60,257	$30,734	$12,528	$35,400	$92,565	$22,414	$1,529,110	$0	0.551
13	$0	$311,058	$60,257	$28,299	$12,528	$35,460	$96,268	$23,311	$1,567,338	$0	0.524
14	$0	$276,463	$60,257	$25,662	$12,528	$35,400	$100,119	$24,243	$1,606,522	$0	0.498
15	$0	$239,013	$60,257	$22,808	$12,528	$35,460	$104,123	$25,213	$1,646,685	$0	0.474
16	$0	$198,475	$60,257	$19,719	$12,528	$17,700	$108,288	$26,222	$1,687,852	$0	0.451
17	$0	$154,591	$60,257	$16,374	$12,528	$0	$112,620	$27,271	$1,730,048	$0	0.429
18	$0	$107,088	$60,257	$12,754	$12,528	$0	$117,125	$28,361	$1,773,299	$0	0.408
19	$0	$55,665	$60,257	$8,835	$12,528	$0	$121,810	$29,496	$1,817,632	$0	0.389
20	$0	$0	$60,257	$4,592	$12,528	$0	$126,682	$30,676	$1,863,073	$0	0.370
21	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	0.225
PV=	$64,530		$744,614	$429,116	$154,811		$1,037,286	$251,176	$17,663,451	$0	

| Year | BENEFITS | | | | | | |
| | Program Incentives | Thermal Credit | Tax Benefits | | Avoided Externality | Avoided Grid Electric | PV Factor |
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$198,544	$10,500	$1,950	$0	$284,455	0.951
2	$0	$203,507	$19,950	$3,705	$0	$291,566	0.905
3	$0	$208,595	$17,955	$3,335	$0	$298,855	0.861
4	$0	$213,810	$16,170	$3,003	$0	$306,327	0.820
5	$0	$219,155	$14,553	$2,703	$0	$313,985	0.780
6	$0	$224,634	$13,083	$2,430	$0	$321,834	0.742
7	$0	$230,250	$12,390	$2,301	$0	$329,880	0.706
8	$0	$236,006	$12,390	$2,301	$0	$338,127	0.672
9	$0	$241,906	$12,411	$2,305	$0	$346,580	0.639
10	$0	$247,954	$12,390	$2,301	$0	$355,245	0.608
11	$0	$254,152	$12,411	$2,305	$0	$364,126	0.579
12	$0	$260,506	$12,390	$2,301	$0	$373,229	0.551
13	$0	$267,019	$12,411	$2,305	$0	$382,560	0.524
14	$0	$273,694	$12,390	$2,301	$0	$392,124	0.498
15	$0	$280,537	$12,411	$2,305	$0	$401,927	0.474
16	$0	$287,550	$6,195	$1,151	$0	$411,975	0.451
17	$0	$294,739	$0	$0	$0	$422,275	0.429
18	$0	$302,107	$0	$0	$0	$432,831	0.408
19	$0	$309,660	$0	$0	$0	$443,652	0.389
20	$0	$317,402	$0	$0	$0	$454,744	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$3,009,227	$145,719	$27,062	$0	$4,311,341	

FARM BASED ANAEROBIC DIGESTER
SPARK IGNITION INTERNAL COMBUSTION ENGINE

Customer Parameters			Escalation
Digester Gas Fuel Cost =	$0.00	/MMBtu	2.5%
Retail Electric Rate =	$0.0528	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	500	kW	
Installed Capital Cost =	$6,000	/kW	
Variable O&M Costs =	$0.020	/kWh	4%
Fixed O&M Costs =	$0	/kW-yr	4%
Generator Heat Rate =	11,000	Btu/kWh	
Heat Recovery =	2,571	Btu/kWh	
Capacity Factor =	90%	of potential	
Generation Sold =	0%	of production	
Plant Life =	20	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	20	Years

Tax Incentives

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$0	
Book Life =	7	years

Program Incentives

Buy Down =	$0	/kW	
PBI =	$0.000	/kWH	5 yrs
Program Costs =	$0		

Operational Results

Electric Generated =	3,942,000	kWh/yr	208138
Electric Sold =	0		
Electric Avoided =	3,942,000		
Generator Fuel =	43,362	MMBtu/yr	
TER = 0.75			
FER = 2.90			
T/T' = 0.62		PURPA minimum	
Generator Fuel Cost =	$0	/yr	
Avoided Boiler Fuel =	7,840	MMBtu/yr	
Avd Boiler Fuel Cost =	$0	/yr	

Cost of Electricity

Cost =	$6,234,258
Benefit =	$1,045,196
Net Cost =	$5,189,062
COE =	$0.0658

Present Value of Grid Electric

Avoided Grid Electric =	$3,233,506
PV Grid Rate =	$0.0410

Year	COSTS Capital	Financing/Recovery Principal	Payment	Interest	Property Tax	Depreciation	O&M Variable	Fixed	Fuel	Self Gen Externality Adder	PV Factor
0	$322,650	$2,903,850	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$2,842,130	$301,287	$239,568	$62,640	$428,700	$81,994	$0	$0	$0	0.951
2	$0	$2,775,319	$301,287	$234,476	$62,640	$734,700	$85,273	$0	$0	$0	0.905
3	$0	$2,702,996	$301,287	$228,964	$62,640	$524,700	$88,684	$0	$0	$0	0.861
4	$0	$2,624,706	$301,287	$222,997	$62,640	$374,700	$92,232	$0	$0	$0	0.820
5	$0	$2,539,957	$301,287	$216,538	$62,640	$267,900	$95,921	$0	$0	$0	0.780
6	$0	$2,448,216	$301,287	$209,546	$62,640	$267,600	$99,758	$0	$0	$0	0.742
7	$0	$2,348,907	$301,287	$201,978	$62,640	$267,900	$103,748	$0	$0	$0	0.706
8	$0	$2,241,405	$301,287	$193,785	$62,640	$133,800	$107,898	$0	$0	$0	0.672
9	$0	$2,125,033	$301,287	$184,916	$62,640	$0	$112,214	$0	$0	$0	0.639
10	$0	$1,999,061	$301,287	$175,315	$62,640	$0	$116,702	$0	$0	$0	0.608
11	$0	$1,862,697	$301,287	$164,923	$62,640	$0	$121,371	$0	$0	$0	0.579
12	$0	$1,715,082	$301,287	$153,672	$62,640	$0	$126,225	$0	$0	$0	0.551
13	$0	$1,555,289	$301,287	$141,494	$62,640	$0	$131,274	$0	$0	$0	0.524
14	$0	$1,382,314	$301,287	$128,311	$62,640	$0	$136,525	$0	$0	$0	0.498
15	$0	$1,195,067	$301,287	$114,041	$62,640	$0	$141,986	$0	$0	$0	0.474
16	$0	$992,373	$301,287	$98,593	$62,640	$0	$147,666	$0	$0	$0	0.451
17	$0	$772,957	$301,287	$81,871	$62,640	$0	$153,572	$0	$0	$0	0.429
18	$0	$535,439	$301,287	$63,769	$62,640	$0	$159,715	$0	$0	$0	0.408
19	$0	$278,325	$301,287	$44,174	$62,640	$0	$166,104	$0	$0	$0	0.389
20	$0	($0)	$301,287	$22,962	$62,640	$0	$172,748	$0	$0	$0	0.370
21	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.352
22	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.335
23	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.319
24	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.303
25	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.288
26	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.274
27	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.261
28	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.248
29	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.236
30	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.225
PV=	$322,650		$3,723,071	$2,145,578	$774,056		$1,414,481	$0	$0	$0	

	BENEFITS						
Year	Program Incentives	Thermal Credit	Tax Benefits		Avoided Externality	Avoided Grid Electric	PV Factor
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$0	$150,045	$27,866	$0	$213,341	0.951
2	$0	$0	$257,145	$47,756	$0	$218,675	0.905
3	$0	$0	$183,645	$34,106	$0	$224,141	0.861
4	$0	$0	$131,145	$24,356	$0	$229,745	0.820
5	$0	$0	$93,765	$17,414	$0	$235,489	0.780
6	$0	$0	$93,660	$17,394	$0	$241,376	0.742
7	$0	$0	$93,765	$17,414	$0	$247,410	0.706
8	$0	$0	$46,830	$8,697	$0	$253,595	0.672
9	$0	$0	$0	$0	$0	$259,935	0.639
10	$0	$0	$0	$0	$0	$266,434	0.608
11	$0	$0	$0	$0	$0	$273,095	0.579
12	$0	$0	$0	$0	$0	$279,922	0.551
13	$0	$0	$0	$0	$0	$286,920	0.524
14	$0	$0	$0	$0	$0	$294,093	0.498
15	$0	$0	$0	$0	$0	$301,445	0.474
16	$0	$0	$0	$0	$0	$308,981	0.451
17	$0	$0	$0	$0	$0	$316,706	0.429
18	$0	$0	$0	$0	$0	$324,624	0.408
19	$0	$0	$0	$0	$0	$332,739	0.389
20	$0	$0	$0	$0	$0	$341,058	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$0	$881,490	$163,705	$0	$3,233,506	

COMMERCIAL
MICROTURBINE WITHOUT THERMAL CREDIT

Customer Parameters

			Escalation
Nat. Gas Fuel Cost =	$13.50	/MMBtu	2.5%
Retail Electric Rate =	$0.0528	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	100	kW	
Installed Capital Cost =	$3,330	/kW	
Variable O&M Costs =	$0.015	/kWh	4%
Fixed O&M Costs =	$0	/kW-yr	4%
Generator Heat Rate =	13,127	Btu/kWh	
Heat Recovery =	4,660	Btu/kWh	
Capacity Factor =	60%	of potential	
Generation Sold =	0%	of production	
Plant Life =	10	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	10	Years

Tax Incentives

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$33,300	10%
Book Life =	5	years

Program Incentives

Buy Down =	$0	/kW
PBI =	$0.000	/kWH 5 yrs
Program Costs =	$0	

Operational Results

Electric Generated =	525,600	kWh/yr
Electric Sold =	0	
Electric Avoided =	525,600	
Generator Fuel =	6,900	MMBtu/yr
TER =	1.37	
FER =	3.46	
T/T' =	0.00	PURPA minimum
Generator Fuel Cost =	$93,144	/yr
Avoided Boiler Fuel =	0	MMBtu/yr
Avd Boiler Fuel Cost =	$0	/yr

Cost of Electricity

Cost =	$1,350,650
Benefit =	$140,185
Net Cost =	$1,210,465
COE =	$0.2303

Present Value of Grid Electric

Avoided Grid Electric =	$242,426
PV Grid Rate =	$0.0461

Year	COSTS Capital	Financing/Recovery Principal	Payment	Interest	Property Tax	Depreciation	O&M Variable	Fixed	Fuel	Self Gen Externality Adder	PV Factor
0	$35,814	$322,327	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$300,340	$48,579	$26,592	$6,953	$59,940	$8,199	$0	$95,473	$0	0.951
2	$0	$276,539	$48,579	$24,778	$6,953	$95,904	$8,527	$0	$97,859	$0	0.905
3	$0	$250,774	$48,579	$22,814	$6,953	$57,542	$8,868	$0	$100,306	$0	0.861
4	$0	$222,883	$48,579	$20,689	$6,953	$34,525	$9,223	$0	$102,813	$0	0.820
5	$0	$192,692	$48,579	$18,388	$6,953	$34,525	$9,592	$0	$105,384	$0	0.780
6	$0	$160,010	$48,579	$15,897	$6,953	$17,263	$9,976	$0	$108,018	$0	0.742
7	$0	$124,631	$48,579	$13,201	$6,953	$0	$10,375	$0	$110,719	$0	0.706
8	$0	$86,334	$48,579	$10,282	$6,953	$0	$10,790	$0	$113,487	$0	0.672
9	$0	$44,877	$48,579	$7,123	$6,953	$0	$11,221	$0	$116,324	$0	0.639
10	$0	($0)	$48,579	$3,702	$6,953	$0	$11,670	$0	$119,232	$0	0.608
11	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.579
12	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.551
13	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.524
14	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.498
15	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.474
16	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.451
17	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.429
18	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.408
19	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.389
20	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.370
21	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.352
22	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.335
23	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.319
24	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.303
25	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.288
26	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.274
27	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.261
28	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.248
29	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.236
30	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.225
PV=	$35,814		$373,302	$133,504	$53,430		$74,441	$0	$813,663	$0	

Year	BENEFITS						
	Program Incentives	Thermal Credit	Tax Benefits		Avoided Externality	Avoided Grid Electric	PV Factor
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$0	$54,279	$3,896	$0	$28,445	0.951
2	$0	$0	$33,566	$6,234	$0	$29,157	0.905
3	$0	$0	$20,140	$3,740	$0	$29,886	0.861
4	$0	$0	$12,084	$2,244	$0	$30,633	0.820
5	$0	$0	$12,084	$2,244	$0	$31,398	0.780
6	$0	$0	$6,042	$1,122	$0	$32,183	0.742
7	$0	$0	$0	$0	$0	$32,988	0.706
8	$0	$0	$0	$0	$0	$33,813	0.672
9	$0	$0	$0	$0	$0	$34,658	0.639
10	$0	$0	$0	$0	$0	$35,524	0.608
11	$0	$0	$0	$0	$0	$0	0.579
12	$0	$0	$0	$0	$0	$0	0.551
13	$0	$0	$0	$0	$0	$0	0.524
14	$0	$0	$0	$0	$0	$0	0.498
15	$0	$0	$0	$0	$0	$0	0.474
16	$0	$0	$0	$0	$0	$0	0.451
17	$0	$0	$0	$0	$0	$0	0.429
18	$0	$0	$0	$0	$0	$0	0.408
19	$0	$0	$0	$0	$0	$0	0.389
20	$0	$0	$0	$0	$0	$0	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$0	$123,191	$16,994	$0	$242,426	

COMMERCIAL
MICROTURBINE

Customer Parameters			Escalation
Nat. Gas Fuel Cost =	$13.50	/MMBtu	2.5%
Retail Electric Rate =	$0.0528	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	100	kW	
Installed Capital Cost =	$3,330	/kW	
Variable O&M Costs =	$0.015	/kWh	4%
Fixed O&M Costs =	$0	/kW-yr	4%
Generator Heat Rate =	13,127	Btu/kWh	
Heat Recovery =	4,660	Btu/kWh	
Capacity Factor =	60%	of potential	
Generation Sold =	0%	of production	
Plant Life =	10	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	10	Years

Tax Incentives

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$33,300	10%
Book Life =	5	years

Program Incentives

Buy Down =	$0	/kW	
PBI =	$0.000	/kWH	5 yrs
Program Costs =	$0		

Operational Results

Electric Generated =	525,600	kWh/yr
Electric Sold =	0	
Electric Avoided =	525,600	
Generator Fuel =	6,900	MMBtu/yr
TER = 1.37		
FER = 3.46		
T/T' = 0.69		PURPA minimum
Generator Fuel Cost =	$93,144	/yr
Avoided Boiler Fuel =	2,114	MMBtu/yr
Avd Boiler Fuel Cost =	$28,543	/yr

Cost of Electricity

Cost =	$1,350,650	
Benefit =	$389,527	
Net Cost =	$961,123	
COE =	$0.1829	

Present Value of Grid Electric

Avoided Grid Electric =	$242,426	
PV Grid Rate =	$0.0461	

Year	COSTS Capital	Financing/Recovery Principal	Payment	Interest	Property Tax	Depreciation	O&M Variable	Fixed	Fuel	Self Gen Externality Adder	PV Factor
0	$35,814	$322,327	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$300,340	$48,579	$26,592	$6,953	$59,940	$8,199	$0	$95,473	$0	0.951
2	$0	$276,539	$48,579	$24,778	$6,953	$95,904	$8,527	$0	$97,859	$0	0.905
3	$0	$250,774	$48,579	$22,814	$6,953	$57,542	$8,868	$0	$100,306	$0	0.861
4	$0	$222,883	$48,579	$20,689	$6,953	$34,525	$9,223	$0	$102,813	$0	0.820
5	$0	$192,692	$48,579	$18,388	$6,953	$34,525	$9,592	$0	$105,384	$0	0.780
6	$0	$160,010	$48,579	$15,897	$6,953	$17,263	$9,976	$0	$108,018	$0	0.742
7	$0	$124,631	$48,579	$13,201	$6,953	$0	$10,375	$0	$110,719	$0	0.706
8	$0	$86,334	$48,579	$10,282	$6,953	$0	$10,790	$0	$113,487	$0	0.672
9	$0	$44,877	$48,579	$7,123	$6,953	$0	$11,221	$0	$116,324	$0	0.639
10	$0	($0)	$48,579	$3,702	$6,953	$0	$11,670	$0	$119,232	$0	0.608
11	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.579
12	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.551
13	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.524
14	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.498
15	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.474
16	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.451
17	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.429
18	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.408
19	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.389
20	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.370
21	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.352
22	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.335
23	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.319
24	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.303
25	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.288
26	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.274
27	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.261
28	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.248
29	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.236
30	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.225
PV=	$35,814		$373,302	$133,504	$53,430		$74,441	$0	$813,663	$0	

| Year | BENEFITS | | | | | | |
| | Program Incentives | Thermal Credit | Tax Benefits | | Avoided Externality | Avoided Grid Electric | PV Factor |
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$29,257	$54,279	$3,896	$0	$28,445	0.951
2	$0	$29,988	$33,566	$6,234	$0	$29,157	0.905
3	$0	$30,738	$20,140	$3,740	$0	$29,886	0.861
4	$0	$31,507	$12,084	$2,244	$0	$30,633	0.820
5	$0	$32,294	$12,084	$2,244	$0	$31,398	0.780
6	$0	$33,102	$6,042	$1,122	$0	$32,183	0.742
7	$0	$33,929	$0	$0	$0	$32,988	0.706
8	$0	$34,777	$0	$0	$0	$33,813	0.672
9	$0	$35,647	$0	$0	$0	$34,658	0.639
10	$0	$36,538	$0	$0	$0	$35,524	0.608
11	$0	$0	$0	$0	$0	$0	0.579
12	$0	$0	$0	$0	$0	$0	0.551
13	$0	$0	$0	$0	$0	$0	0.524
14	$0	$0	$0	$0	$0	$0	0.498
15	$0	$0	$0	$0	$0	$0	0.474
16	$0	$0	$0	$0	$0	$0	0.451
17	$0	$0	$0	$0	$0	$0	0.429
18	$0	$0	$0	$0	$0	$0	0.408
19	$0	$0	$0	$0	$0	$0	0.389
20	$0	$0	$0	$0	$0	$0	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$249,342	$123,191	$16,994	$0	$242,426	

INDUSTRIAL
GAS TURBINE WITHOUT THERMAL CREDIT

Customer Parameters			Escalation
Nat. Gas Fuel Cost =	$11.80	/MMBtu	2.5%
Retail Electric Rate =	$0.0393	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	10,000	kW	
Installed Capital Cost =	$3,070	/kW	
Variable O&M Costs =	$0.005	/kWh	4%
Fixed O&M Costs =	$8	/kW-yr	4%
Generator Heat Rate =	11,765	Btu/kWh	
Heat Recovery =	4,650	Btu/kWh	
Capacity Factor =	60%	of potential	
Generation Sold =	0%	of production	
Plant Life =	20	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	20	Years

Tax Incentives

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$0	
Book Life =	15	years

Program Incentives

Buy Down =	$0	/kW	
PBI =	$0.000	/kWH	5 yrs
Program Costs =	$0		

Operational Results

Electric Generated =	52,560,000	kWh/yr
Electric Sold =	0	
Electric Avoided =	52,560,000	
Generator Fuel =	618,368	MMBtu/yr
TER =	1.36	
FER =	3.10	
T/T' =	0.00	PURPA minimum
Generator Fuel Cost =	$7,296,747	/yr
Avoided Boiler Fuel =	0	MMBtu/yr
Avd Boiler Fuel Cost =	$0	/yr

Cost of Electricity

Cost =	$168,269,462
Benefit =	$8,840,631
Net Cost =	$159,428,831
COE =	$0.1517

Present Value of Grid Electric

Avoided Grid Electric =	$32,090,093
PV Grid Rate =	$0.0305

Year	COSTS										
	Capital	Financing/Recovery			Property Tax	Depreciation	O&M		Fuel	Self Gen Externality Adder	PV Factor
		Principal	Payment	Interest			Variable	Fixed			
0	$3,301,785	$29,716,065	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$29,084,469	$3,083,172	$2,451,575	$641,016	$1,535,000	$245,981	$78,000	$7,479,166	$0	0.951
2		$28,400,766	$3,083,172	$2,399,469	$641,016	$2,916,500	$255,820	$81,120	$7,666,145	$0	0.905
3		$27,660,657	$3,083,172	$2,343,063	$641,016	$2,624,850	$266,053	$84,365	$7,857,799	$0	0.861
4		$26,859,490	$3,083,172	$2,282,004	$641,016	$2,363,900	$276,695	$87,739	$8,054,244	$0	0.820
5		$25,992,226	$3,083,172	$2,215,908	$641,016	$2,127,510	$287,763	$91,249	$8,255,600	$0	0.780
6		$25,053,413	$3,083,172	$2,144,359	$641,016	$1,912,610	$299,273	$94,899	$8,461,990	$0	0.742
7		$24,037,147	$3,083,172	$2,066,907	$641,016	$1,811,300	$311,244	$98,695	$8,673,539	$0	0.706
8		$22,937,040	$3,083,172	$1,983,065	$641,016	$1,811,300	$323,694	$102,643	$8,890,378	$0	0.672
9		$21,746,175	$3,083,172	$1,892,306	$641,016	$1,814,370	$336,642	$106,748	$9,112,637	$0	0.639
10		$20,457,062	$3,083,172	$1,794,059	$641,016	$1,811,300	$350,107	$111,018	$9,340,453	$0	0.608
11		$19,061,598	$3,083,172	$1,687,708	$641,016	$1,814,370	$364,112	$115,459	$9,573,965	$0	0.579
12		$17,551,008	$3,083,172	$1,572,582	$641,016	$1,811,300	$378,676	$120,077	$9,813,314	$0	0.551
13		$15,915,795	$3,083,172	$1,447,958	$641,016	$1,814,370	$393,823	$124,881	$10,058,646	$0	0.524
14		$14,145,676	$3,083,172	$1,313,053	$641,016	$1,811,300	$409,576	$129,876	$10,310,113	$0	0.498
15		$12,229,523	$3,083,172	$1,167,018	$641,016	$1,814,370	$425,959	$135,071	$10,567,865	$0	0.474
16		$10,155,287	$3,083,172	$1,008,936	$641,016	$905,650	$442,998	$140,474	$10,832,062	$0	0.451
17		$7,909,926	$3,083,172	$837,811	$641,016	$0	$460,717	$146,093	$11,102,864	$0	0.429
18		$5,479,323	$3,083,172	$652,569	$641,016	$0	$479,146	$151,936	$11,380,435	$0	0.408
19		$2,848,196	$3,083,172	$452,044	$641,016	$0	$498,312	$158,014	$11,664,946	$0	0.389
20	$0	($0)	$3,083,172	$234,976	$641,016	$0	$518,244	$164,334	$11,956,570	$0	0.370
21	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.352
22	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.335
23	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.319
24	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.303
25	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.288
26	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.274
27	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.261
28	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.248
29	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.236
30	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.225
PV=	$3,301,785		$38,099,422	$21,956,412	$7,921,174		$4,243,443	$1,345,587	$113,358,051	$0	

Year	BENEFITS						
	Program Incentives	Thermal Credit	Tax Benefits		Avoided Externality	Avoided Grid Electric	PV Factor
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$0	$537,250	$99,775	$0	$2,117,248	0.951
2	$0	$0	$1,020,775	$189,573	$0	$2,170,179	0.905
3	$0	$0	$918,698	$170,615	$0	$2,224,434	0.861
4	$0	$0	$827,365	$153,654	$0	$2,280,045	0.820
5	$0	$0	$744,629	$138,288	$0	$2,337,046	0.780
6	$0	$0	$669,414	$124,320	$0	$2,395,472	0.742
7	$0	$0	$633,955	$117,735	$0	$2,455,359	0.706
8	$0	$0	$633,955	$117,735	$0	$2,516,743	0.672
9	$0	$0	$635,030	$117,934	$0	$2,579,661	0.639
10	$0	$0	$633,955	$117,735	$0	$2,644,153	0.608
11	$0	$0	$635,030	$117,934	$0	$2,710,257	0.579
12	$0	$0	$633,955	$117,735	$0	$2,778,013	0.551
13	$0	$0	$635,030	$117,934	$0	$2,847,463	0.524
14	$0	$0	$633,955	$117,735	$0	$2,918,650	0.498
15	$0	$0	$635,030	$117,934	$0	$2,991,616	0.474
16	$0	$0	$316,978	$58,867	$0	$3,066,407	0.451
17	$0	$0	$0	$0	$0	$3,143,067	0.429
18	$0	$0	$0	$0	$0	$3,221,644	0.408
19	$0	$0	$0	$0	$0	$3,302,185	0.389
20	$0	$0	$0	$0	$0	$3,384,739	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$0	$7,455,954	$1,384,677	$0	$32,090,093	

INDUSTRIAL
GAS TURBINE

Customer Parameters			Escalation
Nat. Gas Fuel Cost =	$11.80	/MMBtu	2.5%
Retail Electric Rate =	$0.0393	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	10,000	kW	
Installed Capital Cost =	$3,070	/kW	
Variable O&M Costs =	$0.005	/kWh	4%
Fixed O&M Costs =	$8	/kW-yr	4%
Generator Heat Rate =	11,765	Btu/kWh	
Heat Recovery =	4,650	Btu/kWh	
Capacity Factor =	60%	of potential	
Generation Sold =	0%	of production	
Plant Life =	20	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	20	Years

Tax Incentives

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$0	
Book Life =	15	years

Program Incentives

Buy Down =	$0	/kW	
PBI =	$0.000	/kWH	5 yrs
Program Costs =	$0		

Operational Results

Electric Generated =	52,560,000	kWh/yr
Electric Sold =	0	
Electric Avoided =	52,560,000	
Generator Fuel =	618,368	MMBtu/yr
TER =	1.36	
FER =	3.10	
T/T' =	0.47	PURPA minimum
Generator Fuel Cost =	$7,296,747	/yr
Avoided Boiler Fuel =	142,978	MMBtu/yr
Avd Boiler Fuel Cost =	$1,687,140	/yr

Cost of Electricity

Cost =	$168,269,462
Benefit =	$35,051,067
Net Cost =	$133,218,395
COE =	$0.1267

Present Value of Grid Electric

Avoided Grid Electric =	$32,090,093
PV Grid Rate =	$0.0305

Year	COSTS Capital	Financing/Recovery Principal	Payment	Interest	Property Tax	Depreciation	O&M Variable	Fixed	Fuel	Self Gen Externality Adder	PV Factor
0	$3,301,785	$29,716,065	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$29,084,469	$3,083,172	$2,451,575	$641,016	$1,535,000	$245,981	$78,000	$7,479,166	$0	0.951
2	$0	$28,400,766	$3,083,172	$2,399,469	$641,016	$2,916,500	$255,820	$81,120	$7,666,145	$0	0.905
3	$0	$27,660,657	$3,083,172	$2,343,063	$641,016	$2,624,850	$266,053	$84,365	$7,857,799	$0	0.861
4	$0	$26,859,490	$3,083,172	$2,282,004	$641,016	$2,363,900	$276,695	$87,739	$8,054,244	$0	0.820
5	$0	$25,992,226	$3,083,172	$2,215,908	$641,016	$2,127,510	$287,763	$91,249	$8,255,600	$0	0.780
6	$0	$25,053,413	$3,083,172	$2,144,359	$641,016	$1,912,610	$299,273	$94,899	$8,461,990	$0	0.742
7	$0	$24,037,147	$3,083,172	$2,066,907	$641,016	$1,811,300	$311,244	$98,695	$8,673,539	$0	0.706
8	$0	$22,937,040	$3,083,172	$1,983,065	$641,016	$1,811,300	$323,694	$102,643	$8,890,378	$0	0.672
9	$0	$21,746,175	$3,083,172	$1,892,306	$641,016	$1,814,370	$336,642	$106,748	$9,112,637	$0	0.639
10	$0	$20,457,062	$3,083,172	$1,794,059	$641,016	$1,811,300	$350,107	$111,018	$9,340,453	$0	0.608
11	$0	$19,061,598	$3,083,172	$1,687,708	$641,016	$1,814,370	$364,112	$115,459	$9,573,965	$0	0.579
12	$0	$17,551,008	$3,083,172	$1,572,582	$641,016	$1,811,300	$378,676	$120,077	$9,813,314	$0	0.551
13	$0	$15,915,795	$3,083,172	$1,447,958	$641,016	$1,814,370	$393,823	$124,881	$10,058,646	$0	0.524
14	$0	$14,145,676	$3,083,172	$1,313,053	$641,016	$1,811,300	$409,576	$129,876	$10,310,113	$0	0.498
15	$0	$12,229,523	$3,083,172	$1,167,018	$641,016	$1,814,370	$425,959	$135,071	$10,567,865	$0	0.474
16	$0	$10,155,287	$3,083,172	$1,008,936	$641,016	$905,650	$442,998	$140,474	$10,832,062	$0	0.451
17	$0	$7,909,926	$3,083,172	$837,811	$641,016	$0	$460,717	$146,093	$11,102,864	$0	0.429
18	$0	$5,479,323	$3,083,172	$652,569	$641,016	$0	$479,146	$151,936	$11,380,435	$0	0.408
19	$0	$2,848,196	$3,083,172	$452,044	$641,016	$0	$498,312	$158,014	$11,664,946	$0	0.389
20	$0	($0)	$3,083,172	$234,976	$641,016	$0	$518,244	$164,334	$11,956,570	$0	0.370
21	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.352
22	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.335
23	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.319
24	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.303
25	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.288
26	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.274
27	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.261
28	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.248
29	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.236
30	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.225
PV=	$3,301,785		$38,099,422	$21,956,412	$7,921,174		$4,243,443	$1,345,587	$113,358,051	$0	

Year	Program Incentives	Thermal Credit	Tax Benefits		Avoided Externality	Avoided Grid Electric	PV Factor
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$1,729,319	$537,250	$99,775	$0	$2,117,248	0.951
2	$0	$1,772,552	$1,020,775	$189,573	$0	$2,170,179	0.905
3	$0	$1,816,865	$918,698	$170,615	$0	$2,224,434	0.861
4	$0	$1,862,287	$827,365	$153,654	$0	$2,280,045	0.820
5	$0	$1,908,844	$744,629	$138,288	$0	$2,337,046	0.780
6	$0	$1,956,565	$669,414	$124,320	$0	$2,395,472	0.742
7	$0	$2,005,480	$633,955	$117,735	$0	$2,455,359	0.706
8	$0	$2,055,617	$633,955	$117,735	$0	$2,516,743	0.672
9	$0	$2,107,007	$635,030	$117,934	$0	$2,579,661	0.639
10	$0	$2,159,682	$633,955	$117,735	$0	$2,644,153	0.608
11	$0	$2,213,674	$635,030	$117,934	$0	$2,710,257	0.579
12	$0	$2,269,016	$633,955	$117,735	$0	$2,778,013	0.551
13	$0	$2,325,741	$635,030	$117,934	$0	$2,847,463	0.524
14	$0	$2,383,885	$633,955	$117,735	$0	$2,918,650	0.498
15	$0	$2,443,482	$635,030	$117,934	$0	$2,991,616	0.474
16	$0	$2,504,569	$316,978	$58,867	$0	$3,066,407	0.451
17	$0	$2,567,183	$0	$0	$0	$3,143,067	0.429
18	$0	$2,631,363	$0	$0	$0	$3,221,644	0.408
19	$0	$2,697,147	$0	$0	$0	$3,302,185	0.389
20	$0	$2,764,576	$0	$0	$0	$3,384,739	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$26,210,436	$7,455,954	$1,384,677	$0	$32,090,093	

COMMERCIAL
MOLTEN CARBONATE FUEL CELL
WITHOUT THERMAL CREDIT

Customer Parameters			Escalation
Nat. Gas Fuel Cost =	$13.50	/MMBtu	2.5%
Retail Electric Rate =	$0.0528	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	1,000	kW	
Installed Capital Cost =	$5,500	/kW	
Variable O&M Costs =	$0.010	/kWh	4%
Fixed O&M Costs =	$330	/kW-yr	0%
Generator Heat Rate =	7,986	Btu/kWh	
Heat Recovery =	1,400	Btu/kWh	
Capacity Factor =	60%	of potential	
Generation Sold =	0%	of production	
Plant Life =	20	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	20	Years

Tax Incentives

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$1,000,000	30%
Book Life =	5	years

Program Incentives

Buy Down =	$0	/kW	
PBI =	$0.000	/kWH	5 yrs
Program Costs =	$0		

Operational Results

Electric Generated =	5,256,000	kWh/yr
Electric Sold =	0	
Electric Avoided =	5,256,000	
Generator Fuel =	41,974	MMBtu/yr
TER =	0.41	
FER =	2.11	
T/T' =	0.00	
Generator Fuel Cost =	$566,655	/yr
Avoided Boiler Fuel =	0	MMBtu/yr
Avd Boiler Fuel Cost =	$0	/yr

Cost of Electricity

Cost =	$22,660,345
Benefit =	$2,580,611
Net Cost =	$20,079,734
COE =	$0.1910

Present Value of Grid Electric

Avoided Grid Electric =	$4,311,341
PV Grid Rate =	$0.0410

Year	COSTS Capital	Financing/Recovery Principal	Payment	Interest	Property Tax	Depreciation	O&M Variable	Fixed	Fuel	Self Gen Externality Adder	PV Factor
0	$591,525	$5,323,725	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$5,210,573	$552,360	$439,207	$114,840	$900,000	$54,662	$330,000	$580,821	$0	0.951
2	$0	$5,088,085	$552,360	$429,872	$114,840	$1,440,000	$56,849	$330,000	$595,342	$0	0.905
3	$0	$4,955,492	$552,360	$419,767	$114,840	$864,000	$59,123	$330,000	$610,225	$0	0.861
4	$0	$4,811,961	$552,360	$408,828	$114,840	$518,400	$61,488	$330,000	$625,481	$0	0.820
5	$0	$4,656,588	$552,360	$396,987	$114,840	$518,400	$63,947	$330,000	$641,118	$0	0.780
6	$0	$4,488,396	$552,360	$384,168	$114,840	$259,200	$66,505	$330,000	$657,146	$0	0.742
7	$0	$4,306,329	$552,360	$370,293	$114,840	$0	$69,165	$330,000	$673,574	$0	0.706
8	$0	$4,109,242	$552,360	$355,272	$114,840	$0	$71,932	$330,000	$690,414	$0	0.672
9	$0	$3,895,894	$552,360	$339,012	$114,840	$0	$74,809	$330,000	$707,674	$0	0.639
10	$0	$3,664,946	$552,360	$321,411	$114,840	$0	$77,802	$330,000	$725,366	$0	0.608
11	$0	$3,414,944	$552,360	$302,358	$114,840	$0	$80,914	$330,000	$743,500	$0	0.579
12	$0	$3,144,317	$552,360	$281,733	$114,840	$0	$84,150	$330,000	$762,087	$0	0.551
13	$0	$2,851,364	$552,360	$259,406	$114,840	$0	$87,516	$330,000	$781,140	$0	0.524
14	$0	$2,534,242	$552,360	$235,238	$114,840	$0	$91,017	$330,000	$800,668	$0	0.498
15	$0	$2,190,957	$552,360	$209,075	$114,840	$0	$94,658	$330,000	$820,685	$0	0.474
16	$0	$1,819,351	$552,360	$180,754	$114,840	$0	$98,444	$330,000	$841,202	$0	0.451
17	$0	$1,417,088	$552,360	$150,096	$114,840	$0	$102,382	$330,000	$862,232	$0	0.429
18	$0	$981,638	$552,360	$116,910	$114,840	$0	$106,477	$330,000	$883,788	$0	0.408
19	$0	$510,263	$552,360	$80,985	$114,840	$0	$110,736	$330,000	$905,883	$0	0.389
20	$0	($0)	$552,360	$42,097	$114,840	$0	$115,165	$330,000	$928,530	$0	0.370
21	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.352
22	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.335
23	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.319
24	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.303
25	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.288
26	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.274
27	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.261
28	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.248
29	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.236
30	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.225
PV=	$591,525		$6,825,629	$3,933,559	$1,419,103		$942,987	$4,077,882	$8,803,219	$0	

Year	BENEFITS						
	Program Incentives	Thermal Credit	Tax Benefits		Avoided Externality	Avoided Grid Electric	PV Factor
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$0	$1,315,000	$58,500	$0	$284,455	0.951
2	$0	$0	$504,000	$93,600	$0	$291,566	0.905
3	$0	$0	$302,400	$56,160	$0	$298,855	0.861
4	$0	$0	$181,440	$33,696	$0	$306,327	0.820
5	$0	$0	$181,440	$33,696	$0	$313,985	0.780
6	$0	$0	$90,720	$16,848	$0	$321,834	0.742
7	$0	$0	$0	$0	$0	$329,880	0.706
8	$0	$0	$0	$0	$0	$338,127	0.672
9	$0	$0	$0	$0	$0	$346,580	0.639
10	$0	$0	$0	$0	$0	$355,245	0.608
11	$0	$0	$0	$0	$0	$364,126	0.579
12	$0	$0	$0	$0	$0	$373,229	0.551
13	$0	$0	$0	$0	$0	$382,560	0.524
14	$0	$0	$0	$0	$0	$392,124	0.498
15	$0	$0	$0	$0	$0	$401,927	0.474
16	$0	$0	$0	$0	$0	$411,975	0.451
17	$0	$0	$0	$0	$0	$422,275	0.429
18	$0	$0	$0	$0	$0	$432,831	0.408
19	$0	$0	$0	$0	$0	$443,652	0.389
20	$0	$0	$0	$0	$0	$454,744	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$0	$2,325,445	$255,166	$0	$4,311,341	

COMMERCIAL
MOLTEN CARBONATE FUEL CELL

Customer Parameters			Escalation
Nat. Gas Fuel Cost =	$13.50	/MMBtu	2.5%
Retail Electric Rate =	$0.0528	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	1,000	kW	
Installed Capital Cost =	$5,500	/kW	
Variable O&M Costs =	$0.010	/kWh	4%
Fixed O&M Costs =	$330	/kW-yr	0%
Generator Heat Rate =	7,986	Btu/kWh	
Heat Recovery =	1,400	Btu/kWh	
Capacity Factor =	60%	of potential	
Generation Sold =	0%	of production	
Plant Life =	20	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	20	Years

Tax Incentives

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$1,000,000	30%
Book Life =	5	years

Program Incentives

Buy Down =	$0	/kW	
PBI =	$0.000	/kWH	5 yrs
Program Costs =	$0		

Operational Results

Electric Generated =	5,256,000	kWh/yr
Electric Sold =	0	
Electric Avoided =	5,256,000	
Generator Fuel =	41,974	MMBtu/yr
TER =	0.41	
FER =	2.11	
T/T' =	1.00	100% of WH
Generator Fuel Cost =	$566,655	/yr
Avoided Boiler Fuel =	9,198	MMBtu/yr
Avd Boiler Fuel Cost =	$124,173	/yr

Cost of Electricity

Cost =	$22,660,345
Benefit =	$4,509,691
Net Cost =	$18,150,654
COE =	$0.1727

Present Value of Grid Electric

Avoided Grid Electric =	$4,311,341
PV Grid Rate =	$0.0410

	COSTS										
		Financing/Recovery					O&M			Self Gen Externality Adder	PV Factor
Year	Capital	Principal	Payment	Interest	Property Tax	Depreciation	Variable	Fixed	Fuel		
0	$591,525	$5,323,725	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$5,210,573	$552,360	$439,207	$114,840	$900,000	$54,662	$330,000	$580,821	$0	0.951
2	$0	$5,088,085	$552,360	$429,872	$114,840	$1,440,000	$56,849	$330,000	$595,342	$0	0.905
3	$0	$4,955,492	$552,360	$419,767	$114,840	$864,000	$59,123	$330,000	$610,225	$0	0.861
4	$0	$4,811,961	$552,360	$408,828	$114,840	$518,400	$61,488	$330,000	$625,481	$0	0.820
5	$0	$4,656,588	$552,360	$396,987	$114,840	$518,400	$63,947	$330,000	$641,118	$0	0.780
6	$0	$4,488,396	$552,360	$384,168	$114,840	$259,200	$66,505	$330,000	$657,146	$0	0.742
7	$0	$4,306,329	$552,360	$370,293	$114,840	$0	$69,165	$330,000	$673,574	$0	0.706
8	$0	$4,109,242	$552,360	$355,272	$114,840	$0	$71,932	$330,000	$690,414	$0	0.672
9	$0	$3,895,894	$552,360	$339,012	$114,840	$0	$74,809	$330,000	$707,674	$0	0.639
10	$0	$3,664,946	$552,360	$321,411	$114,840	$0	$77,802	$330,000	$725,366	$0	0.608
11	$0	$3,414,944	$552,360	$302,358	$114,840	$0	$80,914	$330,000	$743,500	$0	0.579
12	$0	$3,144,317	$552,360	$281,733	$114,840	$0	$84,150	$330,000	$762,087	$0	0.551
13	$0	$2,851,364	$552,360	$259,406	$114,840	$0	$87,516	$330,000	$781,140	$0	0.524
14	$0	$2,534,242	$552,360	$235,238	$114,840	$0	$91,017	$330,000	$800,668	$0	0.498
15	$0	$2,190,957	$552,360	$209,075	$114,840	$0	$94,658	$330,000	$820,685	$0	0.474
16	$0	$1,819,351	$552,360	$180,754	$114,840	$0	$98,444	$330,000	$841,202	$0	0.451
17	$0	$1,417,088	$552,360	$150,096	$114,840	$0	$102,382	$330,000	$862,232	$0	0.429
18	$0	$981,638	$552,360	$116,910	$114,840	$0	$106,477	$330,000	$883,788	$0	0.408
19	$0	$510,263	$552,360	$80,985	$114,840	$0	$110,736	$330,000	$905,883	$0	0.389
20	$0	($0)	$552,360	$42,097	$114,840	$0	$115,165	$330,000	$928,530	$0	0.370
21	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.352
22	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.335
23	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.319
24	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.303
25	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.288
26	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.274
27	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.261
28	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.248
29	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.236
30	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.225
PV=	$591,525		$6,825,629	$3,933,559	$1,419,103		$942,987	$4,077,882	$8,803,219	$0	

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Year	BENEFITS						
	Program Incentives	Thermal Credit	Tax Benefits		Avoided Externality	Avoided Grid Electric	PV Factor
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$127,277	$1,315,000	$58,500	$0	$284,455	0.951
2	$0	$130,459	$504,000	$93,600	$0	$291,566	0.905
3	$0	$133,721	$302,400	$56,160	$0	$298,855	0.861
4	$0	$137,064	$181,440	$33,696	$0	$306,327	0.820
5	$0	$140,490	$181,440	$33,696	$0	$313,985	0.780
6	$0	$144,003	$90,720	$16,848	$0	$321,834	0.742
7	$0	$147,603	$0	$0	$0	$329,880	0.706
8	$0	$151,293	$0	$0	$0	$338,127	0.672
9	$0	$155,075	$0	$0	$0	$346,580	0.639
10	$0	$158,952	$0	$0	$0	$355,245	0.608
11	$0	$162,926	$0	$0	$0	$364,126	0.579
12	$0	$166,999	$0	$0	$0	$373,229	0.551
13	$0	$171,174	$0	$0	$0	$382,560	0.524
14	$0	$175,453	$0	$0	$0	$392,124	0.498
15	$0	$179,840	$0	$0	$0	$401,927	0.474
16	$0	$184,336	$0	$0	$0	$411,975	0.451
17	$0	$188,944	$0	$0	$0	$422,275	0.429
18	$0	$193,668	$0	$0	$0	$432,831	0.408
19	$0	$198,509	$0	$0	$0	$443,652	0.389
20	$0	$203,472	$0	$0	$0	$454,744	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$1,929,080	$2,325,445	$255,166	$0	$4,311,341	

COMMERCIAL
PHOSPHORIC ACID FUEL CELL WITHOUT THERMAL CREDIT

Customer Parameters			Escalation
Nat. Gas Fuel Cost =	$13.50	/MMBtu	2.5%
Retail Electric Rate =	$0.0528	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	200	kW	
Installed Capital Cost =	$5,000	/kW	
Variable O&M Costs =	$0.009	/kWh	4%
Fixed O&M Costs =	$300	/kW-yr	0%
Generator Heat Rate =	9,480	Btu/kWh	
Heat Recovery =	3,400	Btu/kWh	
Capacity Factor =	60%	of potential	
Generation Sold =	0%	of production	
Plant Life =	14	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	10	Years

Tax Incentives

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$200,000	30%
Book Life =	5	years

Program Incentives

Buy Down =	$0	/kW
PBI =	$0.000	/kWH	5 yrs
Program Costs =	$0	

Operational Results

Electric Generated =	1,051,200	kWh/yr
Electric Sold =	0	
Electric Avoided =	1,051,200	
Generator Fuel =	9,965	MMBtu/yr
TER =	1.00	
FER =	2.50	
T/T' =	0.00	
Generator Fuel Cost =	$134,533	/yr
Avoided Boiler Fuel =	0	MMBtu/yr
Avd Boiler Fuel Cost =	$0	/yr

Cost of Electricity

Cost =	$3,666,423	
Benefit =	$479,919	
Net Cost =	$3,186,504	
COE =	$0.2165	

Present Value of Grid Electric

Avoided Grid Electric =	$647,244	
PV Grid Rate =	$0.0440	

Year	COSTS Capital	Financing/Recovery Principal	Payment	Interest	Property Tax	Depreciation	O&M Variable	Fixed	Fuel	Self Gen Externality Adder	PV Factor
0	$107,550	$967,950	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$901,922	$145,884	$79,856	$20,880	$160,000	$9,511	$60,000	$137,896	$0	0.951
2	$0	$830,447	$145,884	$74,409	$20,880	$256,000	$9,892	$60,000	$141,343	$0	0.905
3	$0	$753,075	$145,884	$68,512	$20,880	$153,600	$10,287	$60,000	$144,877	$0	0.861
4	$0	$669,319	$145,884	$62,129	$20,880	$92,160	$10,699	$60,000	$148,499	$0	0.820
5	$0	$578,654	$145,884	$55,219	$20,880	$92,160	$11,127	$60,000	$152,211	$0	0.780
6	$0	$480,509	$145,884	$47,739	$20,880	$46,080	$11,572	$60,000	$156,017	$0	0.742
7	$0	$374,267	$145,884	$39,642	$20,880	$0	$12,035	$60,000	$159,917	$0	0.706
8	$0	$259,261	$145,884	$30,877	$20,880	$0	$12,516	$60,000	$163,915	$0	0.672
9	$0	$134,766	$145,884	$21,389	$20,880	$0	$13,017	$60,000	$168,013	$0	0.639
10	$0	($0)	$145,884	$11,118	$20,880	$0	$13,537	$60,000	$172,213	$0	0.608
11	$0	($0)	$0	($0)	$0	$0	$14,079	$60,000	$176,518	$0	0.579
12	$0	($0)	$0	($0)	$0	$0	$14,642	$60,000	$180,931	$0	0.551
13	$0	($0)	$0	($0)	$0	$0	$15,228	$60,000	$185,455	$0	0.524
14	$0	($0)	$0	($0)	$0	$0	$15,837	$60,000	$190,091	$0	0.498
15	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.474
16	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.451
17	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.429
18	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.408
19	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.389
20	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.370
21	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.352
22	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.335
23	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.319
24	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.303
25	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.288
26	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.274
27	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.261
28	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.248
29	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.236
30	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.225
PV=	$107,550		$1,121,026	$400,914	$160,450		$118,428	$590,139	$1,568,830	$0	

| Year | BENEFITS | | | | | | |
| | Program Incentives | Thermal Credit | Tax Benefits | | Avoided Externality | Avoided Grid Electric | PV Factor |
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$0	$256,000	$10,400	$0	$56,891	0.951
2	$0	$0	$89,600	$16,640	$0	$58,313	0.905
3	$0	$0	$53,760	$9,984	$0	$59,771	0.861
4	$0	$0	$32,256	$5,990	$0	$61,265	0.820
5	$0	$0	$32,256	$5,990	$0	$62,797	0.780
6	$0	$0	$16,128	$2,995	$0	$64,367	0.742
7	$0	$0	$0	$0	$0	$65,976	0.706
8	$0	$0	$0	$0	$0	$67,625	0.672
9	$0	$0	$0	$0	$0	$69,316	0.639
10	$0	$0	$0	$0	$0	$71,049	0.608
11	$0	$0	$0	$0	$0	$72,825	0.579
12	$0	$0	$0	$0	$0	$74,646	0.551
13	$0	$0	$0	$0	$0	$76,512	0.524
14	$0	$0	$0	$0	$0	$78,425	0.498
15	$0	$0	$0	$0	$0	$0	0.474
16	$0	$0	$0	$0	$0	$0	0.451
17	$0	$0	$0	$0	$0	$0	0.429
18	$0	$0	$0	$0	$0	$0	0.408
19	$0	$0	$0	$0	$0	$0	0.389
20	$0	$0	$0	$0	$0	$0	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$0	$434,556	$45,363	$0	$647,244	

COMMERCIAL
PHOSPHORIC ACID FUEL CELL

<u>Customer Parameters</u>   <u>Escalation</u>

Nat. Gas Fuel Cost =	$13.50	/MMBtu	2.5%
Retail Electric Rate =	$0.0528	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

<u>Grid Electric</u>

Externality Adder =	$0.000	/kWh

<u>Self Gen Parameters</u>

Plant Capacity =	200	kW	
Installed Capital Cost =	$5,000	/kW	
Variable O&M Costs =	$0.009	/kWh	4%
Fixed O&M Costs =	$300	/kW-yr	0%
Generator Heat Rate =	9,480	Btu/kWh	
Heat Recovery =	3,400	Btu/kWh	
Capacity Factor =	60%	of potential	
Generation Sold =	0%	of production	
Plant Life =	14	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

<u>Financing</u>

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	10	Years

<u>Tax Incentives</u>

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$200,000	30%
Book Life =	5	years

<u>Program Incentives</u>

Buy Down =	$0	/kW
PBI =	$0.000	/kWH 5 yrs
Program Costs =	$0	

<u>Operational Results</u>

Electric Generated =	1,051,200	kWh/yr
Electric Sold =	0	
Electric Avoided =	1,051,200	
Generator Fuel =	9,965	MMBtu/yr
TER =	1.00	
FER =	2.50	
T/T' =	0.13	100% of WH
Generator Fuel Cost =	$134,533	/yr
Avoided Boiler Fuel =	563	MMBtu/yr
Avd Boiler Fuel Cost =	$7,596	/yr

<u>Cost of Electricity</u>

Cost =	$3,666,423
Benefit =	$568,497
Net Cost =	$3,097,926
COE =	$0.2105

<u>Present Value of Grid Electric</u>

Avoided Grid Electric =	$647,244
PV Grid Rate =	$0.0440

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	COSTS										
		Financing/Recovery					O&M			Self Gen Externality Adder	PV Factor
Year	Capital	Principal	Payment	Interest	Property Tax	Depreciation	Variable	Fixed	Fuel		
0	$107,550	$967,950	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$901,922	$145,884	$79,856	$20,880	$160,000	$9,511	$60,000	$137,896	$0	0.951
2	$0	$830,447	$145,884	$74,409	$20,880	$256,000	$9,892	$60,000	$141,343	$0	0.905
3	$0	$753,075	$145,884	$68,512	$20,880	$153,600	$10,287	$60,000	$144,877	$0	0.861
4	$0	$669,319	$145,884	$62,129	$20,880	$92,160	$10,699	$60,000	$148,499	$0	0.820
5	$0	$578,654	$145,884	$55,219	$20,880	$92,160	$11,127	$60,000	$152,211	$0	0.780
6	$0	$480,509	$145,884	$47,739	$20,880	$46,080	$11,572	$60,000	$156,017	$0	0.742
7	$0	$374,267	$145,884	$39,642	$20,880	$0	$12,035	$60,000	$159,917	$0	0.706
8	$0	$259,261	$145,884	$30,877	$20,880	$0	$12,516	$60,000	$163,915	$0	0.672
9	$0	$134,766	$145,884	$21,389	$20,880	$0	$13,017	$60,000	$168,013	$0	0.639
10	$0	($0)	$145,884	$11,118	$20,880	$0	$13,537	$60,000	$172,213	$0	0.608
11	$0	($0)	$0	($0)	$0	$0	$14,079	$60,000	$176,518	$0	0.579
12	$0	($0)	$0	($0)	$0	$0	$14,642	$60,000	$180,931	$0	0.551
13	$0	($0)	$0	($0)	$0	$0	$15,228	$60,000	$185,455	$0	0.524
14	$0	($0)	$0	($0)	$0	$0	$15,837	$60,000	$190,091	$0	0.498
15	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.474
16	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.451
17	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.429
18	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.408
19	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.389
20	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.370
21	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.352
22	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.335
23	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.319
24	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.303
25	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.288
26	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.274
27	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.261
28	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.248
29	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.236
30	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.225
PV=	$107,550		$1,121,026	$400,914	$160,450		$118,428	$590,139	$1,568,830	$0	

Year	BENEFITS						
	Program Incentives	Thermal Credit	Tax Benefits		Avoided Externality	Avoided Grid Electric	PV Factor
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$7,786	$256,000	$10,400	$0	$56,891	0.951
2	$0	$7,980	$89,600	$16,640	$0	$58,313	0.905
3	$0	$8,180	$53,760	$9,984	$0	$59,771	0.861
4	$0	$8,384	$32,256	$5,990	$0	$61,265	0.820
5	$0	$8,594	$32,256	$5,990	$0	$62,797	0.780
6	$0	$8,809	$16,128	$2,995	$0	$64,367	0.742
7	$0	$9,029	$0	$0	$0	$65,976	0.706
8	$0	$9,255	$0	$0	$0	$67,625	0.672
9	$0	$9,486	$0	$0	$0	$69,316	0.639
10	$0	$9,723	$0	$0	$0	$71,049	0.608
11	$0	$9,966	$0	$0	$0	$72,825	0.579
12	$0	$10,216	$0	$0	$0	$74,646	0.551
13	$0	$10,471	$0	$0	$0	$76,512	0.524
14	$0	$10,733	$0	$0	$0	$78,425	0.498
15	$0	$0	$0	$0	$0	$0	0.474
16	$0	$0	$0	$0	$0	$0	0.451
17	$0	$0	$0	$0	$0	$0	0.429
18	$0	$0	$0	$0	$0	$0	0.408
19	$0	$0	$0	$0	$0	$0	0.389
20	$0	$0	$0	$0	$0	$0	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$88,578	$434,556	$45,363	$0	$647,244	

COMMERCIAL (Primary Service Rate)
VRLA BATTERY STORAGE (8 hours of Storage)

Customer Parameters			Escalation
Electricity Fuel Cost =	$12.02	/MMBtu	2.5%
Retail Electric Rate =	$0.0506	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	100	kW	
Installed Capital Cost =	$1,825	/kW	
Variable O&M Costs =	$0.000	/kWh	4%
Fixed O&M Costs =	$5	/kW-yr	4%
Generator Heat Rate =	4,549	Btu/kWh	
Heat Recovery =	0	Btu/kWh	
Capacity Factor =	12%	of potential	
Generation Sold =	0%	of production	
Plant Life =	5	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	5	Years

Tax Incentives

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$0	
Book Life =	5	years

Program Incentives

Buy Down =	$0	/kW	
PBI =	$0.000	/kWH	5 yrs
Program Costs =	$0		

Operational Results

Electric Generated =	104,000	kWh/yr
Electric Sold =	0	
Electric Avoided =	104,000	
Generator Fuel =	473	MMBtu/yr
TER =	0.00	
FER =	1.20	
T/T' =	0.00	PURPA minimum
Generator Fuel Cost =	$5,685	/yr
Avoided Boiler Fuel =	0	MMBtu/yr
Avd Boiler Fuel Cost =	$0	/yr

Cost of Electricity

Cost =	$257,169
Benefit =	$56,030
Net Cost =	$201,139
COE =	$0.3868

Present Value of Grid Electric

Avoided Grid Electric =	$24,422
PV Grid Rate =	$0.0470

Year	COSTS Capital	Financing/Recovery Principal	Payment	Interest	Property Tax	Depreciation	O&M Variable	Fixed	Fuel	Self Gen Externality Adder	PV Factor
0	$19,628	$176,651	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$146,689	$44,535	$14,574	$3,811	$36,500	$0	$520	$5,827	$0	0.951
2	$0	$114,256	$44,535	$12,102	$3,811	$58,400	$0	$541	$5,973	$0	0.905
3	$0	$79,147	$44,535	$9,426	$3,811	$35,040	$0	$562	$6,122	$0	0.861
4	$0	$41,141	$44,535	$6,530	$3,811	$21,024	$0	$585	$6,275	$0	0.820
5	$0	($0)	$44,535	$3,394	$3,811	$21,024	$0	$608	$6,432	$0	0.780
6	$0	($0)	$0	($0)	$0	$10,512	$0	$0	$0	$0	0.742
7	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.706
8	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.672
9	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.639
10	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.608
11	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.579
12	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.551
13	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.524
14	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.498
15	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.474
16	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.451
17	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.429
18	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.408
19	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.389
20	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.370
21	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.352
22	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.335
23	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.319
24	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.303
25	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.288
26	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.274
27	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.261
28	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.248
29	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.236
30	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.225
PV=	$19,628		$192,283	$40,940	$16,452		$0	$2,423	$26,383	$0	

Year	BENEFITS						
	Program Incentives	Thermal Credit	Tax Benefits		Avoided Externality	Avoided Grid Electric	PV Factor
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$0	$12,775	$2,373	$0	$5,394	0.951
2	$0	$0	$20,440	$3,796	$0	$5,529	0.905
3	$0	$0	$12,264	$2,278	$0	$5,667	0.861
4	$0	$0	$7,358	$1,367	$0	$5,809	0.820
5	$0	$0	$0	$0	$0	$5,954	0.780
6	$0	$0	$0	$0	$0	$0	0.742
7	$0	$0	$0	$0	$0	$0	0.706
8	$0	$0	$0	$0	$0	$0	0.672
9	$0	$0	$0	$0	$0	$0	0.639
10	$0	$0	$0	$0	$0	$0	0.608
11	$0	$0	$0	$0	$0	$0	0.579
12	$0	$0	$0	$0	$0	$0	0.551
13	$0	$0	$0	$0	$0	$0	0.524
14	$0	$0	$0	$0	$0	$0	0.498
15	$0	$0	$0	$0	$0	$0	0.474
16	$0	$0	$0	$0	$0	$0	0.451
17	$0	$0	$0	$0	$0	$0	0.429
18	$0	$0	$0	$0	$0	$0	0.408
19	$0	$0	$0	$0	$0	$0	0.389
20	$0	$0	$0	$0	$0	$0	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$0	$47,254	$8,776	$0	$24,422	

COMMERCIAL (Primary Service Rate)
FLOODED BATTERY STORAGE (8 Hours of Storage)

Customer Parameters			Escalation
Off-Peak Electricity Fuel Cost =	$12.02	/MMBtu	2.5%
On-Peak Retail Electric Rate =	$0.0506	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	100	kW	
Installed Capital Cost =	$1,425	/kW	
Variable O&M Costs =	$0.000	/kWh	4%
Fixed O&M Costs =	$15	/kW-yr	4%
Generator Heat Rate =	4,549	Btu/kWh	
Heat Recovery =	0	Btu/kWh	
Capacity Factor =	12%	of potential	
Generation Sold =	0%	of production	
Plant Life =	6	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	6	Years

Tax Incentives

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$0	
Book Life =	5	years

Program Incentives

Buy Down =	$0	/kW	
PBI =	$0.000	/kWH	5 yrs
Program Costs =	$0		

Operational Results

Electric Generated =	104,000	kWh/yr
Electric Sold =	0	
Electric Avoided =	104,000	
Generator Fuel =	473	MMBtu/yr
TER =	0.00	
FER =	1.20	
T/T' =	0.00	PURPA minimum
Generator Fuel Cost =	$5,685	/yr
Avoided Boiler Fuel =	0	MMBtu/yr
Avd Boiler Fuel Cost =	$0	/yr

Cost of Electricity

Cost =	$222,438
Benefit =	$49,062
Net Cost =	$173,376
COE =	$0.2778

Present Value of Grid Electric

Avoided Grid Electric =	$28,951
PV Grid Rate =	$0.0464

Year	COSTS										
	Capital	Financing/Recovery			Property Tax	Depreciation	O&M		Fuel	Self Gen Externality Adder	PV Factor
		Principal	Payment	Interest			Variable	Fixed			
0	$15,326	$137,933	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$119,249	$30,064	$11,379	$2,975	$28,500	$0	$1,560	$5,827	$0	0.951
2	$0	$99,023	$30,064	$9,838	$2,975	$45,600	$0	$1,622	$5,973	$0	0.905
3	$0	$77,129	$30,064	$8,169	$2,975	$27,360	$0	$1,687	$6,122	$0	0.861
4	$0	$53,428	$30,064	$6,363	$2,975	$16,416	$0	$1,755	$6,275	$0	0.820
5	$0	$27,772	$30,064	$4,408	$2,975	$16,416	$0	$1,825	$6,432	$0	0.780
6	$0	($0)	$30,064	$2,291	$2,975	$8,208	$0	$1,898	$6,593	$0	0.742
7	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.706
8	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.672
9	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.639
10	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.608
11	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.579
12	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.551
13	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.524
14	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.498
15	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.474
16	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.451
17	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.429
18	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.408
19	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.389
20	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.370
21	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.352
22	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.335
23	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.319
24	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.303
25	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.288
26	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.274
27	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.261
28	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.248
29	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.236
30	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.225
PV=	$15,326		$152,107	$37,123	$15,054		$0	$8,676	$31,275	$0	

| Year | BENEFITS | | | | | | |
| | Program Incentives | Thermal Credit | Tax Benefits | | Avoided Externality | Avoided Grid Electric | PV Factor |
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$0	$9,975	$1,853	$0	$5,394	0.951
2	$0	$0	$15,960	$2,964	$0	$5,529	0.905
3	$0	$0	$9,576	$1,778	$0	$5,667	0.861
4	$0	$0	$5,746	$1,067	$0	$5,809	0.820
5	$0	$0	$5,746	$1,067	$0	$5,954	0.780
6	$0	$0	$0	$0	$0	$6,103	0.742
7	$0	$0	$0	$0	$0	$0	0.706
8	$0	$0	$0	$0	$0	$0	0.672
9	$0	$0	$0	$0	$0	$0	0.639
10	$0	$0	$0	$0	$0	$0	0.608
11	$0	$0	$0	$0	$0	$0	0.579
12	$0	$0	$0	$0	$0	$0	0.551
13	$0	$0	$0	$0	$0	$0	0.524
14	$0	$0	$0	$0	$0	$0	0.498
15	$0	$0	$0	$0	$0	$0	0.474
16	$0	$0	$0	$0	$0	$0	0.451
17	$0	$0	$0	$0	$0	$0	0.429
18	$0	$0	$0	$0	$0	$0	0.408
19	$0	$0	$0	$0	$0	$0	0.389
20	$0	$0	$0	$0	$0	$0	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$0	$41,378	$7,684	$0	$28,951	

COMMERCIAL (Primary Service Rate)
ZnBr BATTERY STORAGE (8 Hours of Storage)

Customer Parameters			Escalation
Off-Peak Electricity Fuel Cost =	$12.02	/MMBtu	2.5%
On-Peak Retail Electric Rate =	$0.0506	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	100	kW	
Installed Capital Cost =	$3,375	/kW	
Variable O&M Costs =	$0.000	/kWh	4%
Fixed O&M Costs =	$20	/kW-yr	4%
Generator Heat Rate =	5,687	Btu/kWh	
Heat Recovery =	0	Btu/kWh	
Capacity Factor =	12%	of potential	
Generation Sold =	0%	of production	
Plant Life =	8	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	6	Years

Tax Incentives

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$0	
Book Life =	5	years

Program Incentives

Buy Down =	$0	/kW	
PBI =	$0.000	/kWH	5 yrs
Program Costs =	$0		

Operational Results

Electric Generated =	104,000	kWh/yr
Electric Sold =	0	
Electric Avoided =	104,000	
Generator Fuel =	591	MMBtu/yr
TER = 0.00		
FER = 1.50		
T/T' = 0.00		PURPA minimum
Generator Fuel Cost =	$7,107	/yr
Avoided Boiler Fuel =	0	MMBtu/yr
Avd Boiler Fuel Cost =	$0	/yr

Cost of Electricity

Cost =	$498,350
Benefit =	$122,185
Net Cost =	$376,165
COE =	$0.4521

Present Value of Grid Electric

Avoided Grid Electric =	$37,673
PV Grid Rate =	$0.0453

Year	COSTS Capital	Financing/Recovery Principal	Payment	Interest	Property Tax	Depreciation	O&M Variable	Fixed	Fuel	Self Gen Externality Adder	PV Factor
0	$36,298	$326,683	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$282,431	$71,203	$26,951	$7,047	$67,500	$0	$2,080	$7,285	$0	0.951
2	$0	$234,528	$71,203	$23,301	$7,047	$108,000	$0	$2,163	$7,467	$0	0.905
3	$0	$182,673	$71,203	$19,349	$7,047	$64,800	$0	$2,250	$7,654	$0	0.861
4	$0	$126,541	$71,203	$15,071	$7,047	$38,880	$0	$2,340	$7,845	$0	0.820
5	$0	$65,777	$71,203	$10,440	$7,047	$38,880	$0	$2,433	$8,041	$0	0.780
6	$0	($0)	$71,203	$5,427	$7,047	$19,440	$0	$2,531	$8,242	$0	0.742
7	$0	($0)	$0	($0)	$0	$0	$0	$2,632	$8,448	$0	0.706
8	$0	($0)	$0	($0)	$0	$0	$0	$2,737	$8,659	$0	0.672
9	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.639
10	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.608
11	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.579
12	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.551
13	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.524
14	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.498
15	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.474
16	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.451
17	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.429
18	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.408
19	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.389
20	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.370
21	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.352
22	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.335
23	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.319
24	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.303
25	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.288
26	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.274
27	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.261
28	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.248
29	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.236
30	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.225
PV=	$36,298		$360,254	$87,923	$35,654		$0	$15,265	$50,879	$0	

| Year | BENEFITS | | | | | | |
| | Program Incentives | Thermal Credit | Tax Benefits | | Avoided Externality | Avoided Grid Electric | PV Factor |
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$0	$23,625	$4,388	$0	$5,394	0.951
2	$0	$0	$37,800	$7,020	$0	$5,529	0.905
3	$0	$0	$22,680	$4,212	$0	$5,667	0.861
4	$0	$0	$13,608	$2,527	$0	$5,809	0.820
5	$0	$0	$13,608	$2,527	$0	$5,954	0.780
6	$0	$0	$6,804	$1,264	$0	$6,103	0.742
7	$0	$0	$0	$0	$0	$6,255	0.706
8	$0	$0	$0	$0	$0	$6,412	0.672
9	$0	$0	$0	$0	$0	$0	0.639
10	$0	$0	$0	$0	$0	$0	0.608
11	$0	$0	$0	$0	$0	$0	0.579
12	$0	$0	$0	$0	$0	$0	0.551
13	$0	$0	$0	$0	$0	$0	0.524
14	$0	$0	$0	$0	$0	$0	0.498
15	$0	$0	$0	$0	$0	$0	0.474
16	$0	$0	$0	$0	$0	$0	0.451
17	$0	$0	$0	$0	$0	$0	0.429
18	$0	$0	$0	$0	$0	$0	0.408
19	$0	$0	$0	$0	$0	$0	0.389
20	$0	$0	$0	$0	$0	$0	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$0	$103,048	$19,137	$0	$37,673	

COMMERCIAL (Primary Service Rate)
CHILLED WATER THERMAL ENERGY STORAGE
(4200 Ton-hours of Storage)

Customer Parameters			Escalation
Off-Peak Electricity Fuel Cost =	$12.02	/MMBtu	2.5%
On-Peak Retail Electric Rate =	$0.0509	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	315	kW	
Installed Capital Cost =	$1,438	/kW	
Variable O&M Costs =	$0.000	/kWh	4%
Fixed O&M Costs =	$33	/kW-yr	4%
Generator Heat Rate =	4,560	Btu/kWh	
Heat Recovery =	0	Btu/kWh	
Capacity Factor =	12%	of potential	
Generation Sold =	0%	of production	
Plant Life =	20	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	20	Years

Tax Incentives

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$0	
Book Life =	15	years

Program Incentives

Buy Down =	$0	/kW
PBI =	$0.000	/kWH 5 yrs
Program Costs =	$0	

Operational Results

Electric Generated =	331,128	kWh/yr
Electric Sold =	0	
Electric Avoided =	331,128	
Generator Fuel =	1,510	MMBtu/yr
TER = 0.00		
FER = 1.20		
T/T' = 0.00		PURPA minimum
Generator Fuel Cost =	$18,145	/yr
Avoided Boiler Fuel =	0	MMBtu/yr
Avd Boiler Fuel Cost =	$0	/yr

Cost of Electricity

Cost =	$1,196,057
Benefit =	$130,428
Net Cost =	$1,065,629
COE =	$0.1609

Present Value of Grid Electric

Avoided Grid Electric =	$261,689
PV Grid Rate =	$0.0395

Year	COSTS Capital	Financing/Recovery Principal	Payment	Interest	Property Tax	Depreciation	O&M Variable	Fixed	Fuel	Self Gen Externality Adder	PV Factor
0	$48,712	$438,409	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$429,091	$45,487	$36,169	$9,457	$22,646	$0	$10,811	$18,599	$0	0.951
2	$0	$419,004	$45,487	$35,400	$9,457	$43,028	$0	$11,243	$19,064	$0	0.905
3	$0	$408,085	$45,487	$34,568	$9,457	$38,725	$0	$11,693	$19,540	$0	0.861
4	$0	$396,265	$45,487	$33,667	$9,457	$34,875	$0	$12,161	$20,029	$0	0.820
5	$0	$383,470	$45,487	$32,692	$9,457	$31,388	$0	$12,647	$20,530	$0	0.780
6	$0	$369,619	$45,487	$31,636	$9,457	$28,217	$0	$13,153	$21,043	$0	0.742
7	$0	$354,626	$45,487	$30,494	$9,457	$26,723	$0	$13,679	$21,569	$0	0.706
8	$0	$338,396	$45,487	$29,257	$9,457	$26,723	$0	$14,226	$22,108	$0	0.672
9	$0	$320,827	$45,487	$27,918	$9,457	$26,768	$0	$14,795	$22,661	$0	0.639
10	$0	$301,808	$45,487	$26,468	$9,457	$26,723	$0	$15,387	$23,227	$0	0.608
11	$0	$281,221	$45,487	$24,899	$9,457	$26,768	$0	$16,003	$23,808	$0	0.579
12	$0	$258,935	$45,487	$23,201	$9,457	$26,723	$0	$16,643	$24,403	$0	0.551
13	$0	$234,810	$45,487	$21,362	$9,457	$26,768	$0	$17,308	$25,013	$0	0.524
14	$0	$208,695	$45,487	$19,372	$9,457	$26,723	$0	$18,001	$25,639	$0	0.498
15	$0	$180,425	$45,487	$17,217	$9,457	$26,768	$0	$18,721	$26,280	$0	0.474
16	$0	$149,824	$45,487	$14,885	$9,457	$13,361	$0	$19,470	$26,937	$0	0.451
17	$0	$116,697	$45,487	$12,360	$9,457	$0	$0	$20,248	$27,610	$0	0.429
18	$0	$80,838	$45,487	$9,628	$9,457	$0	$0	$21,058	$28,300	$0	0.408
19	$0	$42,020	$45,487	$6,669	$9,457	$0	$0	$21,901	$29,008	$0	0.389
20	$0	($0)	$45,487	$3,467	$9,457	$0	$0	$22,777	$29,733	$0	0.370
21	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.352
22	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.335
23	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.319
24	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.303
25	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.288
26	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.274
27	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.261
28	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.248
29	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.236
30	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.225
PV=	$48,712		$562,091	$323,929	$116,863		$0	$186,498	$281,893	$0	

| Year | BENEFITS | | | | | | |
| | Program Incentives | Thermal Credit | Tax Benefits | | Avoided Externality | Avoided Grid Electric | PV Factor |
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$0	$7,926	$1,472	$0	$17,266	0.951
2	$0	$0	$15,060	$2,797	$0	$17,697	0.905
3	$0	$0	$13,554	$2,517	$0	$18,140	0.861
4	$0	$0	$12,206	$2,267	$0	$18,593	0.820
5	$0	$0	$10,986	$2,040	$0	$19,058	0.780
6	$0	$0	$9,876	$1,834	$0	$19,535	0.742
7	$0	$0	$9,353	$1,737	$0	$20,023	0.706
8	$0	$0	$9,353	$1,737	$0	$20,524	0.672
9	$0	$0	$9,369	$1,740	$0	$21,037	0.639
10	$0	$0	$9,353	$1,737	$0	$21,563	0.608
11	$0	$0	$9,369	$1,740	$0	$22,102	0.579
12	$0	$0	$9,353	$1,737	$0	$22,654	0.551
13	$0	$0	$9,369	$1,740	$0	$23,221	0.524
14	$0	$0	$9,353	$1,737	$0	$23,801	0.498
15	$0	$0	$9,369	$1,740	$0	$24,396	0.474
16	$0	$0	$4,676	$868	$0	$25,006	0.451
17	$0	$0	$0	$0	$0	$25,631	0.429
18	$0	$0	$0	$0	$0	$26,272	0.408
19	$0	$0	$0	$0	$0	$26,929	0.389
20	$0	$0	$0	$0	$0	$27,602	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$0	$110,000	$20,428	$0	$261,689	

COMMERCIAL (Primary Service Rate)
ENCAPSULATED ICE THERMAL ENERGY STORAGE
(4200 Ton-hours of Storage)

Customer Parameters			Escalation
Off-Peak Electricity Fuel Cost =	$12.02	/MMBtu	2.5%
On-Peak Retail Electric Rate =	$0.0509	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	315	kW	
Installed Capital Cost =	$1,503	/kW	
Variable O&M Costs =	$0.000	/kWh	4%
Fixed O&M Costs =	$40	/kW-yr	4%
Generator Heat Rate =	6,824	Btu/kWh	
Heat Recovery =	0	Btu/kWh	
Capacity Factor =	12%	of potential	
Generation Sold =	0%	of production	
Plant Life =	20	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	20	Years

Tax Incentives

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$0	
Book Life =	15	years

Program Incentives

Buy Down =	$0	/kW	
PBI =	$0.000	/kWH	5 yrs
Program Costs =	$0		

Operational Results

Electric Generated =	327,600	kWh/yr
Electric Sold =	0	
Electric Avoided =	327,600	
Generator Fuel =	2,236	MMBtu/yr
TER = 0.00		
FER = 1.80		
T/T' = 0.00		PURPA minimum
Generator Fuel Cost =	$26,863	/yr
Avoided Boiler Fuel =	0	MMBtu/yr
Avd Boiler Fuel Cost =	$0	/yr

Cost of Electricity

Cost =	$1,404,191
Benefit =	$136,367
Net Cost =	$1,267,824
COE =	$0.1935

Present Value of Grid Electric

Avoided Grid Electric =	$258,901
PV Grid Rate =	$0.0395

	COSTS										
		Financing/Recovery					O&M			Self Gen Externality Adder	PV Factor
Year	Capital	Principal	Payment	Interest	Property Tax	Depreciation	Variable	Fixed	Fuel		
0	$50,930	$458,373	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$448,630	$47,558	$37,816	$9,888	$23,678	$0	$13,104	$27,535	$0	0.951
2	$0	$438,084	$47,558	$37,012	$9,888	$44,987	$0	$13,628	$28,223	$0	0.905
3	$0	$426,668	$47,558	$36,142	$9,888	$40,489	$0	$14,173	$28,929	$0	0.861
4	$0	$414,310	$47,558	$35,200	$9,888	$36,463	$0	$14,740	$29,652	$0	0.820
5	$0	$400,932	$47,558	$34,181	$9,888	$32,817	$0	$15,330	$30,393	$0	0.780
6	$0	$386,451	$47,558	$33,077	$9,888	$29,502	$0	$15,943	$31,153	$0	0.742
7	$0	$370,775	$47,558	$31,882	$9,888	$27,939	$0	$16,581	$31,932	$0	0.706
8	$0	$353,806	$47,558	$30,589	$9,888	$27,939	$0	$17,244	$32,730	$0	0.672
9	$0	$335,437	$47,558	$29,189	$9,888	$27,987	$0	$17,934	$33,548	$0	0.639
10	$0	$315,552	$47,558	$27,674	$9,888	$27,939	$0	$18,651	$34,387	$0	0.608
11	$0	$294,027	$47,558	$26,033	$9,888	$27,987	$0	$19,397	$35,247	$0	0.579
12	$0	$270,726	$47,558	$24,257	$9,888	$27,939	$0	$20,173	$36,128	$0	0.551
13	$0	$245,502	$47,558	$22,335	$9,888	$27,987	$0	$20,980	$37,031	$0	0.524
14	$0	$218,198	$47,558	$20,254	$9,888	$27,939	$0	$21,819	$37,957	$0	0.498
15	$0	$188,641	$47,558	$18,001	$9,888	$27,987	$0	$22,692	$38,906	$0	0.474
16	$0	$156,646	$47,558	$15,563	$9,888	$13,970	$0	$23,600	$39,879	$0	0.451
17	$0	$122,011	$47,558	$12,923	$9,888	$0	$0	$24,544	$40,875	$0	0.429
18	$0	$84,519	$47,558	$10,066	$9,888	$0	$0	$25,525	$41,897	$0	0.408
19	$0	$43,934	$47,558	$6,973	$9,888	$0	$0	$26,546	$42,945	$0	0.389
20	$0	($0)	$47,558	$3,625	$9,888	$0	$0	$27,608	$44,018	$0	0.370
21	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.352
22	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.335
23	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.319
24	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.303
25	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.288
26	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.274
27	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.261
28	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.248
29	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.236
30	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.225
PV=	$50,930		$587,687	$338,679	$122,185		$0	$226,059	$417,331	$0	

Year	BENEFITS						
	Program Incentives	Thermal Credit	Tax Benefits		Avoided Externality	Avoided Grid Electric	PV Factor
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$0	$8,287	$1,539	$0	$17,082	0.951
2	$0	$0	$15,746	$2,924	$0	$17,509	0.905
3	$0	$0	$14,171	$2,632	$0	$17,947	0.861
4	$0	$0	$12,762	$2,370	$0	$18,395	0.820
5	$0	$0	$11,486	$2,133	$0	$18,855	0.780
6	$0	$0	$10,326	$1,918	$0	$19,327	0.742
7	$0	$0	$9,779	$1,816	$0	$19,810	0.706
8	$0	$0	$9,779	$1,816	$0	$20,305	0.672
9	$0	$0	$9,795	$1,819	$0	$20,813	0.639
10	$0	$0	$9,779	$1,816	$0	$21,333	0.608
11	$0	$0	$9,795	$1,819	$0	$21,866	0.579
12	$0	$0	$9,779	$1,816	$0	$22,413	0.551
13	$0	$0	$9,795	$1,819	$0	$22,973	0.524
14	$0	$0	$9,779	$1,816	$0	$23,547	0.498
15	$0	$0	$9,795	$1,819	$0	$24,136	0.474
16	$0	$0	$4,889	$908	$0	$24,740	0.451
17	$0	$0	$0	$0	$0	$25,358	0.429
18	$0	$0	$0	$0	$0	$25,992	0.408
19	$0	$0	$0	$0	$0	$26,642	0.389
20	$0	$0	$0	$0	$0	$27,308	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$0	$115,009	$21,359	$0	$258,901	

COMMERCIAL (Primary Service Rate)
ICE HARVESTER THERMAL ENERGY STORAGE
(4200 Ton Hours of Storage)

Customer Parameters			**Escalation**
Off-Peak Electricity Fuel Cost =	$12.02	/MMBtu	2.5%
On-Peak Retail Electric Rate =	$0.0509	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	315	kW	
Installed Capital Cost =	$2,025	/kW	
Variable O&M Costs =	$0.000	/kWh	4%
Fixed O&M Costs =	$40	/kW-yr	4%
Generator Heat Rate =	6,255	Btu/kWh	
Heat Recovery =	0	Btu/kWh	
Capacity Factor =	12%	of potential	
Generation Sold =	0%	of production	
Plant Life =	20	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	20	Years

Tax Incentives

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$0	
Book Life =	15	years

Program Incentives

Buy Down =	$0	/kW	
PBI =	$0.000	/kWH	5 yrs
Program Costs =	$0		

Operational Results

Electric Generated =	327,600	kWh/yr
Electric Sold =	0	
Electric Avoided =	327,600	
Generator Fuel =	2,049	MMBtu/yr
TER = 0.00		
FER = 1.65		
T/T' = 0.00		PURPA minimum
Generator Fuel Cost =	$24,625	/yr
Avoided Boiler Fuel =	0	MMBtu/yr
Avd Boiler Fuel Cost =	$0	/yr

Cost of Electricity

Cost =	$1,633,482	
Benefit =	$183,699	
Net Cost =	$1,449,782	
COE =	$0.2213	

Present Value of Grid Electric

Avoided Grid Electric =	$258,901	
PV Grid Rate =	$0.0395	

	COSTS						O&M			Self Gen Externality Adder	PV Factor
		Financing/Recovery									
Year	Capital	Principal	Payment	Interest	Property Tax	Depreciation	Variable	Fixed	Fuel		
0	$68,608	$617,470	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$604,346	$64,065	$50,941	$13,320	$31,896	$0	$13,104	$25,240	$0	0.951
2	$0	$590,140	$64,065	$49,859	$13,320	$60,602	$0	$13,628	$25,871	$0	0.905
3	$0	$574,761	$64,065	$48,687	$13,320	$54,542	$0	$14,173	$26,518	$0	0.861
4	$0	$558,113	$64,065	$47,418	$13,320	$49,119	$0	$14,740	$27,181	$0	0.820
5	$0	$540,093	$64,065	$46,044	$13,320	$44,208	$0	$15,330	$27,860	$0	0.780
6	$0	$520,585	$64,065	$44,558	$13,320	$39,742	$0	$15,943	$28,557	$0	0.742
7	$0	$499,468	$64,065	$42,948	$13,320	$37,637	$0	$16,581	$29,271	$0	0.706
8	$0	$476,609	$64,065	$41,206	$13,320	$37,637	$0	$17,244	$30,003	$0	0.672
9	$0	$451,864	$64,065	$39,320	$13,320	$37,701	$0	$17,934	$30,753	$0	0.639
10	$0	$425,077	$64,065	$37,279	$13,320	$37,637	$0	$18,651	$31,522	$0	0.608
11	$0	$396,081	$64,065	$35,069	$13,320	$37,701	$0	$19,397	$32,310	$0	0.579
12	$0	$364,692	$64,065	$32,677	$13,320	$37,637	$0	$20,173	$33,117	$0	0.551
13	$0	$330,714	$64,065	$30,087	$13,320	$37,701	$0	$20,980	$33,945	$0	0.524
14	$0	$293,933	$64,065	$27,284	$13,320	$37,637	$0	$21,819	$34,794	$0	0.498
15	$0	$254,117	$64,065	$24,249	$13,320	$37,701	$0	$22,692	$35,664	$0	0.474
16	$0	$211,017	$64,065	$20,965	$13,320	$18,819	$0	$23,600	$36,555	$0	0.451
17	$0	$164,360	$64,065	$17,409	$13,320	$0	$0	$24,544	$37,469	$0	0.429
18	$0	$113,855	$64,065	$13,560	$13,320	$0	$0	$25,525	$38,406	$0	0.408
19	$0	$59,183	$64,065	$9,393	$13,320	$0	$0	$26,546	$39,366	$0	0.389
20	$0	($0)	$64,065	$4,883	$13,320	$0	$0	$27,608	$40,350	$0	0.370
21	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.352
22	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.335
23	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.319
24	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.303
25	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.288
26	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.274
27	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.261
28	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.248
29	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.236
30	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.225
PV=	$68,608		$791,668	$456,232	$164,594		$0	$226,059	$382,553	$0	

| Year | BENEFITS | | | | | | |
| | Program Incentives | Thermal Credit | Tax Benefits | | Avoided Externality | Avoided Grid Electric | PV Factor |
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$0	$11,164	$2,073	$0	$17,082	0.951
2	$0	$0	$21,211	$3,939	$0	$17,509	0.905
3	$0	$0	$19,090	$3,545	$0	$17,947	0.861
4	$0	$0	$17,192	$3,193	$0	$18,395	0.820
5	$0	$0	$15,473	$2,873	$0	$18,855	0.780
6	$0	$0	$13,910	$2,583	$0	$19,327	0.742
7	$0	$0	$13,173	$2,446	$0	$19,810	0.706
8	$0	$0	$13,173	$2,446	$0	$20,305	0.672
9	$0	$0	$13,195	$2,451	$0	$20,813	0.639
10	$0	$0	$13,173	$2,446	$0	$21,333	0.608
11	$0	$0	$13,195	$2,451	$0	$21,866	0.579
12	$0	$0	$13,173	$2,446	$0	$22,413	0.551
13	$0	$0	$13,195	$2,451	$0	$22,973	0.524
14	$0	$0	$13,173	$2,446	$0	$23,547	0.498
15	$0	$0	$13,195	$2,451	$0	$24,136	0.474
16	$0	$0	$6,586	$1,223	$0	$24,740	0.451
17	$0	$0	$0	$0	$0	$25,358	0.429
18	$0	$0	$0	$0	$0	$25,992	0.408
19	$0	$0	$0	$0	$0	$26,642	0.389
20	$0	$0	$0	$0	$0	$27,308	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$0	$154,927	$28,772	$0	$258,901	

Appendix B

COMMERCIAL (Primary Service Rate)
EUTECTIC ICE THERMAL ENERGY STORAGE
(4200 Ton-hours of Storage)

Customer Parameters			Escalation
Off-Peak Electricity Fuel Cost =	$12.02	/MMBtu	2.5%
On-Peak Retail Electric Rate =	$0.0509	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	315	kW	
Installed Capital Cost =	$3,298	/kW	
Variable O&M Costs =	$0.000	/kWh	4%
Fixed O&M Costs =	$40	/kW-yr	4%
Generator Heat Rate =	4,549	Btu/kWh	
Heat Recovery =	0	Btu/kWh	
Capacity Factor =	12%	of potential	
Generation Sold =	0%	of production	
Plant Life =	20	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	20	Years

Tax Incentives

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$0	
Book Life =	15	years

Program Incentives

Buy Down =	$0	/kW	
PBI =	$0.000	/kWH	5 yrs
Program Costs =	$0		

Operational Results

Electric Generated =	327,600	kWh/yr
Electric Sold =	0	
Electric Avoided =	327,600	
Generator Fuel =	1,490	MMBtu/yr
TER =	0.00	
FER =	1.20	
T/T' =	0.00	PURPA minimum
Generator Fuel Cost =	$17,909	/yr
Avoided Boiler Fuel =	0	MMBtu/yr
Avd Boiler Fuel Cost =	$0	/yr

Cost of Electricity

Cost =	$2,173,127	
Benefit =	$299,127	
Net Cost =	$1,874,000	
COE =	$0.2860	

Present Value of Grid Electric

Avoided Grid Electric =	$258,901	
PV Grid Rate =	$0.0395	

Confidential

Year	COSTS Capital	Financing/Recovery Principal	Payment	Interest	Property Tax	Depreciation	O&M Variable	Fixed	Fuel	Self Gen Externality Adder	PV Factor
0	$111,718	$1,005,458	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$984,088	$104,321	$82,950	$21,689	$51,938	$0	$13,104	$18,357	$0	0.951
2	$0	$960,954	$104,321	$81,187	$21,689	$98,681	$0	$13,628	$18,815	$0	0.905
3	$0	$935,912	$104,321	$79,279	$21,689	$88,813	$0	$14,173	$19,286	$0	0.861
4	$0	$908,804	$104,321	$77,213	$21,689	$79,984	$0	$14,740	$19,768	$0	0.820
5	$0	$879,460	$104,321	$74,976	$21,689	$71,985	$0	$15,330	$20,262	$0	0.780
6	$0	$847,695	$104,321	$72,555	$21,689	$64,714	$0	$15,943	$20,769	$0	0.742
7	$0	$813,309	$104,321	$69,935	$21,689	$61,286	$0	$16,581	$21,288	$0	0.706
8	$0	$776,086	$104,321	$67,098	$21,689	$61,286	$0	$17,244	$21,820	$0	0.672
9	$0	$735,793	$104,321	$64,027	$21,689	$61,390	$0	$17,934	$22,366	$0	0.639
10	$0	$692,175	$104,321	$60,703	$21,689	$61,286	$0	$18,651	$22,925	$0	0.608
11	$0	$644,959	$104,321	$57,104	$21,689	$61,390	$0	$19,397	$23,498	$0	0.579
12	$0	$593,847	$104,321	$53,209	$21,689	$61,286	$0	$20,173	$24,085	$0	0.551
13	$0	$538,519	$104,321	$48,992	$21,689	$61,390	$0	$20,980	$24,687	$0	0.524
14	$0	$478,626	$104,321	$44,428	$21,689	$61,286	$0	$21,819	$25,305	$0	0.498
15	$0	$413,792	$104,321	$39,487	$21,689	$61,390	$0	$22,692	$25,937	$0	0.474
16	$0	$343,609	$104,321	$34,138	$21,689	$30,643	$0	$23,600	$26,586	$0	0.451
17	$0	$267,636	$104,321	$28,348	$21,689	$0	$0	$24,544	$27,250	$0	0.429
18	$0	$185,396	$104,321	$22,080	$21,689	$0	$0	$25,525	$27,932	$0	0.408
19	$0	$96,370	$104,321	$15,295	$21,689	$0	$0	$26,546	$28,630	$0	0.389
20	$0	($0)	$104,321	$7,951	$21,689	$0	$0	$27,608	$29,346	$0	0.370
21	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.352
22	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.335
23	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.319
24	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.303
25	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.288
26	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.274
27	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.261
28	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.248
29	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.236
30	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.225
PV=	$111,718		$1,289,113	$742,906	$268,017		$0	$226,059	$278,220	$0	

| | BENEFITS | | | | | | |
| Year | Program Incentives | Thermal Credit | Tax Benefits | | Avoided Externality | Avoided Grid Electric | PV Factor |
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$0	$18,178	$3,376	$0	$17,082	0.951
2	$0	$0	$34,538	$6,414	$0	$17,509	0.905
3	$0	$0	$31,085	$5,773	$0	$17,947	0.861
4	$0	$0	$27,994	$5,199	$0	$18,395	0.820
5	$0	$0	$25,195	$4,679	$0	$18,855	0.780
6	$0	$0	$22,650	$4,206	$0	$19,327	0.742
7	$0	$0	$21,450	$3,984	$0	$19,810	0.706
8	$0	$0	$21,450	$3,984	$0	$20,305	0.672
9	$0	$0	$21,487	$3,990	$0	$20,813	0.639
10	$0	$0	$21,450	$3,984	$0	$21,333	0.608
11	$0	$0	$21,487	$3,990	$0	$21,866	0.579
12	$0	$0	$21,450	$3,984	$0	$22,413	0.551
13	$0	$0	$21,487	$3,990	$0	$22,973	0.524
14	$0	$0	$21,450	$3,984	$0	$23,547	0.498
15	$0	$0	$21,487	$3,990	$0	$24,136	0.474
16	$0	$0	$10,725	$1,992	$0	$24,740	0.451
17	$0	$0	$0	$0	$0	$25,358	0.429
18	$0	$0	$0	$0	$0	$25,992	0.408
19	$0	$0	$0	$0	$0	$26,642	0.389
20	$0	$0	$0	$0	$0	$27,308	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$0	$252,276	$46,851	$0	$258,901	

COMMERCIAL (Primary Service Rate)
ICE ON COIL THERMAL ENERGY STORAGE
(4200 Ton-hours of Storage)

Customer Parameters			Escalation
Off-Peak Electricity Fuel Cost =	$12.02	/MMBtu	2.5%
On-Peak Retail Electric Rate =	$0.0509	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	315	kW	
Installed Capital Cost =	$1,097	/kW	
Variable O&M Costs =	$0.000	/kWh	4%
Fixed O&M Costs =	$40	/kW-yr	4%
Generator Heat Rate =	5,687	Btu/kWh	
Heat Recovery =	0	Btu/kWh	
Capacity Factor =	12%	of potential	
Generation Sold =	0%	of production	
Plant Life =	20	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	20	Years

Tax Incentives

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$0	
Book Life =	15	years

Program Incentives

Buy Down =	$0	/kW	
PBI =	$0.000	/kWH	5 yrs
Program Costs =	$0		

Operational Results

Electric Generated =	327,600	kWh/yr
Electric Sold =	0	
Electric Avoided =	327,600	
Generator Fuel =	1,863	MMBtu/yr
TER =	0.00	
FER =	1.50	
T/T' =	0.00	PURPA minimum
Generator Fuel Cost =	$22,386	/yr
Avoided Boiler Fuel =	0	MMBtu/yr
Avd Boiler Fuel Cost =	$0	/yr

Cost of Electricity

Cost =	$1,129,193
Benefit =	$99,543
Net Cost =	$1,029,649
COE =	$0.1572

Present Value of Grid Electric

Avoided Grid Electric =	$258,901
PV Grid Rate =	$0.0395

Year	COSTS Capital	Financing/Recovery Principal	Payment	Interest	Property Tax	Depreciation	O&M Variable	Fixed	Fuel	Self Gen Externality Adder	PV Factor
0	$37,177	$334,596	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$327,484	$34,716	$27,604	$7,218	$17,284	$0	$13,104	$22,946	$0	0.951
2	$0	$319,786	$34,716	$27,017	$7,218	$32,839	$0	$13,628	$23,519	$0	0.905
3	$0	$311,453	$34,716	$26,382	$7,218	$29,555	$0	$14,173	$24,107	$0	0.861
4	$0	$302,432	$34,716	$25,695	$7,218	$26,617	$0	$14,740	$24,710	$0	0.820
5	$0	$292,667	$34,716	$24,951	$7,218	$23,955	$0	$15,330	$25,328	$0	0.780
6	$0	$282,096	$34,716	$24,145	$7,218	$21,536	$0	$15,943	$25,961	$0	0.742
7	$0	$270,653	$34,716	$23,273	$7,218	$20,395	$0	$16,581	$26,610	$0	0.706
8	$0	$258,266	$34,716	$22,329	$7,218	$20,395	$0	$17,244	$27,275	$0	0.672
9	$0	$244,857	$34,716	$21,307	$7,218	$20,429	$0	$17,934	$27,957	$0	0.639
10	$0	$230,342	$34,716	$20,201	$7,218	$20,395	$0	$18,651	$28,656	$0	0.608
11	$0	$214,629	$34,716	$19,003	$7,218	$20,429	$0	$19,397	$29,372	$0	0.579
12	$0	$197,620	$34,716	$17,707	$7,218	$20,395	$0	$20,173	$30,107	$0	0.551
13	$0	$179,208	$34,716	$16,304	$7,218	$20,429	$0	$20,980	$30,859	$0	0.524
14	$0	$159,277	$34,716	$14,785	$7,218	$20,395	$0	$21,819	$31,631	$0	0.498
15	$0	$137,702	$34,716	$13,140	$7,218	$20,429	$0	$22,692	$32,422	$0	0.474
16	$0	$114,346	$34,716	$11,360	$7,218	$10,197	$0	$23,600	$33,232	$0	0.451
17	$0	$89,064	$34,716	$9,434	$7,218	$0	$0	$24,544	$34,063	$0	0.429
18	$0	$61,696	$34,716	$7,348	$7,218	$0	$0	$25,525	$34,914	$0	0.408
19	$0	$32,070	$34,716	$5,090	$7,218	$0	$0	$26,546	$35,787	$0	0.389
20	$0	($0)	$34,716	$2,646	$7,218	$0	$0	$27,608	$36,682	$0	0.370
21	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.352
22	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.335
23	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.319
24	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.303
25	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.288
26	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.274
27	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.261
28	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.248
29	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.236
30	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.225
PV=	$37,177		$428,991	$247,224	$89,191		$0	$226,059	$347,776	$0	

Year	BENEFITS						
	Program Incentives	Thermal Credit	Tax Benefits		Avoided Externality	Avoided Grid Electric	PV Factor
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$0	$6,049	$1,123	$0	$17,082	0.951
2	$0	$0	$11,494	$2,135	$0	$17,509	0.905
3	$0	$0	$10,344	$1,921	$0	$17,947	0.861
4	$0	$0	$9,316	$1,730	$0	$18,395	0.820
5	$0	$0	$8,384	$1,557	$0	$18,855	0.780
6	$0	$0	$7,537	$1,400	$0	$19,327	0.742
7	$0	$0	$7,138	$1,326	$0	$19,810	0.706
8	$0	$0	$7,138	$1,326	$0	$20,305	0.672
9	$0	$0	$7,150	$1,328	$0	$20,813	0.639
10	$0	$0	$7,138	$1,326	$0	$21,333	0.608
11	$0	$0	$7,150	$1,328	$0	$21,866	0.579
12	$0	$0	$7,138	$1,326	$0	$22,413	0.551
13	$0	$0	$7,150	$1,328	$0	$22,973	0.524
14	$0	$0	$7,138	$1,326	$0	$23,547	0.498
15	$0	$0	$7,150	$1,328	$0	$24,136	0.474
16	$0	$0	$3,569	$663	$0	$24,740	0.451
17	$0	$0	$0	$0	$0	$25,358	0.429
18	$0	$0	$0	$0	$0	$25,992	0.408
19	$0	$0	$0	$0	$0	$26,642	0.389
20	$0	$0	$0	$0	$0	$27,308	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$0	$83,952	$15,591	$0	$258,901	

COMMERCIAL (Primary Service Rate)
ICE BEAR THERMAL ENERGY STORAGE
(336 Ton-hours of Storage)

Customer Parameters			Escalation
Off-Peak Electricity Fuel Cost =	$12.02	/MMBtu	2.5%
On-Peak Retail Electric Rate =	$0.0509	/kWh	2.5%
Discount Rate =	5.1%		
Federal Tax Rate =	35.0%		
State Tax Rate =	6.5%		
Sales Tax =	7.6%	of Price	
Property Tax =	2%	of Book Value	
Boiler Efficiency =	80%		

Grid Electric

Externality Adder =	$0.000	/kWh

Self Gen Parameters

Plant Capacity =	43	kW	
Installed Capital Cost =	$1,657	/kW	
Variable O&M Costs =	$0.000	/kWh	4%
Fixed O&M Costs =	$40	/kW-yr	4%
Generator Heat Rate =	2,626	Btu/kWh	
Heat Recovery =	0	Btu/kWh	
Capacity Factor =	12%	of potential	
Generation Sold =	0%	of production	
Plant Life =	20	years	
Self Gen Externality =	$0.000	/kWh	
Boiler Externality =	$0.000	/kWh	

Financing

Equity =	10%	
Financing Rate =	8.3%	
Loan Term =	20	Years

Tax Incentives

Int. Deduct. Or Dep. =	0	(1=Resid, 0=Corp)
Investment Tax Credit =	$0	
Book Life =	15	years

Program Incentives

Buy Down =	$0	/kW
PBI =	$0.000	/kWH	5 yrs
Program Costs =	$0	

Operational Results

Electric Generated =	44,720	kWh/yr
Electric Sold =	0	
Electric Avoided =	44,720	
Generator Fuel =	117	MMBtu/yr
TER =	0.00	
FER =	0.69	
T/T' =	0.00	PURPA minimum
Generator Fuel Cost =	$1,411	/yr
Avoided Boiler Fuel =	0	MMBtu/yr
Avd Boiler Fuel Cost =	$0	/yr

Cost of Electricity

Cost =	$167,249
Benefit =	$20,517
Net Cost =	$146,732
COE =	$0.1641

Present Value of Grid Electric

Avoided Grid Electric =	$35,342
PV Grid Rate =	$0.0395

	COSTS										
		Financing/Recovery					O&M			Self Gen Externality	PV
Year	Capital	Principal	Payment	Interest	Property Tax	Depreciation	Variable	Fixed	Fuel	Adder	Factor
0	$7,663	$68,964	$0	$0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$67,498	$7,155	$5,690	$1,488	$3,562	$0	$1,789	$1,447	$0	0.951
2	$0	$65,912	$7,155	$5,569	$1,488	$6,769	$0	$1,860	$1,483	$0	0.905
3	$0	$64,194	$7,155	$5,438	$1,488	$6,092	$0	$1,935	$1,520	$0	0.861
4	$0	$62,335	$7,155	$5,296	$1,488	$5,486	$0	$2,012	$1,558	$0	0.820
5	$0	$60,322	$7,155	$5,143	$1,488	$4,937	$0	$2,093	$1,597	$0	0.780
6	$0	$58,143	$7,155	$4,977	$1,488	$4,439	$0	$2,176	$1,637	$0	0.742
7	$0	$55,785	$7,155	$4,797	$1,488	$4,204	$0	$2,263	$1,678	$0	0.706
8	$0	$53,232	$7,155	$4,602	$1,488	$4,204	$0	$2,354	$1,719	$0	0.672
9	$0	$50,468	$7,155	$4,392	$1,488	$4,211	$0	$2,448	$1,762	$0	0.639
10	$0	$47,476	$7,155	$4,164	$1,488	$4,204	$0	$2,546	$1,807	$0	0.608
11	$0	$44,238	$7,155	$3,917	$1,488	$4,211	$0	$2,648	$1,852	$0	0.579
12	$0	$40,732	$7,155	$3,650	$1,488	$4,204	$0	$2,754	$1,898	$0	0.551
13	$0	$36,937	$7,155	$3,360	$1,488	$4,211	$0	$2,864	$1,945	$0	0.524
14	$0	$32,829	$7,155	$3,047	$1,488	$4,204	$0	$2,978	$1,994	$0	0.498
15	$0	$28,382	$7,155	$2,708	$1,488	$4,211	$0	$3,098	$2,044	$0	0.474
16	$0	$23,568	$7,155	$2,342	$1,488	$2,102	$0	$3,222	$2,095	$0	0.451
17	$0	$18,357	$7,155	$1,944	$1,488	$0	$0	$3,350	$2,147	$0	0.429
18	$0	$12,716	$7,155	$1,514	$1,488	$0	$0	$3,484	$2,201	$0	0.408
19	$0	$6,610	$7,155	$1,049	$1,488	$0	$0	$3,624	$2,256	$0	0.389
20	$0	($0)	$7,155	$545	$1,488	$0	$0	$3,769	$2,312	$0	0.370
21	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.352
22	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.335
23	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.319
24	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.303
25	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.288
26	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.274
27	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.261
28	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.248
29	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.236
30	$0	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	0.225
PV=	$7,663		$88,420	$50,956	$18,383		$0	$30,859	$21,924	$0	

| Year | BENEFITS | | | | | | |
| | Program Incentives | Thermal Credit | Tax Benefits | | Avoided Externality | Avoided Grid Electric | PV Factor |
			Federal	State			
0	$0	$0	$0	$0	$0	$0	1.000
1	$0	$0	$1,247	$232	$0	$2,332	0.951
2	$0	$0	$2,369	$440	$0	$2,390	0.905
3	$0	$0	$2,132	$396	$0	$2,450	0.861
4	$0	$0	$1,920	$357	$0	$2,511	0.820
5	$0	$0	$1,728	$321	$0	$2,574	0.780
6	$0	$0	$1,554	$289	$0	$2,638	0.742
7	$0	$0	$1,471	$273	$0	$2,704	0.706
8	$0	$0	$1,471	$273	$0	$2,772	0.672
9	$0	$0	$1,474	$274	$0	$2,841	0.639
10	$0	$0	$1,471	$273	$0	$2,912	0.608
11	$0	$0	$1,474	$274	$0	$2,985	0.579
12	$0	$0	$1,471	$273	$0	$3,060	0.551
13	$0	$0	$1,474	$274	$0	$3,136	0.524
14	$0	$0	$1,471	$273	$0	$3,214	0.498
15	$0	$0	$1,474	$274	$0	$3,295	0.474
16	$0	$0	$736	$137	$0	$3,377	0.451
17	$0	$0	$0	$0	$0	$3,462	0.429
18	$0	$0	$0	$0	$0	$3,548	0.408
19	$0	$0	$0	$0	$0	$3,637	0.389
20	$0	$0	$0	$0	$0	$3,728	0.370
21	$0	$0	$0	$0	$0	$0	0.352
22	$0	$0	$0	$0	$0	$0	0.335
23	$0	$0	$0	$0	$0	$0	0.319
24	$0	$0	$0	$0	$0	$0	0.303
25	$0	$0	$0	$0	$0	$0	0.288
26	$0	$0	$0	$0	$0	$0	0.274
27	$0	$0	$0	$0	$0	$0	0.261
28	$0	$0	$0	$0	$0	$0	0.248
29	$0	$0	$0	$0	$0	$0	0.236
30	$0	$0	$0	$0	$0	$0	0.225
PV=	$0	$0	$17,304	$3,214	$0	$35,342	

Appendix C – DG Program Survey Summary

Utility	State	Program Name	Incentive Type	Incentive Structure	Contact Info	URL	Technologies	Sectors
TVA	AL, GA, KY, MS, TN, VA	Green Power Switch Generation Partners Program	Production Incentive	Amount: $500 (residential only) plus $0.15/kWh (residential/small-commercial) or $0.20/kWh (commercial) for 10 years. Terms: $500 payment available only until the program capacity reaches 150 kW	S. Jolyn Newton Tennessee Valley Authority Green Power Switch Generation Partners 26 Century Blvd OCP 2-F, NST Nashville, TN 37229 Phone: (615) 232-6409 E-Mail: sjnewton@tva.gov Web site: http://www.greenpowerswitch.com	http://www.gpsgenpartners.com	Photovoltaics, Wind	Commercial, Residential
APS	AZ	Solar Partners Incentive Program	Utility Rebate Program	Incentive Amount: Grid-tied residential PV: $3/watt DC; Grid-tied commercial PV: $2.50/watt DC or production-based incentive. Off-grid (less than 5 kW) $2/watt DC. Solar water heating: $0.50/kWh of estimated first-year savings. Maximum Incentive: PV: $500,000; system expansions are eligible for up to 50% of project costs	Credit Purchase Program Customer Service Line Arizona Public Service Company Solar Energy Services Mail Station 8378 P.O. Box 53999 Phoenix, AZ 85072-3999 Phone: (602) 250-2826 Fax: (602) 250-2724 E-Mail: solar&renewableenergy@apsc.com	http://www.aps.com/my_community/Solar/aps_html	Solar Water Heat, Photovoltaics, Solar HVAC	Commercial, Residential
Tucson Electric Power	AZ	SunShare PV Buydown	Utility Rebate Program	Incentive Amount: Residential Option 1: $2/watt AC (includes maintenance & repair) Residential Option 3: $3/watt DC Non-Residential: $2.50/watt DC Maximum Incentive: Residential Option 1 –$39,000 Residential Option 3: $45,000 Non-Residential: $250,000	Steve Metzger Tucson Electric Power 3950 E Irvington Road Mailstop RC 116 Tucson, AZ 85702 Phone: (520) 745-3316 E-Mail: smetzger@tep.com Web site: http://www.tucsonelectric.com/	http://www.greenwatts.com/pages/sunshare.html	Photovoltaics	Commercial, Residential
Anaheim Public Utilities	CA	Thermal Energy Storage Incentive	Utility Rebate Program	Business customers can receive up to $21,000 for the purchase of a refrigerant-based Thermal Energy Storage air conditioning system. $400/kW of vintage A/C depending on climate zone, size and age. Commercial and industrial customers using packaged rooftop, split, single vertical packaged, mini split or direct expansion air-conditioning systems may qualify. The program is not applicable to central plant, chilled water circulation cooling systems. Incentives apply to ice storage units listed by the California Energy Commission as an approved compliance option under Title 24 Building Energy Efficiency Standards, then click on Approved Ice Storage Air Conditioners	emurdock@anaheim.net 714/765-4178	http://www.anaheim.net/utilities/adv_svc_prog/TES/TESIncentive.pdf	Thermal Energy Storage	Non-residential
LADWP	CA	Solar Incentive Program	Utility Rebate Program	Incentive Amount: $0.04 - $0.16/kWh. Varies by system size, tilt, position and location. Maximum Incentive: Up to 75% of project costs for systems <30 kW AC. Up to 50% for systems 30 kW AC and larger. Incentive payments will be provided only for the first 300 kW AC x inverter rating per site or per government or corporate parent per year. Eligible System Size: No size restrictions specified. Program Budget: $150 million over 10 years	Solar Program Information Los Angeles Department of Water & Power 111 North Hope Street Los Angeles, CA 90051 Phone: (800) 473-3652 Phone 2: (213) 367-4122 E-Mail: solar@ladwp.com Web site: http://www.ladwp.com Josephine Gonzalez Los Angeles Department of Water & Power 111 North Hope Street Los Angeles, CA 90051 Phone: (213) 367-0414 Fax: (213) 367-2591 E-Mail: josephine.gonzalez@ladwp.com Web site: http://www.ladwp.com	http://www.ladwp.com/ladwp/cms/ladwp000787.jsp	Photovoltaics	Commercial, Residential
SMUD	CA	Non-Residential PV Buydown	Utility Rebate Program	Incentive Amount: Commercial/Industrial: $2.80/watt AC, Non-profits: $3.75/watt AC, incentives adjusted based on expected performance. Maximum Incentive: Commercial/Industrial: $2.8M, Non-profits: $3.75M. Eligible System Size: No restrictions specified	Jim Barnett Sacramento Municipal Utility District 6201 S Street PO Box 15830 Sacramento, CA 95852-1830 Phone: (916) 732-6762 Web site: http://www.smud.org/index.html	http://www.smud.org/green/solar/comov.html	Photovoltaics	Commercial, Industrial, Nonprofit
SMUD	CA	PV Pioneers Residential Buy-down Program	Utility Rebate Program	Incentive Amount: Residential retrofit $2.50/watt AC, Residential new construction: $3/W AC, incentives adjusted based on expected performance. Maximum Incentive: No maximum limit. Eligible System Size: No size limit	Jim Barnett Sacramento Municipal Utility District 6201 S Street PO Box 15830 Sacramento, CA 95852-1830 Phone: (916) 732-6762 Web site: http://www.smud.org/index.html	http://www.smud.org/green/solar/index.html	Photovoltaics	Residential

Utility	State	Program Name	Incentive Type	Incentive Strcture	Contact Info	URL	Technologies	Sectors
	CA	California Solar Initiative	State Rebate Program	Incentive Amount: Varies by sector and system size (see below). Program Budget: $3.2 billion over 10 years. Ownership of Renewable Energy Credits: Remains with customer-producer	Website: www.pge.com/solar. E-mail Address: solar@pge.com. Contact Person: Program Manager, California Solar Initiative Program. Telephone: 1-800-743-5000. Fax: 415-973-2510. Mailing Address: PG&E Integrated Processing Center, P.O. Box 7265, San Francisco, CA 94120-7265.

San Diego Regional Energy Office (SDREO). Website: www.sdenergy.org. E-mail Address: csi@sdenergy.org. Contact Person: Nathalie Osborn, Program Manager. Telephone: 858-244-1177/(866)-sdenergy. Fax: 858-244-1178. Mailing Address: San Diego Regional Energy Office, Attn: SELFGEN Program Manager, 8690 Balboa Avenue Suite 100, San Diego, CA 92123.

Southern California Edison (SCE). Website: www.sce.com/rebatesandsavings/CaliforniaSolarInitiative/. E-mail Address: greenhi@sce.com. Contact Person: Program Manager, California Solar Initiative Program. Telephone: 1-800-799-4177. Fax: 626-302-6253. Mailing Address: | http://www.gosolarcalifornia.ca.gov/ | Photovoltaics | Commercial, Industrial, Residential, Nonprofit, Schools, Local Government, State Government, Fed. Government, Multi-Family Residential, Low-Income Residential, Agricultural, Institutional. (All customers of PG&E, SDG&E, SCE. Bear Valley eligible only for NHSP) |
| | CA | Self-Generation Incentive Program | State Rebate Program | Incentive Amount: $1.00/W to $4.50/W for renewables, depending on technology. Maximum Incentive: Incentive payment is capped at 1 MW. Eligible System Size: Systems must be sized according to customer's electricity demand, maximum system size of 5 MW, minimum of 30 kW for wind turbines and fuel cells using renewable fuels. Equipment Requirements: Systems must be new, UL listed, and in compliance with all applicable performance and safety standards. Wind systems and fuels must be covered by a minimum five year warranty. Other systems must be covered at least three years. Installation Requirements: Installation must comply with all federal, state, and local codes. Must be grid-connected and installed by a California-licensed contractor. Program Budget: 2007 Funding. PG&E: $32.4 million; SCE: $25.2 million; So Cal Gas: $9.9 million; SDG&E: $7.2 million | Web: www.pge.com/selfgen. Phone: 415-973-6436. Email: selfgen@pge.com. Fax: (415) 973-2510. Mailing Address: Self-Generation Incentive Program, P.O. Box 770000, Mail Code B27P, San Francisco, CA 94177-001.

San Diego Regional Energy Office (administrator for San Diego Gas & Electric, or SDG&E). Web: www.sdenergy.org/ContentPage.asp?ContentID=35&SectionID=24. Contact: Nathalie Osborn, Program Manager. Phone: (858) 244-1193. Phone 1-866-SDENERGY. Fax: (858) 244-1178. Email: selfgen@sdenergy.org. Address: San Diego Regional Energy Office, Attn: SELFGEN Program Manager, 8520 Tech Way Suite 110, San Diego, CA 92123.

Southern California Edison (SCE). Web: www.sce.com/RebatesandSavings/SelfGenerationIncentivePro gram. Phone: 1-800-736-4777 or (626) 302-8436. Fax: (626) 302-6253. Email: greenhi@sce.com. Address: Program Manager Self-Generation Incentive Program | http://www.cpuc.ca.gov/static/energy/electric/051005_sgip.htm | Wind, Fuel Cells, CHP/Cogeneration, Other Distributed Generation Technologies | Commercial, Industrial, Residential, Nonprofit, Schools, Local Government, State Government, Fed. Government, Institutional |
| Aquila | CO | On-Site Solar PV Rebate Program | Utility Rebate Program | Incentive Amount: $2/watt DC plus REC payment of $3/watt for systems up to 10 kW; $2/watt DC plus $1.50/Watt REC payment and additional REC payment based on annual production for systems greater than 10 kW up to 100 kW. Eligible System Size: Up to 100 kW DC. Equipment Requirements: PV modules must be warranted for a minimum period of 20 years. All other components (with the exception of batteries), labor and installation must be warranted for a minimum period of 5 years. All equipment must be new, UL-listed, and meet IEEE standards. Installation Requirements: Aquila recommends COSEIA or other qualified installer | Aquila PV Rebate Program, Aquila, Inc. 105 South Victoria, Pueblo, CO 81003. Phone (800) 454-8651. Web site: http://www.aquila.com | http://by.aquilaxprograms.com | Photovoltaics | Commercial, Industrial, Residential, Nonprofit, Schools, (All Aquila customers) |

Utility	State	Program Name	Incentive Type	Incentive Structure	Contact Info	URL	Technologies	Sectors
Xcel	CO	Solar*Rewards Program	Utility Rebate Program	Incentive Amount: $2/watt DC plus REC payment of up to $2.50/watt for systems up to 10 kW / $2/watt DC plus REC payment of $0.115/kWh for systems >10 kW up to 100 kW / RFP for systems >100 kW is closed as of 1/11/07 / Maximum Incentive: $45,000 for systems up to 10 kW; $200,000 for the rebate portion for systems >10 kW up to 100 kW / Eligible System Size: Small 0.5 kW - 10 kW DC; Medium 10.1 kW - 100 kW; Large 100.1 kW - 2 MW / Equipment Requirements: Eligible modules and inverters are listed on the California Energy Commission web site. / Solar systems must carry a five-year warranty from both the manufacturer and the installer, including parts and labor.	Julia Gauthier / Xcel Energy / 1225 17th Street, Suite 1277 / Denver, CO 80202 / Phone: (800) 895-4999 / E-Mail: julia.gauthier@xcelenergy.com / Web site: http://www.xcelenergy.com/solar	http://www.xcelenergy.com/solar	Photovoltaics	Commercial, Residential, Nonprofit
	CT	Solar PV Rebate Program	State Rebate Program	Maximum Amount: $4 million per project (plus potential additional production incentive for projects installed in southwestern Connecticut) / Equipment Requirements: Minimum system capacity of 10 kW; systems must be commercially available, and must have warranties, spare parts and service commensurate with commercial status / Funding Source: Connecticut Clean Energy Fund / Program Budget: $32.75 million	Dale Hedman / Connecticut Clean Energy Fund / 200 Corporate Place, 3rd Floor / Rocky Hill, CT 06067 / Phone: (860) 563-5851 Ext.331 / Fax: (860) 563-6978 / E-Mail: dale.hedman@ctinnovations.com / Web site: http://www.ctcleanenergy.com	http://www.ctinnovations.com/funding/ccef/solar_rebates.php	Photovoltaics, Landfill Gas, Wind, Biomass, Fuel Cells, Small Hydroelectric, Tidal Energy, Wave Energy, Ocean Thermal	Residential, Nonprofit, Local Government, State Government, Multi-Family Residential, Institutional
	D.C.	Reliable Energy Trust Fund	Public Benefits Fund	Total Fund: $2.3 million collected annually in 2001-04; $9.5 million collected in 2005; $10.5 million collected in 2006 / Charge: Non-bypassable surcharge based on kWh use	Ralph McMillan / District Department of the Environment / Energy Division / 2000 14th Street, NW, 300 East / Washington, DC 20009 / Phone: (202) 673-6700 / Fax: (202) 673-6725 / Web site: http://www.dcenergy.org	http://www.dcee.dc.gov/dcee/cwp/view,a,3,q,603158,dceeNav_123974.asp	Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Photovoltaics, Wind, Biomass, Hydroelectric, Anaerobic Digestion, Tidal Energy	Commercial, Industrial, Residential, General Public/Consumer, Utility, Institutional
	DE	Green Energy Program Incentives	State Rebate Program	Incentive Amount: 50% of installed cost / Maximum Incentive: PV: $22,500 for residential, $250,000 for commercial / Solar Water Heaters: $3,000 for residential, $250,000 for non-residential / Wind: $22,500 for residential, $100,000 for non-residential / Fuel Cells: $22,500 for residential, $250,000 for non-residential / Geo. Heat Pumps: $3,000 for residential, $25,000 for non-residential / (See Regulations for different maximum incentives for Delaware Electric Cooperative customers) / Eligible System Size: No size restrictions specified / Equipment Requirements: Systems must carry a full five-year warranty and meet applicable UL, IEEE, and NEC standards; on- and off-grid systems are eligible; SRCC certification required for solar water heating systems; See Regulations for detailed requirements / Installation Requirements: Systems must be installed by a participating contractor / Program Budget: Approximately $975,000 per year / Ownership of Renewable Energy Credits: Remains with customer/producer	Scott Lynch / Delaware Department of Natural Resources and Environmental Control / Delaware Energy Office / P.O. Box 1401 / Dover, DE 19901 / Phone: (302) 739-1530 / Fax: (302) 739-6148 / E-Mail: scott.lynch@state.de.us / Web site: http://www.delaware-energy.com/	http://www.delaware-energy.com/green_energy_program-home.html	Solar Water Heat, Photovoltaics, Wind, Geothermal Heat Pumps, Fuel Cells using Renewable Fuels	Commercial, Industrial, Residential
Progress Energy	FL	Thermal Energy Storage Incentive	Utility Rebate Program	$300 per kW / of reduced cooling load at peak times	1.877.372.8477 / SAVETHEWATTS.COM	www.SAVETHEWATTS.COM	Thermal Energy Storage	commercial or industrial facility
	MA	MTC - Large Onsite Renewables Initiative (LORI) Grants	State Rebate Program	Amount: Varies by solicitation / Maximum Amount: Varies by solicitation / Funding Source: Renewable Energy Trust Fund / Program Budget: $8.9 million over 3 years	Jon Abe / Massachusetts Technology Collaborative / Renewable Energy Trust / 75 North Drive / Westborough, MA 01581 / Phone: (508) 870-0312 / Fax: (508) 898-9226 / E-Mail: LORI@masstech.org / Web site: http://www.masstech.org	http://www.masstech.org/renewableenergy/large_renewables.htm	Photovoltaics, Landfill Gas, Wind, Biomass, Hydroelectric, Fuel Cells, Anaerobic Digestion, Renewable Fuels, Biodiesel	Commercial, Industrial, Schools, Local Government, State Government, Fed. Government, Multi-Family Residential, Institutional
	MA	MTC - Small Renewables Initiative Rebate	State Rebate Program	Incentive Amount: $2.00/W to $6.75/W depending on technology and application / Maximum Incentive: $50,000 per project or site / Eligible System Size: 10 kW maximum. PV systems may be larger, but the incentive is based on a maximum of 3.6 kW DC for residential and 10 kW DC for non-residential systems / Equipment Requirements: Systems must be new, UL listed, and meet applicable IEEE standards; Must have dedicated meter that meets ANSI C-12 standards / Installation Requirements: Must be grid-connected, with the exception that off-grid PV applications that are located on the same contiguous property of an eligible non-residential grid connected applicant and facility are eligible; Must comply with all federal, state, and local codes, and NEC standards; Project must be pre-approved, but there is no list of pre-approved contractors / Program Budget: April 2005 through 2006: $6 million; 2007 - FY 2010: $3.6 million per year.	Small Renewables Coordinator / Massachusetts Technology Collaborative / Renewable Energy Trust / 75 North Drive / Westborough, MA 01581 / Phone: (508) 439-5640 / Fax: (508) 898-2275 / E-Mail: smallrenewables@masstech.org / Web site: http://www.masstech.org	http://www.masstech.org/RenewableEnergy/small_renewables.htm	Photovoltaics, Wind, Small Hydroelectric	Commercial, Industrial, Residential, Nonprofit, Schools, Local Government, State Government, Fed. Government, Multi-Family Residential, Institutional

Utility	State	Program Name	Incentive Type	Incentive Structure	Contact Info	URL	Technologies	Sectors
Austin Public Utilities	MN	Solar Choice Program	Production Incentive	Varies; determined by $ amount purchased and kWh produced by each utility's customer base. Maximum Incentive: $1,000/kWh. 40 kW system limit	Kelly Lady, Austin Public Utilities, 400 4th St NE, Austin, MN 55912. Phone: (507) 437-0855. E-Mail: Kelly.L@austinutilities.com. Web site: http://www.austinutilities.com	http://www.austinutilities.com/Solar Choice.html	Photovoltaics	Commercial, Industrial, Residential, Nonprofit, Schools, Agricultural, Institutional, (APU customers)
Minnesota Power	MN	Solar-Electric (PV) Rebate Program	Utility Rebate Program	Incentive Amount: $2/watt DC. Maximum Incentive: $4,000, may be combined with state PV rebate. Eligible System Size: At least 1 kW. Equipment Requirements: Equipment must conform to the requirements of the State of Minnesota Rebate Program. Installation Requirements: Systems must be installed by an approved installer	Dean Talbot, Minnesota Power, 30 West Superior Street, Duluth, MN 55802. Phone: (218) 722-5642 Ext. 2843. Fax: (218) 720-2795. E-Mail: DTALBOTT@mnpower.com. Web site: http://www.mnpower.com	http://www.mnpower.com/environment/solar/index.htm	Photovoltaics	Commercial, Industrial, Residential, Nonprofit, Schools, (All MN Power retail customers)
Xcel Energy	MN	Renewable Development Fund Grants	Utility Grant Program	Amount: Varies. Max. Limit: Varies	Debra J. Paulson, Xcel Energy, 414 Nicollet Mall, Minneapolis, MN 55401-1993. Phone: (800) 895-4999. Fax: (612) 330-7601. E-Mail: debra.j.paulson@xcelenergy.com. Web site: http://www.xcelenergy.com	http://www.xcelenergy.com/XLWEB/CDA/0,2914,1-1-1_4359_3725-8011-2_171_258-0,00.html	Photovoltaics, Wind, Biomass, Hydroelectric, CHP/Cogeneration, Anaerobic Digestion, Renewable Fuels, Fuel Cells using Renewable Fuels	Commercial, Industrial, Residential, Nonprofit, Schools, Local Government, Utility, State Government, Tribal Government, Fed. Government, Agricultural, Institutional
PNM	NM	Customer Solar PV Program	Production Incentive	$0.13/kWh through 2018	Customer Service, PNM, Customer Generation Programs, 4201 Edith Blvd NE, MS ES92, Albuquerque, NM 87107-2225. Phone: (505) 241-2548. Web site: http://www.pnm.com	http://www.pnm.com/customers/pv_rec.htm	Photovoltaics	Commercial, Residential
	NV	SolarGenerations PV Rebate Program	State Rebate Program	Incentive Amount: Year 5 amounts: $2.50/W AC for residential and small business. $5/W AC for schools and public buildings. Maximum Incentive: Residential: $12,500. Small Business: $75,000. Public Facilities: $150,000. Schools: $150,000. Eligible System Size: Residential: Maximum of 5 kW AC. Small Business/Public Facilities/Schools: 20 kW AC. Equipment Requirements: Systems must be in compliance with all applicable standards. Must carry a minimum 5-year warranty on inverters, 20-year warranty on panels, and 1-year warranty on labor. Modules and inverters must be on the California Energy Commission (CEC) approved equipment list. Installation Requirements: Installations must comply with all federal, state, and local codes and meet detailed siting criteria specified in program guidelines. Systems must be grid-connected, net-metered, and installed by a Nevada-licensed electrical contractor.	John Hargrove, Sierra Pacific Power Company, SolarGenerations™ Rebate Program, 6100 Neil Road, Reno, NV 89511. Phone: (866) 786-3823. E-Mail: info@SolarGenerations.com. Web site: http://www.sierrapacific.com	http://www.SolarGenerations.com	Photovoltaics	Commercial, Residential, Schools, Local Government, State Government, Other Public Buildings
LIPA	NY	Solar Pioneer Program	Utility Rebate Program	Incentive Amount: Residential and Commercial $3.75/watt DC, Schools, Nonprofits, Government agencies: $4.75/watt DC. Eligible System Size: 10 kW maximum	Customer Service - LIPA, Long Island Power Authority, 333 Earle Ovington Blvd, Uniondale, NY 11553. Phone: (800) 692-2626. Web site: http://www.lipa.state.ny.us	http://www.lipower.org/solar	Photovoltaics	Commercial, Residential, Nonprofit, Schools, Local Government, State Government
	NY	NYSERDA - PV Incentive Program	State Rebate Program	Incentive Amount: $4/watt (DC rated capacity). Maximum Incentive: 60% of total installed costs. Eligible System Size: No maximum specified, but incentives capped at 50 kW capacity. Systems may not exceed 110% of demonstrated energy demand. Equipment Requirements: Systems must be new, UL-listed, and compliant with all applicable performance and safety standards; minimum five-year warranty on all equipment. Installation Requirements: Installation must comply with all federal, state and local codes, must be grid-connected and installed by a pre-approved contractor; must comply with New York's Standard Interconnection Requirements. Program Budget: $22.9 million (2002-2007)	Public Information Specialist, New York State Energy Research and Development Authority, 17 Columbia Circle, Albany, NY 12203-6399. Phone: (866) 697-3732. Phone 2: (518) 862-1090. Fax: (518) 862-1091. E-Mail: info@nyserda.org. Web site: http://www.nyserda.org	http://www.powernaturally.org/Programs/Solar/incentives.asp	Photovoltaics	Commercial, Industrial, Residential, Nonprofit, Schools, Local Government, State Government, Institutional. (Must be customer of investor-owned utility in NY)
Austin Energy	TX	Thermal Energy Storage Incentive Program	Utility Rebate Program	• $300 per kW – 0 to 100 kW shift • $150 per kW – 100 to 500 kW shift • $50 per kW – 500 kW shift or higher A Feasibility Study incentive of 50% of the cost of a Feasibility Study, up to $7,000 for new and existing construction, will be offered for qualifying Feasibility Study Applications. No Feasibility Study incentive will be paid if the anticipated demand shift is 100 kW or less.	Austin Energy, Thermal Energy Storage Program, 811 Barton Springs Road, Austin, TX 78704. Phone: (512) 482-5346 FAX (512) 482-5455. Email: conservation@austinenergy.com	http://www.austinenergy.com/Energy%20Efficiency/Programs/Rebates/Commercial/Commercial%20Energy/thermalEnergyStorageOverview.pdf	Thermal Energy Storage	Austin Energy commercial customers

Utility	State	Program Name	Incentive Type	Incentive Structure	Contact Info	URL	Technologies	Sectors
Austin Energy	TX	Solar PV Rebate Program	Utility Rebate Program	Incentive Amount: Residential and Commercial $4.50/watt AC; Equipment manufactured in Austin: $6.25/watt AC. Maximum Incentive: Residential: the lesser of $13,500 or 80% of invoiced cost; Commercial: the lesser of $100,000 or 80% of invoiced cost. Equipment Requirements: Must use pre-approved modules and inverters (those listed by the California Energy Commission). PV systems must carry a 5-year warranty from the installer in addition to a 10-year manufacturer warrantee on inverters in residential applications without battery back-up. Installation Requirements: Must be grid-connected. Must use a solar installer from the Austin Energy Registered Installer List. Solar installers must be certified by the North American Board of Certified Energy Practitioners (NABCEP) within two years of becoming a Registered Installer	Conservation Information Center - Solar Rebates Austin Energy Solar Rebate Program 721 Barton Springs Road Austin, TX 78704 Phone: (512) 482-5346 Fax: (512) 482-5409 E-Mail: solarrebate@austinenergy.com Web site: http://www.austinenergy.com	http://www.austinenergy.com/ Energy%20Efficiency/Programs/R ebates/Solar%20Rebates/index.ht m	Photovoltaics	Commercial, Residential, Nonprofit, Must be the Austin Energy Customer
City of St. George	UT	Solar and Wind Rebate Program	Utility Rebate Program	Applicable Sectors: Commercial, Residential, General Public/Consumer Incentive Amount: $2,000 per kW-AC Maximum Incentive: Residential systems - $6,000; commercial systems: $20,000 Eligible System Size: 1 kW - 10 kW	René Fleming City of St. George City Hall 175 East 200 North St. George, UT 84770 Phone: (435) 627-4948 E-Mail: rene.fleming@sgcity.org Web site: http://www.sgcity.org	http://www.sgcity.org/ wp/pwer/NetMetering/brochure.p df	Photovoltaics, Wind	Commercial, Residential, General Public/Consumer
Clark Public Utilities	WA	Solar Energy System Loan	Utility Loan Program	Terms: 5% interest rate with 60-month repayment term for solar water heating and an 84-month repayment term for PV Up to $6,000 for solar pool heaters Up to $6,000 for solar water heaters Up to $20,000 for solar PV	Bruce Carter 1200 Fort Vancouver Way P.O. Box 8900 Vancouver, WA 98668 Phone: (360) 992-3365 Phone 2: (800) 992-3000 Fax: (360) 992-3038 E-Mail: bbcarter@clarkpud.com Web site: http://www.clarkpublicutilities.com	http://www.clarkpublicutilities.com/ Residential/solar-Programs/solar-Lo ans	Solar Water Heat, Photovoltaics, Solar Pool Heating	Commercial, Residential
Puget Sound Energy	WA	Solar PV System Rebate	Utility Rebate Program	Incentive Amount: $5/25/kW DC to $600/kW DC, depending on county Maximum Incentive: No maximum specified Equipment Requirements: PV systems must be approved for operation under the Washington State Electrical Code Project Review/Certification: A system field check by must be completed by PSE	PSE Energy Advisors Puget Sound Energy Bellevue, WA Phone: (800) 562-1482 E-Mail: EnergyEfficiency@pse.com Web site: http://www.pse.com/energy/energy_feedback.html	https://www.pse.com/ solutions/rebates/OnRenewable.as px	Photovoltaics	Residential
We Energies	WI	Biogas Buy-Back Rate	Production Incentive	$0.08 per kilowatt-hour (8.0¢/kWh) for on-peak generation, $0.049 per kilowatt-hour (4.9¢/kWh) for off-peak generation Available to systems up to 800 kW in capacity, maximum aggregate capacity limit of 10 MW	Carl Siegrist We Energies 231 W. Michigan St., P318 Milwaukee, WI 53203 Phone: (414) 221-2183 Fax: (414) 221-2851 E-Mail: carl.siegrist@we-energies.com Web site: http://www.we-energies.com	http://www.we-energies.com/ business_new/altenergy/custgen.h tml#terms	Biomass, Anaerobic Digestion	Commercial, Industrial, Residential, Nonprofit, Schools, Local Government, Agricultural, Institutional
We Energies	WI	Biogas Buy-Back Rate	Production Incentive	Amount: $0.08 per kilowatt-hour (8.0¢/kWh) for on-peak generation; $0.049 per kilowatt-hour (4.9¢/kWh) for off-peak generation Terms: Available to systems up to 800 kW in capacity; maximum aggregate capacity limit of 10 MW	Carl Siegrist We Energies 231 W. Michigan St., P318 Milwaukee, WI 53203 Phone: (414) 221-2183 Fax: (414) 221-2851 E-Mail: carl.siegrist@we-energies.com Web site: http://www.we-energies.com	http://www.we-energies.com/ business_new/altenergy/custgen.h tml#terms	Biomass, Anaerobic Digestion	Commercial, Industrial, Residential, Nonprofit, Schools, Local Government, Agricultural, Institutional
We Energies	WI	Renewable Energy Development Program	Utility Grant Program	Amount: $10,000 - $100,000 Max. Limit: $100,000 Terms: Systems must be manufactured and installed in compliance with the latest edition of the National Electric Code. Systems must be installed by a "Full Service Installer" approved by Focus on Energy. PV and wind-energy projects must undergo a site-assessment prior to proposal submission	Carl Siegrist We Energies 231 W. Michigan St., P318 Milwaukee, WI 53203 Phone: (414) 221-2183 Fax: (414) 221-2851 E-Mail: carl.siegrist@we-energies.com Web site: http://www.we-energies.com	http://www.we-energies.com/RE	Solar Thermal Electric, Photovoltaics, Wind, Biomass, Anaerobic Digestion, Small Hydroelectric, Fuel Cells using Renewable Fuels	Nonprofit, Schools, Local Government, State Government, Tribal Government, Fed Government
We Energies	WI	Solar-Electric Development (SED) Program	Utility Rebate Program	Incentive Amount: $5.00 per watt-AC for systems that meet "optimal" performance criteria Maximum Incentive: $2 million Eligible System Size: 100 kW-AC to 400 kW-AC Equipment Requirements: Modules and inverters must meet CEC eligibility criteria, modules must be certified UL 1703 standard, inverters must be certified to UL 1741, system components must have 5-year minimum warranty, customer must install approved meter socket and associated wiring Installation Requirements: Systems must be designed and installed in accordance with all applicable NEC requirements, must be permitted and inspected as required by local and state codes, installation must have 5-year minimum warranty Program Budget: $4 million	Carl Siegrist We Energies 231 W. Michigan St., P318 Milwaukee, WI 53203 Phone: (414) 221-2183 Fax: (414) 221-2851 E-Mail: carl.siegrist@we-energies.com Web site: http://www.we-energies.com	http://www.we-energies.com/ business_new/altenergy/install_re newenrgy.htm	Photovoltaics	Commercial

Utility	State	Program Name	Incentive Type	Incentive Structure	Contact Info	URL	Technologies	Sectors
We Energies	WI	Solar Buy-Back Rate	Production Incentive	Amount: $0.225 per kilowatt-hour (22.5¢/kWh), 10-year contract. Maximum Incentive: No maximum specified. Terms: System capacity must be between 1.5 kW - 100 kW; must comply with applicable national, state and local electrical codes, rules and regulations; electric service rules and regulations of We Energies; requirements of Wisconsin Administrative Code Chapter PSC 119; the state's Distributed Generation Interconnection Agreement, and "Energy for Tomorrow" Power Partner Program Agreement	Carl Siegrist, We Energies, 231 W. Michigan St., P318, Milwaukee, WI 53203, Phone (414) 221-2183, Fax: (414) 221-2851, E-Mail: carl.siegrist@we-energies.com, Web site: http://www.we-energies.com	http://www.we-energies.com/ business_new/altenergy/custgen.htm#terms	Photovoltaics	Commercial, Industrial, Residential, Nonprofit, Schools, Agricultural, Institutional
We Energies	WI	Solar Buy-Back Rate	Production Incentive	$0.225 per kilowatt-hour (22.5¢/kWh), 10-year contract. No maximum specified. System capacity must be between 1.5 kW - 100 kW, aggregate capacity of all participating systems is 1 MW; must comply with applicable national, state and local electrical codes, rules and regulations; electric service rules and regulations of We Energies; requirements of Wisconsin Administrative Code Chapter PSC 119; the state's Distributed Generation Interconnection Agreement, and "Energy for Tomorrow" Power Partner Program Agreement	Carl Siegrist, We Energies, 231 W. Michigan St., P318, Milwaukee, WI 53203, Phone (414) 221-2183, Fax: (414) 221-2851, E-Mail: carl.siegrist@we-energies.com, Web site: http://www.we-energies.com	http://www.we-energies.com/ business_new/altenergy/custgen.htm#terms	Photovoltaics	Commercial, Industrial, Residential, Nonprofit, Schools, Agricultural, Institutional
Wisconsin Public Power, Inc.	WI	Renewable Energy Loan	Utility Loan Program	Terms: Participants may borrow $2,500 - $20,000, 1.99% interest rate, 10-year maximum term	Mike Hodges, Wisconsin Public Power, Inc. (WPPI), 1425 Corporate Center Drive, Sun Prairie, WI 53590-9109, Phone (608) 837-2653, Phone 2: (608) 834-4500, Fax: (608) 837-0274, E-Mail: mhodges@wppisys.org, Web site: http://www.wppisys.org	http://www.wppisys.org/ programs_services/default.asp?CategoryID=128&SubcategoryID=22	Solar Water Heat, Solar Space Heat, Photovoltaics, Wind, Site Assessments	Commercial, Residential
Wisconsin Public Power, Inc.	WI	Renewable Energy Rebate	Utility Rebate Program	Incentive Amount: Solar-thermal systems: $25-$30/sq. foot of collector area, PV systems: $1-$3/kWh; Wind-energy systems: 25% of project cost; Site assessments: 75% of fee, Repairs to existing systems: 50% of project cost. Maximum Incentive: Solar-thermal systems: $3,500, PV systems: $10,000; Wind-energy systems: $10,000; Site assessments: $375; Repairs to existing systems: $2,500. Equipment Requirements: Solar-thermal equipment must be certified by the SRCC and backed by an extended warranty. Installation Requirements: Solar-thermal equipment must be installed by an experienced solar contractor. All electrically-operated components must meet applicable safety requirements of the NEC.	Mike Hodges, Wisconsin Public Power, Inc. (WPPI), 1425 Corporate Center Drive, Sun Prairie, WI 53590-9109, Phone (608) 837-2653, Phone 2: (608) 834-4500, Fax: (608) 837-0274, E-Mail: mhodges@wppisys.org, Web site: http://www.wppisys.org	http://www.wppisys.org/ programs_services/default.asp?CategoryID=128&SubcategoryID=22	Solar Water Heat, Solar Space Heat, Photovoltaics, Wind, Site Assessments	Commercial, Residential
Wisconsin Public Power, Inc.	WI	Renewable Energy Rebate	Utility Rebate Program	Incentive Amount: Solar-thermal systems: $25-$30/sq. foot of collector area, PV systems: $1-$3/kWh; Wind-energy systems: 25% of project cost; Site assessments: 75% of fee, Repairs to existing systems: 50% of project cost. Maximum Incentive: Solar-thermal systems: $3,500, PV systems: $10,000; Wind-energy systems: $10,000; Site assessments: $375; Repairs to existing systems: $2,500. Equipment Requirements: Solar-thermal equipment must be certified by the SRCC and backed by an extended warranty. Installation Requirements: Solar-thermal equipment must be installed by an experienced solar contractor. All electrically-operated components must meet applicable safety requirements of the NEC.	Mike Hodges, Wisconsin Public Power, Inc. (WPPI), 1425 Corporate Center Drive, Sun Prairie, WI 53590-9109, Phone ((60)8)-837-, Phone 2: ((60)8)-834-, Fax: ((60)8)-837-, E-Mail: mhodges@wppisys.org, Web site: http://www.wppisys.org	http://www.wppisys.org/ programs_services/default.asp?CategoryID=128&SubcategoryID=22	Solar Water Heat, Solar Space Heat, Photovoltaics, Wind	Commercial, Residential
Carbon Power & Light	WY	Photovoltaic Leasing Program	Leasing/Lease Purchase	Lease Terms: Five or ten years; utility covers all costs up to $2,500. Participants: 0 photovoltaic systems	Joe Parrie, Carbon Power & Light, Inc., 110 E. Spring Street, PO Box 579, Saratoga, WY 82331, Phone (307) 326-5206 Ext.104, Phone 2: (800) 359-0249, Fax: (307) 326-5804, E-Mail: jparrie@carbonpower.com, Web site: http://www.carbonpower.com/		Photovoltaics	Commercial, Residential, Agricultural

Utility	State	Program Name	Description
We Energies	WI	Solar Buy-Back Rate	We Energies, a utility serving portions of Wisconsin and Michigan, offers to purchase electricity and associated renewable energy credits generated by Wisconsin customers with qualifying solar photovoltaic (PV) systems. Under a 10-year contract,* We Energies purchases all of the the system output (no net metering) at a rate of 22.5¢ per kilowatt-hour for electricity generated. Customers will receive a monthly credit for the energy sold to We Energies and will receive a check whenever any net accumulated amount exceeds $100. The program, which began operation October 2005, allows customers to begin participating until September 2008 -- or until the program is fully subscribed. Enrollment is capped at an aggregate total of 500 kilowatts (kW) of installed PV systems under this experimental tariff. Eligible PV systems must be rated for an aggregate generation capacity of at least 1.5 kW and not more than 100 kW. As of March 2007, a total of 300 kW has been accepted on the solar buy-back rate. Participating customers must comply with applicable national, state and local electrical codes, rules and regulations; the electric service rules and regulations of We Energies; the requirements of Wisconsin Administrative
We Energies	WI	Solar Buy-Back Rate	We Energies, a utility serving portions of Wisconsin and Michigan, offers to purchase electricity and the associated renewable energy credits (RECs) generated by Wisconsin customers with qualifying solar photovoltaic (PV) systems. Under a 10-year contract,* We Energies purchases 100% of the system output at a rate of 22.5¢ per kilowatt-hour (kWh) for electricity generated. PV systems must have a rated capacity of at least 1.5 kilowatts (kW) and not more than 100 kW to be eligible. Customers will receive a monthly credit for the energy and RECs sold to We Energies, and will receive a check whenever any net accumulated amount exceeds $100. Customers participating in this program may not net meter. The program, which began operation October 2005, initially allowed customers to begin participating until September 2008 or until the program reached a total of 500 kilowatts (kW) of installed PV capacity. However, We Energies gained approval from the Public Service Commission of Wisconsin for an expansion of their existing solar buy-back rate effective May 14, 2007. The cap has now been increased to 1,000 kW, and eligible customers may enroll in this experimental tariff through September 30, 2011, for a 10-year term. Participating customers must comply with applicable national, state and local electrical codes, rules and regulations; the electric service rules and regulations of We Energies, the
Wisconsin Public Power, Inc.	WI	Renewable Energy Loan	Low-interest loans for renewable-energy systems are available to residential and small business customers of all Wisconsin Public Power, Inc. (WPPI) member utilities. This incentive is available for solar water-heating systems, solar space-heating systems for buildings that use electricity as the primary heat source, photovoltaic (PV) systems up to 20 kilowatts (kW) in capacity, wind-energy systems up to 20 kW in capacity, and repairs to existing systems. Customers can borrow from $2,500 to $20,000, at an interest rate of 1.99%. Loan terms vary from three to 10 years. Financing is through Fannie Mae's Residential Home Energy Improvement Program and underwritten by Energy Finance Solutions (EFS), a service of Wisconsin Energy Conservation Corporation. Eligibility is based on the customer's credit score, bankruptcy history and debt-to-income ratio.
Wisconsin Public Power, Inc.	WI	Renewable Energy Rebate	Rebates for renewable-energy systems are available to residential and small commercial customers of all Wisconsin Public Power, Inc. (WPPI) utilities. The following technologies generally qualify for a cash rebate. Residential Solar Water-Heating Systems For new systems using electricity as the backup water-heating fuel, eligible customers will receive a rebate of $30 per square foot of collector area. For systems using propane or natural gas as the backup water-heating fuel, customers will receive $25 per square foot of collector area. The maximum award is the lesser of $3,500 or 35% of project cost. Solar-Thermal Heating Systems Rebates are available for solar-thermal heating systems for buildings that use electricity as their primary heat source. (Electric space heating must provide more than 50% of the building's space-heating needs.) Eligible customers will receive a rebate of $30 per square foot of collector area. The maximum award is the lesser of $3,500 or 35% of project cost. Photovoltaic (PV) Systems For rack-mounted or building-integrated PV systems rated 20 kilowatts (kW) or less, eligible customers will receive a rebate based on estimated annual energy production, calcul
Wisconsin Public Power, Inc.	WI	Renewable Energy Rebate	Rebates for renewable-energy systems are available to residential and small commercial customers of all Wisconsin Public Power, Inc. (WPPI) utilities, including these Michigan utilities: Alger Delta CEA, Baraga Electric Utility, Gladstone Power & Light, L'Anse Electric Utility, Negaunee Electric Department, and Norway Power & Light. Customers must reside in the service territory of the participating utility, and the system must be installed on the customer's property. Projects must be approved by the utility before installation. The following technologies generally qualify for a cash rebate. Residential Solar Water-Heating Systems For new systems using electricity as the backup water-heating fuel, eligible customers will receive a rebate of $30 per square foot of collector area. For systems using propane or natural gas as the backup water-heating fuel, customers will receive $25 per square foot of collector area. The maximum award is the lesser of $3,500 or 35% of project cost. Solar-Thermal Heating Systems Rebates are available for solar-thermal heating systems for buildings that use electricity as their primary heat source. (Electric space heating must provide more than 50% of the PV Systems For rack-mounted or building-integrated PV systems rated 20 kilowatts (kW) or less, eligible customers will receive a rebate based on estimated annual energy production, calcul Small Wind-Energy Systems
Carbon Power & Light	WY	Photovoltaic Leasing Program	Carbon Power & Light (CP&L) offers its customers a leasing program for PV systems, with an option to purchase the equipment. The utility provides the PV equipment, handles installation, and conducts routine maintenance of the systems. CP&L will cover all construction costs below the electric facilities allowance (EFA) cap of $2,500. The EFA is a standard line extension cost determined by the typical customer's average bill over a set number of years. The leasing period can extend for either five years or ten years. If a customer wishes to discontinue the lease, he or she can either transfer the contract to another individual or purchase the system by paying off both the remaining balance of the line extension charges and the remainder of the monthly minimum amounts per the applicable rate tariff. This program is available for Carbon Power & Light customers only. Currently, there are no participants in the leasing program. The majority of the leased systems in the past were used to operate livestock water installations. The utility has found that members can now purchase systems on the market at a lower cost than can be offered to them through the program.

Utility	State	Program Name	Description
TVA	AL, GA, KY, MS, TN, VA	Green Power Switch Generation Partners Program	Participating power distributors in TVA's Green Power Switch Generation Partners program offer production-based incentives for solar photovoltaics (PV) and wind projects to residential/small-commercial customers and incentives for PV projects to large commercial customers. The energy generated from participating projects will be counted toward the green power resources for TVA's green pricing program, Green Power Switch. Consumers participate as either residential/small-commercial or commercial customers. Under the residential/small-commercial contract, TVA will purchase the entire output of a qualifying system at $0.15 per kWh through a participating power distributor, and the consumer will receive a credit for the power generated. In September 2004, larger commercial customers were included in the program. Under the larger commercial contract, TVA will purchase the output at $0.20 per kWh. Participation in this program is entirely up to the discretion of the power distributor. As of August 2006, 30 distributors have signed up for the program. Thus far, the program includes several residential solar participants, a 20-kW wind project, a 50-kW commercial solar system, and a 10-kW commercial solar
APS	AZ	Solar Partners Incentive Program	Through the Solar Partners® Incentive Program (formerly the Environmental Portfolio Standard Credit Purchase Program), Arizona Public Service (APS) offers customers who install photovoltaic and solar hot water systems the opportunity to sell the credits associated with the energy generated to APS. Solar energy systems are eligible for the following credit amounts: Grid-tied residential PV: $3/watt DC; No system size limit. Grid-tied commercial systems: $2.50/watt DC up to $500,000. Alternatively, commercial customers may opt for a production-based incentive. Off-grid residential PV: $2/watt DC; System must be less than 5 kW. Solar hot water systems: Rebate amounts for small systems are based upon an estimate of first-year energy savings at $0.50/kWh based on OG-300 ratings. The incentive structures for large SWH systems and solar HVAC systems are under development. Expansions to existing systems are eligible for a credit of up to 50% of their costs. Customers electing to sell back excess power can do so under the EPR4 rate if the system is 10kW or less or under the EPR2 rate if the system is between 10 kW and 100 kW. Note that these rates are based on avoided cost; systems are not net metered. APS allocated
Tucson Electric Power	AZ	SunShare PV Buydown	Tucson Electric Power (TEP) created the SunShare Program in 2001 to encourage residential and business customers to install new photovoltaic (PV) equipment. Residential PV systems with an installed capacity of 1.2 kW to 15 kW and non-residential systems greater than 1.2 kW are eligible for incentives. SunShare Residential Option 1: TEP provides a rebate of $2 per watt of verified AC output for photovoltaic systems. The incentive will be reduced according to the program derating chart for sub-optimal orientation and shading. This option includes maintenance and repair. SunShare Residential Option 3: TEP provides a rebate of $3 per watt of rated DC solar generating capacity. The incentive will be reduced according to the program derating chart for sub-optimal orientation and shading. (TEP no longer offers Option 2 in which customers purchased a photovoltaic kit from TEP.) SunShare Non-Residential Option 3: TEP provides a rebate of $2.50 per watt of rated DC solar generating capacity for the first 100 kW ($250,000 maximum). The incentive will be reduced according to the program derating chart for sub-optimal orientation and shading. A single customer may not receive more than $500,000 of incentive pa
Anaheim Public Utilities	CA	Thermal Energy Storage Incentive	The program is designed to encourage the installation and use of ice storage for air conditioning systems in new construction, renovation, retrofit and replacement applications.
LADWP	CA	Solar Incentive Program	The Board of Commissioners of the Los Angeles Department of Water and Power (LADWP) approved new guidelines for the Solar Photovoltaic Rebate Program on July 25, 2006. The revised program, available to residents and businesses, will provide rebates to LADWP customers based on a photovoltaic (PV) system's expected performance rather than the system's capacity. Incentive amounts will vary depending on a system's size, tilt, position and location. The LADWP advises interested customers to visit the utility's web site to use the on-line PVWatts calculating tool in order to estimate individual PV system output and calculate the potential rebate amount. New applications for the Solar Incentive Program are being accepted as of August 14, 2006. Applications will only be accepted via U.S. Post Office regular delivery and U.S. postmarks will be noted for solar rebate reservations. No other form of submission will be accepted. The LADWP anticipates that the program will remain open to applications continuously into the future and that all qualifying customers that submit an application will be served. LADWP's 10-year, $150 million Solar Photovoltaic Rebate Program began in 2000 and will remain in ef
SMUD	CA	Non-Residential PV Buydown	SMUD offers a cash rebate to commercial, industrial, and non-profit customers who install solar photovoltaic (PV) systems. SMUD will pay a one-time incentive for the first 1,000 kW of installed capacity in the amount of $2.80/Watt AC for commercial/industrial customers and $3.75/W for non-profit customers. The incentive will be adjusted based on expected performance, which is calculated based on factors such as components used, system orientation, and shading. Rebate recipients must comply with SMUD interconnection and net-metering agreements and must agree that all environmental and air quality credits (also known as renewable energy credits) resulting from the installation remain with SMUD.
SMUD	CA	PV Pioneers Residential Buy-down	SMUD offers an incentive of $2.50/W AC for residential retrofits and $3/W AC for residential new construction to customers who contract directly with SMUD-approved contractors for the purchase/installation of grid-connected solar electric (PV) systems. The incentive will be adjusted based on expected system performance (orientation, array, tilt and shade). The incentive will be paid to the contractor and is intended for the contractor's bid to the customer. Both traditional PV modules and building-integrated PV "roof shingles" are available under the program. Visit the program website for the list of participating contractors for residential systems.

Utility	State	Program Name	Description
	CA	California Solar Initiative	In January 2006, the California Public Utilities Commission (CPUC) adopted a program – the California Solar Initiative (CSI) – to provide more than $3 billion in incentives for solar projects with the objective of providing 3,000 MW of solar capacity by 2017. The CSI will fund solar photovoltaics (PV) initially, with other solar technologies included at a later point. The program shuffles administrative responsibilities of the previous incentive programs in which the California Energy Commission (Energy Commission) handled the Emerging Renewables Program for projects under 30 kW, and the CPUC oversaw the Self-Generation Incentive Program (SGIP) for renewables larger than 30 kW up to 5 MW. Beginning in 2007, the CPUC will manage the solar program for non-residential and existing residential customers ($2+ billion), while the Energy Commission will oversee the New Solar Homes Partnership targeting the residential new construction market (~$400 million). Originally limited to customers of the state's investor-owned utilities, the CSI was expanded in August 2006, as a result of Senate Bill 1, to encompass municipal utility territories as well. Municipal utilities are required to offer incentives beginning in 2008 (nearly Expected Performance-Based Buydown for Systems under 100 kW: $2.50/W AC for residential and commercial systems, adjusted based on expected performance $3.25/W AC for government entities and nonprofits, adjusted based on expected performance Incentives will be awarded as a one-time, up-front payment based on expected performance, which will be calculated using equipment ratings and installation factors, such as ge Performance-Based Incentives for Systems 100 kW and larger: $0.39/kWh for first 5 years for taxable entities $0.50/kWh for first 5 years for government entities and nonprofits Incentives will be paid monthly based on the actual energy produced for a period of five years. Residential and small commercial projects can also choose to opt-in to this perform The program will be managed by the existing SGIP administrators – Pacific Gas and Electric Company, Southern California Edison, and the San Diego Regional Energy Office. Future CSI rulemaking activities will address energy efficiency requirements, incentives for non-photovoltaic solar projects, affordable housing incentives, and other program elem
	CA	Self-Generation Incentive Program	Initiated in 2001, the Self-Generation Incentive Program (SGIP) offers incentives to customers who produce electricity with microturbines, gas turbines, wind turbines, fuel cells and internal combustion engines. The incentive payments range from $1/W - $4.50/W for renewable energy systems depending on the type of system. Retail electric and gas customers of San Diego Gas & Electric (SDG&E), Pacific Gas & Electric (PG&E), Southern California Edison (SCE) or Southern California Gas (SoCal Gas) are eligible for SGIP Beginning January 1, 2007, the SGIP no longer provides rebates for solar photovoltaic (PV) installations. The incentive program for installing PV systems on non-residential buildings and existing homes is administered by the California Public Utilities Commission as part of the California Solar Initiative (CSI). Funding for integrating solar in new home construction is administered by the California Energy Commission. Click here for more information about CSI incentives. The following technologies and corresponding incentive amounts apply to the SGIP, effective January 1, 2007: Technologies using renewable fuels: Wind turbines (minimum of 30 kW) - $1.50/W Fuel cells (minimum of 30 kW) - $4.50/W Microturbines and Small Gas Turbines - $1.30/W IC Engines and Large Gas Turbines - $1.00/W Technologies using non-renewable fuels: Fuel cells - $2.50/W Microturbines and Small Gas Turbines - $0.80/W IC Engines and Large Gas Turbines - $0.60/W The maximum eligible system size is 5 MW, although the incentive payment remains capped at 1 MW. Projects receiving incentives based on future performance of the system a For projects that receive other incentives funded by California investor-owned utility ratepayers, the SGIP incentive is discounted by the amount of the other incentive. For project PG&E, SCE, and SoCal Gas administer the SGIP program in their service territories, and the San Diego Regional Energy Office administers the program in SDG&E's territory. Cl
Aquila	CO	On-Site Solar PV Rebate Program	Aquila's On-Site Solar PV Rebate Program provides an incentive of $2 per watt DC of installed photovoltaic (PV) capacity combined with a separate payment for the renewable energy credits (RECs) associated with the PV-generated electricity over a 20-year period. The rebate and REC payment incentive program are available to any Aquila customer who installs a new PV system up to 100 kilowatts (kW) in capacity for on-site use. Rebates and REC payments for PV systems up to 10 kW will be calculated as follows: A rebate of $2 per DC watt; and A one-time REC payment, currently set at of $3 per DC watt. The REC payment may change depending on the total amount of PV already installe by Aquila's Colorado electric customers. Rebates and REC payments for PV systems greater than 10 kW and up to 100 kW will be calculated as follows: A rebate of $2 per DC watt; and a fixed REC payment of $1.50 per DC Watt, but could change depending on application receipt date. A variable REC payment will be also be made annually based on the total amount of electricity generated by the PV system. The value of the variable REC payment will be determined by the average annual market price of solar energy RECs in Colorado for the calendar year. All ret

Utility	State	Program Name	Description
Xcel	CO	Solar*Rewards Program	Xcel Energy's Solar*Rewards Program provides up to a $4.50-per-watt (DC) incentive for Xcel Energy customers who install grid-connected photovoltaic (PV) systems ranging from 0.5 kilowatts (kW) to 10 kW-DC in capacity. The incentive is structured as a $2.00-per-watt rebate and up to $2.50-per-watt Renewable Energy Credit (REC) payment. The REC payment may be adjusted, either up or down, based on the calculation of expected kWh of electric output as compared with an optimally oriented, fixed (i.e., non-tracking) system at the customer's location, but only if the calculated system output differs from the optimally oriented system output by more than 10%. Battery storage is not covered by the rebate. To qualify for a solar rebate, participants must submit an application and receive an approval letter prior to installing the system. A list of solar system modules and inverters eligible for the rebate is available on the California Energy Commission's web site. All solar systems must carry a five-year warranty from both the manufacturer and the installer, including parts and labor. Net metering to Xcel Energy's customers, with net excess generation (NEG) at the end of a monthly billing period credited to the next month's
	CT	Solar PV Rebate Program	Connecticut's On-Site Renewable Distributed Generation (DG) Program provides grants to support the installation of systems that generate electricity at commercial, industrial and institutional buildings. Systems utilizing solar photovoltaic (PV), wind, fuel cells, landfill gas, low-emission advanced biomass-conversion technologies, run-of-the-river hydropower, wave or tidal power, or ocean-thermal power are eligible." Most program support will target PV and fuel-cell projects. Projects that have potential to reduce the federally mandated congestion charges in Connecticut will be favored. This program is supported by the Connecticut Clean Energy Fund (CCEF), which has created an objective to assist in contracting for the installation of five megawatts (MW) of customer-side DG projects by mid-2007. The total funding allocated for all selected projects under the On-Site Renewable DG Program is $32.75 million. All projects must have a minimum system capacity of 10 kilowatts (kW), and projects must use an energy-generation device that is commercially available and offers warranties, spare parts and service commensurate with commercial status. Facilities must be located in Connecticut within the Connecticut Ligh Solar: $5 per watt; 20-year evaluation timeframe
	D.C.	Reliable Energy Trust Fund	The District of Columbia's Retail Electric Competition and Consumer Protection Act of 1999 required the DC Public Service Commission (PSC) to establish a public benefits fund to provide energy assistance to low-income residents, and to support energy-efficiency programs and renewable-energy programs. This fund, known as the Reliable Energy Trust Fund (RETF), took effect in 2001. The DC Energy Office administers the efficiency and renewables components of the RETF. The RETF is financed by a non-bypassable surcharge on the electricity bills of all electricity customers who are not Residential Aid Discount (RAD) customers. By statute, the maximum surcharge was $0.0008 per kilowatt-hour (0.8 mils per kWh) through December 31, 2004. Beginning January 1, 2005, the maximum surcharge is $0.002 (2 mils) per kWh, and the minimum surcharge is $0.0001 (0.1 mil) per kWh. The PSC evaluates the surcharge annually and has the authority to adjust it. Although the RETF was authorized to collect up to $8 million annually from 2001-2004, the PSC allowed the fund to collect only $2 million annually during each of these four years. The PSC approved an RETF budget of $9.5 million in 2005 and $10.5 million in
	DE	Green Energy Program Incentives	The Green Energy Program was established as part of The Electric Utility Restructuring Act of 1999, and is supported under Delaware's public benefits program, the Green Energy Fund. Under the program, incentives are available for the installation of qualifying photovoltaic, solar water heating, wind turbine, fuel cell, and geothermal heat pump systems. The Fund may also be used to support energy efficiency education programs. Grant reservation request forms and interconnection requirements and forms may be downloaded from the Web site shown above. To ensure that funding is provided to both residential and nonresidential applicants, 40% of rebate funding is available for residential customers and 60% of funding is available for nonresidential customers, including energy efficiency education programs. The total of all grants shall not exceed 65% of the total annual revenue collected for the Green Energy Fund. For customers of Delmarva Power, the maximum individual grant amount is 50% of installation costs for photovoltaic, solar water heating, fuel cells, and wind turbine systems, with the following caps: PV -- Residential, $22,500; non-residential, $250,000 Solar Water Heating -- Residential, $3,000; non-residential, $250,000 Solar Water Heating integrated into a radiant heating application -- Residential, $5,000; non-residential, $250,000 Small Wind Turbines -- Residential, $22,500; non-residential, $100,000 Fuel Cells -- Residential, $22,500; non-residential, $250,000 Grants are also available for geothermal heat pumps at a maximum of $600/ton, capped at $3,000 for residential systems and $25,000 for non-residential systems. All systems must be installed by a participating contractor and carry a full five year warranty. For further details on systems that qualify for rebates under this program, see the Gr To be eligible for funding consideration, an Energy Efficiency Information Program must encourage energy efficiency improvements through education, information, or promotion Beginning June 1, 2006, customers of Delaware Electric Cooperative became eligible for incentives to support renewable energy installations through it Renewable Resource Pro As part of the state's renewables portfolio standard (RPS), municipal electric companies and rural electric cooperatives were able to elect to be exempt from the RPS requiremen
Progress Energy	FL	Thermal Energy Storage Incentive	
	MA	MTC - Large Onsite Renewables Initiative (LORI) Grants	The Massachusetts Technology Collaborative's (MTC) Large Onsite Renewables Initiative (LORI) provides two kinds of grants -- Feasibility Study Grants and Design & Construction Grants -- on a competitive basis to expand the production and use of distributed renewable-energy technologies in the state. MTC is the administrator of the Renewable Energy Trust Fund, the state's public benefits fund for renewable energy. Under LORI, $9.9 million in funding is available through 2009 to support grid-tied renewable energy projects greater than 10 kilowatts (kW) in capacity that are located at commercial, industrial, institutional and public facilities that will consume more than 25% of the renewable energy generated by the project on-site. The applicant and project site must be a customer of a Massachusetts investor-owned electric distribution utility. Grant awards may be used to facilitate the installation of renewable-energy projects on existing buildings (retrofits) or in conjunction with new construction/major renovation projects, including green buildings. MTC anticipates there will be a new round of LORI funding every six months. The third round of LORI funding, totaling $3.5 million, was made available
	MA	MTC - Small Renewables Initiative Rebate	Through its Small Renewables Initiative, the Massachusetts Technology Collaborative (MTC) offers rebates of up to $50,000 for design & construction of customer-sited renewable energy projects, with a goal of supporting the installation of 400 - 500 systems statewide. MTC is the administrator of the Massachusetts Renewable Energy Trust, the state's clean energy fund. From April 2005 through 2008, a total of $6 million was provided in a series of six $1 million funding blocks. With each block, incentives were reduced. Beginning in 2007 and through FY 2010, funding in the amount of $3.6 million per year is available to support installations. Click here for the 2007 funding solicitation. Eligible technologies include micro-hydroelectric, solar photovoltaic (PV), and wind electric systems. Projects must be located at residential, commercial, industrial, or institutional facilities that are connected to one of the investor-owned electric distribution utilities in Massachusetts -- Fitchburg Gas and Electric Light (Unitil), Massachusetts Electric (National Grid), Nantucket Electric (National Grid), NSTAR Electric, or Western Massachusetts Electric. These rebate awards may be used for installations on existing buildings (retrofits) or in conjunction with new construction/major renovation projects. The applicant may b The incentive level for each project will be determined on an incentive-per-watt of renewable energy capacity basis. The base incentive amount for each technology is as follows Solar PV: $2.00 per watt (DC) Wind: $2.25 per watt (AC) Micro-hydroelectric: $4 per watt (AC) The incentive-per-watt can be increased by $0.25/W to $2.50/W by adding features to a particular project. Features and technology applications that qualify for higher rebate leve MA-manufactured components Public Buildings Economic Target Area Low-Income / Affordable Housing

Utility	State	Program Name	Description
Austin Public Utilities	MN	Solar Choice Program	Modeled after the successful Sustainable and Natural Alternative Power (SNAP) program in Chelan County, Washington, Austin Public Utility's Solar Choice program encourages customers to install photovoltaic solar arrays and connect them to their utilities' electrical distribution system by offering an incentive payment based on the system's production on a $/kWh basis. The amount paid by each participating utility to its solar energy producers depends on the total amount contributed by that utility's purchasers through their solar green pricing program. The greater the amount contributed by purchasers, the greater the amount that will be distributed among participating producers, up to a maximum of $1.00 per kWh. This amount is considered payment for the green attributes of the electricity only, and is additional to retail rates the producer may receive for their electricity under the state's net metering laws. Producers are compensated for the total electricity produced, not the total exported to the grid. The maximum generation project that may be interconnected with the distribution system is 40 kilowatts. Solar Choice is not for customers who want to install renewable energy sources for back-up power generation at their home or business.
Minnesota Power	MN	Solar-Electric (PV) Rebate Program	Minnesota Power offers a rebate of $2,000 per kilowatt-DC for grid-connected solar-electric (PV) systems, with a maximum award of $4,000 per customer. This program, available to the utility's residential, commercial and industrial customers, began in February 2004 and is subject to availability of funding. Minnesota Power's rebate for PV systems may be combined with the Minnesota Department of Commerce's Solar-Electric (PV) Rebate Program, which also offers $2,000 per kilowatt (up to $20,000). The following conditions apply to Minnesota Power's Solar-Electric Rebate Program: Systems must be installed on or before December 31, 2007, and must meet the installation completion timeline established by the Minnesota Department of Commerce's Solar-Electric (PV) Rebate Program. Applicants must apply for and receive rebate confirmation through the Minnesota Department of Commerce's Solar-Electric Rebate Program. Minnesota Power's solar-electric rebate funds will be allocated on a first-come, first-served basis. Contact Minnesota Power to determine availability of funds. The minimum system capacity is 1 kW; the maximum capacity is 2 kW. (Systems may be larger, but the incentive is paid only on the first 2 kW.) Systems must be installed by an approved installer. Contact Minnesota Power for a listing of trained installers. Minnesota Power reserve
Xcel Energy	MN	Renewable Development Fund Grants	Xcel Energy Renewable Development Fund (RDF) was created in 1999 as an outcome of 1994 Minnesota legislation concerning spent nuclear fuel at Xcel Energy's Prairie Island Nuclear Plant. The Xcel RDF provides grants periodically through a Request for Proposals process. Renewable energy technologies eligible for funding typically include wind, biomass, solar, hydroelectric generators and fuel cells. Funding is generally split between new development projects that result in the production of renewable energy, and research and development. The first round of grants from the Xcel Energy RDF program, completed in 2001, supported 19 projects with nearly $16 million in funding. In 2005 the Minnesota Public Utilities Commission approved the second round of projects funded from the Xcel Energy RDF program – 29 projects totaling nearly $37 million. A third round of funding is anticipated in March 2007.
PNM	NM	Customer Solar PV Program	In March 2006, PNM initiated a Renewable Energy Credit (REC) purchase program as part of its plan to comply with New Mexico's renewable portfolio standard (RPS). PNM will purchase RECs from customers who install solar PV systems (up to 10 kilowatts in capacity) at a rate of $0.13/kilowatt-hour through 2018. PNM will then be able to apply these RECs towards their obligations under the state's RPS (which considers each kilowatt-hour of solar power is equivalent to three kilowatt-hours for compliance purposes). The program has funding for 1.2 megawatts of solar installations, at a cost of about $2.8 million. Plans for commercial customers are in the works. Under this program, the electricity output of the PV system is used on-site, and customers retain their net-metering benefit for excess generation. REC payments are based on the system's total output. However, customers with a PV system that has battery backup may not participate in the program. PNM will purchase RECs from each participant as part of the regular monthly billing process. Participants will receive a monthly invoice documenting the number of kWh produced by the PV system, the number of RECs purchased by PNM, the purchase price pe
	NV	SolarGenerations PV Rebate Program	Note: The application period for Program Year 4, for projects to be completed July 1, 2007 through June 30, 2008, has ended. Applications for Program Year 5 will be available later in 2007 and will be accepted beginning August 1, 2007. Year 5 projects can be completed between July 1, 2008 and June 30, 2009. Sierra Pacific Power and Nevada Power administer the SolarGenerations™ Rebate Program for photovoltaic (PV) systems on behalf of the Nevada Task Force on Energy Conservation and Renewable Energy. The SolarGenerations Rebate Program was established in 2003 as a result of AB 431 ("the Solar Energy Systems Demonstration Program") and began in August 2004. Rebates are available for grid-connected PV installations on residences, small businesses*, public buildings, and schools. Participants must be current customers of the utilities. Incentive amounts and capacity limits for Program Years 4 - 6 are as follows: Schools: $5/W AC (up to a total capacity of 570 kW for all school projects) Public Buildings: $5/W AC (up to a total capacity of 570 kW for all public building projects) Residences/Small Businesses: $3/W AC in Year 4, $2.50/W in Year 5 and $2/W in Year 6 (up to a total capacity of 760 kW each of the remaining program years). Size restrictions of 5 kW of rated AC output per program year for residential systems and 30 kW of rated AC output for small business, schools or public buildings apply. The equ All complete, qualified applications were submitted to the Task Force for approval in February, 2007. Approved Program Year 4 installations must be completed on or after July 1. Sierra Pacific Power and Nevada Power will own the Renewable Energy Credits from the electricity produced by the customer's photovoltaic system. The Renewable Energy Cre * Small business is defined by the Public Utility Commission of Nevada as a business with 150 employees or fewer worldwide
LIPA	NY	Solar Pioneer Program	LIPA launched the Solar Pioneer Program in 2000 as part of the utility's five-year Clean Energy Initiative -- a $32 million commitment to developing clean energy alternatives. In May, 2003, LIPA announced that it would extend its Clean Energy Initiative for another five years and increase funding levels by $5 million per year, to an annual investment of $37 million and a total investment of $185 million. LIPA's Solar Pioneer program is designed to offer rebates that are approximately 50% of the costs for a PV system. As the PV market has been growing, the overall PV prices have been trending downward. LIPA's rebates are designed to reflect the current PV costs. In August 2002, LIPA's rebate was set at $5/watt for the 1000 kW of PV installed. By September 2003, rebates for 1,000 kW had been issued, and the rebate was adjusted to $4.50/watt for the next 1,000 kW of installed PV systems. By November 2004, another 1,000 kW of PV had been added, and the rebate was adjusted to $4/watt for the next 1,000-kW block. In November 2005, the incentive was adjusted to $3.75/watt for the next 1,000-kW block. Currently, LIPA offers rebates for (PV) system installations of $3.75 per watt (DC) for residential and commercial grid-connected photovoltaic (PV) systems. The maximum capacity supported by the program is 50 kW. (Larger systems are permitted, but incentives are based on a maximum of 50 kW.) Incentives are only available to eligible installers, and incentives must be passed on to customers. Once eligible, installers reserve incentives for approved systems, for specific customers, on a first-come, first-served basis for as long as funds are available. From 2002-2007, this program will provide $22.9 million in funding for PV systems. Additional funds for incentives are expected to be made available through 2009 through the Renewable Portfolio Standard and will be based on program success, customer demand, and overall system, program, and installer performance. The program continuously accepts applications from installers who seek to participate. The goal is to increase the network of eligible installers across the state, offering customers a choice of qualified or certified installers in their area. Installer eligibility will be determined and maintained b
	NY	NYSERDA - PV Incentive Program	Residential Incentive $4.00/W up to 5 kW $4.50/W for New York Energy Star homes up to 5 kW $4.50/W for all building integrated PV systems up to 5 kW For additional capacity above 5 kW, all residential incentives will be reduced by $1.00/watt and all residential incentives will be capped at 10 kW. Non-Residential Incentives The New York State Energy Research and Development Authority (NYSERDA) provides incentives of $4 to $5 per watt (DC) to eligible installers for the installation of approved, grid-connected photovoltaic (PV) systems.
Austin Energy	TX	Thermal Energy Storage Incentive	Eligible participants must be Austin Energy commercial customers who are considering technologies that shift air conditioning load from on-peak to off-peak. Eligible participants must be billed for electricity on any demand rate and must utilize the TES Time of Use rider. New construction projects are defined as new buildings, tenant finish-outs, additions, or any renovations that require compliance to Austin's Energy Code, as dictated by the Development Review & Inspection Department. Rebate funding is limited, may be subject to City Council approval, and is offered on a first-come first served basis. While the purposes for participating in the TES programs are varied depending on the Business Customer's focus and may include not only lowering energy costs and rates, but also marketing their environmental awareness, a major benefit of this program for Austin Energy is to demand during its peak period, which occurs within the time frame of 4 p.m. Therefore, qualifying retrofits or new construction projects' daily operating hours must have been, and/or will include, a minimum to 8 p.m. weekdays, May 1 through October 31.

Utility	State	Program Name	Description
Austin Energy	TX	Solar PV Rebate Program	Austin Energy's Solar Rebate Program, launched on June 1, 2004, offers a $4.50 per watt incentive to eligible residential and commercial customers (including nonprofit organizations) who install photovoltaics on their homes or facilities. For solar installations that use PV equipment manufactured in Austin, the rebate is $5.60 per watt. For residential customers, the rebate program will pay 80% of customer invoiced cost or $100,000, whichever is less. For commercial customers, the rebate program will pay 80% of customer invoiced cost or $13,500, whichever is less. Batteries are not eligible for the rebate. The City Council initially approved $933,000 in funding for the fiscal year ending September 30, 2004. For 2005, $2,000,000 was budgeted for solar PV rebates and $500,000 for PV installations on municipal buildings. For 2006, the solar PV rebate budget was raised to $3,000,000, while $450,000 is being allocated for PV installations on municipal buildings. Austin Energy will provide net metering for customers with solar systems. Any net excess generation at the end of each month will be credited to the following month's bill. However, the credit will be less than retail value -- calculated by multiplying the r
City of St. George	UT	Solar and Wind Rebate Program	The City of St. George offers a rebate of $2,000 per kilowatt-AC (kW-AC) to customers who install photovoltaic (PV) systems or wind-energy systems. The rebate is limited to $6,000 for residential systems and $20,000 for commercial systems. The minimum system capacity is 1 kW; the maximum system capacity is 10 kW. All customers that receive a rebate must also participate in the utility's net-metering program.
Clark Public Utilities	WA	Solar Energy System Loan	Clark Public Utilities offers financing available to its customers for the purchase and installation of residential solar equipment. Loans up to $6,000 are available for solar pool heaters and solar water heaters, and up to $20,000 for photovoltaic systems. Solar water and pool heater loans have a maximum term of 60 months while solar PV has a maximum term of 84 months. All loans are at an interest rate of five percent. Solar pool and water heater loans are only applicable to customers currently using electricity to heat water. In addition, Clark County Public Utilities offers a rebate program for eligible solar water heater equipment.
Puget Sound Energy	WA	Solar PV System Rebate	Puget Sound Energy (PSE) offers rebates to PSE residential electric customers who install a solar PV system on their homes. The incentive amount is based on system capacity and varies depending on the county in which the system is installed, as follows: LOCATION (County) King, Kitsap, Pierce, Thurston $525/kW DC Island, Skagit, Whatcom $575/kW DC Jefferson, Kittitas $600/kW DC For more information about PSE's solar PV system rebate, please call 1-800-562-1482 or visit the website above to contact an Energy Efficiency Specialist. Note that PSE is also a voluntary participant in Washington State's Renewable Energy Cost Recovery Program, which provides production-based incentives (12¢ to 54¢ per kWh) to individuals, businesses, and local governments that generate electricity from solar power, wind power or anaerobic digesters. Click here for more information on PSE's Renewable Energy Advantage Program.
We Energies	WI	Biogas Buy-Back Rate	We Energies, an investor-owned utility serving portions of Wisconsin and Michigan, offers to purchase electricity and associated renewable energy credits generated by anaerobic digesters owned by its Wisconsin customers. Under a 10-year contract,* eligible customers will receive $0.08 per kilowatt-hour (8.0¢/kWh) for electricity generated on-peak and $0.049 per kilowatt-hour (4.9¢/kWh) for electricity generated off-peak. Anaerobic digesters may use animal waste from farm operations, waste from industrial food processes, or waste from municipal wastewater-treatment facilities. The utility provides a second meter to determine system output. Participating customers must comply with applicable national, state and local electrical codes, rules and regulations; the electric service rules and regulations of We Energies; the requirements of Wisconsin Administrative Code Chapter PSC 119; the state's Distributed Generation Interconnection Agreement; and the "Energy for Tomorrow" Power Partner Program Agreement. The program is limited to systems up to 800 kilowatts (kW) in capacity and has a total aggregate limit of 10 megawatts (MW). This program was approved by the Public Service
We Energies	WI	Biogas Buy-Back Rate	We Energies, an investor-owned utility serving portions of Wisconsin and Michigan, offers to purchase electricity and associated renewable energy credits generated by anaerobic digesters owned by its Wisconsin customers. Under a 10-year contract,* eligible customers will receive $0.08 per kilowatt-hour (8.0¢/kWh) for electricity generated on-peak and $0.049 per kilowatt-hour (4.9¢/kWh) for electricity generated off-peak. Anaerobic digesters may use animal waste from farm operations, waste from industrial food processes, or waste from municipal wastewater-treatment facilities. The utility provides a second meter to determine system output. Participating customers must comply with applicable national, state and local electrical codes, rules and regulations; the electric service rules and regulations of We Energies, the requirements of Wisconsin Administrative Code Chapter PSC 119; the state's Distributed Generation Interconnection Agreement, and the "Energy for Tomorrow" Power Partner Program Agreement. The program is limited to systems up to 800 kilowatts (kW) in capacity and has a total aggregate limit of 10 megawatts (MW). This program is approved by the Public Service Commission of W
We Energies	WI	Renewable Energy Development Program	We Energies, a Wisconsin-based investor-owned utility, offers certain customers grants ranging from $10,000 to $100,000 to support the installation of renewable-energy projects. As part of the utility's Renewable Energy Development Program, the Direct Financial Incentives Program is available to nonprofits (including schools and academic institutions) and units of government (including special districts and authorities defined as government entities under Wisconsin law). An award will cover up to 50% of a project's total installed cost, less any federal or state government incentive or credit, and less any funding from Wisconsin Focus on Energy. In most cases, customers retain ownership of the renewable-energy credits (RECs) associated with the generation of electricity using eligible renewables. The following conditions apply: Proposed photovoltaic (PV) and wind-energy projects must have a site-assessment completed, preferably through the Focus on Energy Site Assessment Program or an equivalent program. All renewable-energy systems must be manufactured and installed in compliance with all requirements of the latest edition of the National Electric Code (American National Standards Institute/National Fire Protection Association-70).
We Energies	WI	Solar-Electric Development (SED) Program	We Energies, an investor-owned utility, offers up to $5.00 per watt-AC for large photovoltaic (PV) systems installed by its business customers. The Solar Electric Development (SED) Program supports new PV systems ranging from 100 kilowatts-AC to 400 kilowatts-AC in capacity. Payments will be made based on the expected energy production of the system. The maximum payment is $2 million per system; the spending cap for the SED Program is $4 million. Applications received after the cap is reached will be placed on a waiting list. System components must be installed on or after January 1, 2007, and PV modules and inverters must be currently certified as eligible by the California Energy Commission (CEC). PV modules must be certified to the UL 1703 standard, and inverters must be certified to the UL 1741 standard. These components also must have completed the CEC's required weighted efficiency testing. Systems must be designed and installed in accordance with all applicable National Electric Code (NEC) requirements, and must be permitted and inspected as required by local and state codes. In addition, all systems must have a minimum five-year warranty and must be installed by a licensed,