



Solar Power in Small Municipalities

March 30, 2011

Agenda

- Why Solar?
- Regulatory Environment & Incentives
- Technologies
- Selecting a Site
- Financing Structures

Why Solar?

- Costs are Coming Down
- Federal and State Mandates
- Technically Straightforward
- Coincides with Peak Demands

However

- Variable Power
- Without Incentives, Will Not Reach Grid Parity

Regulatory Drivers

- Federal Mandates
 - EPA Act 2005 and EISA 2007 set goals at 5% for 2010 up to 25% by 2025
- Renewable Portfolio Standard
 - State imposed mandatory renewable energy goals for utilities
- Enablers
 - ARRA Funding
 - Net Metering Tariffs

Available Incentives - Federal

- Federal Investment Tax Credit
 - 30% ITC for tax paying entities
 - Through 2011, cash grant in lieu of tax credit optional
- Accelerated Depreciation
 - Through 2011, 100% first year bonus
 - In 2012, 50% first year bonus
 - After 2012, 5yr accelerated MACRS depreciation

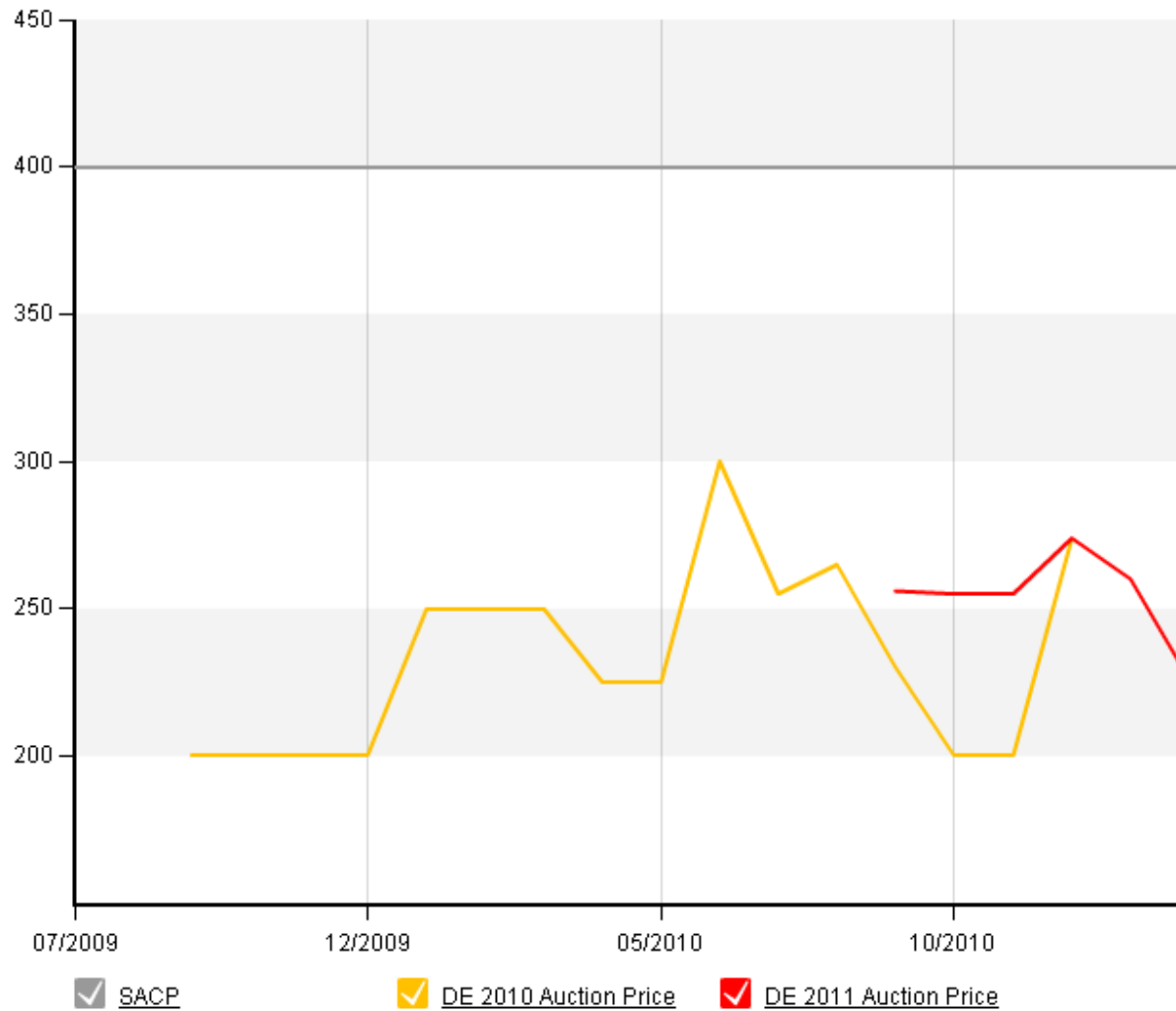
Available Incentives - SRECs

- Renewable Portfolio Standard
 - DE: 25% by 2026 (3.5% PV)
 - MD: 20% by 2022 (2% PV)
 - VA: 15% by 2025 (voluntary)
- Solar Renewable Energy Credit (SREC)
 - SREC market developed from RPS requirements
 - Value of SRECs set by the Alternative Compliance Payment (ACP)
 - Penalty for utilities that do not meet RPS
 - SREC can be purchased at a slightly lower cost than ACP
 - MD has a good SREC market

**incentives by state available at www.dsireusa.org*

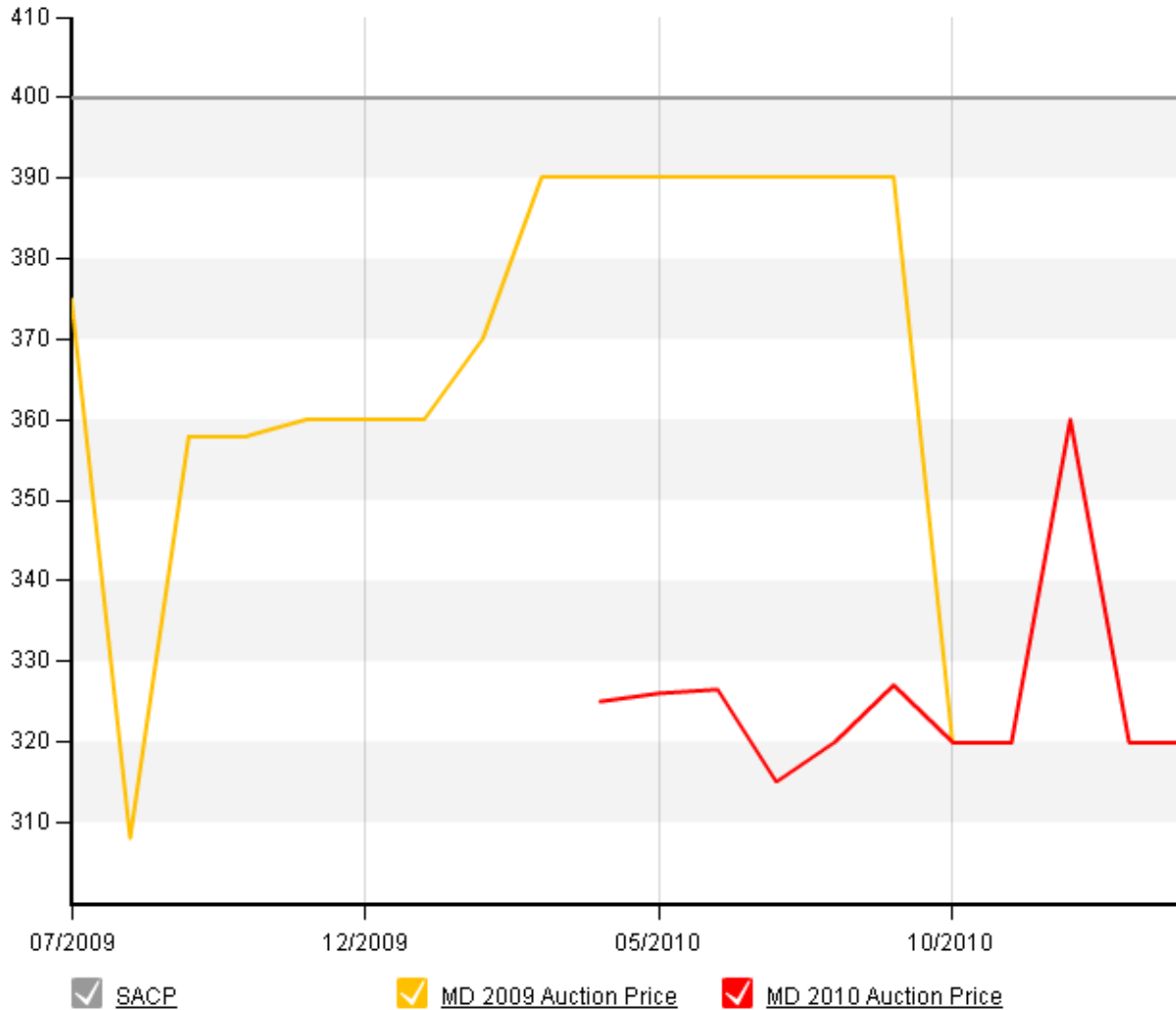
Delaware SRECs

Historical Delaware SREC Prices



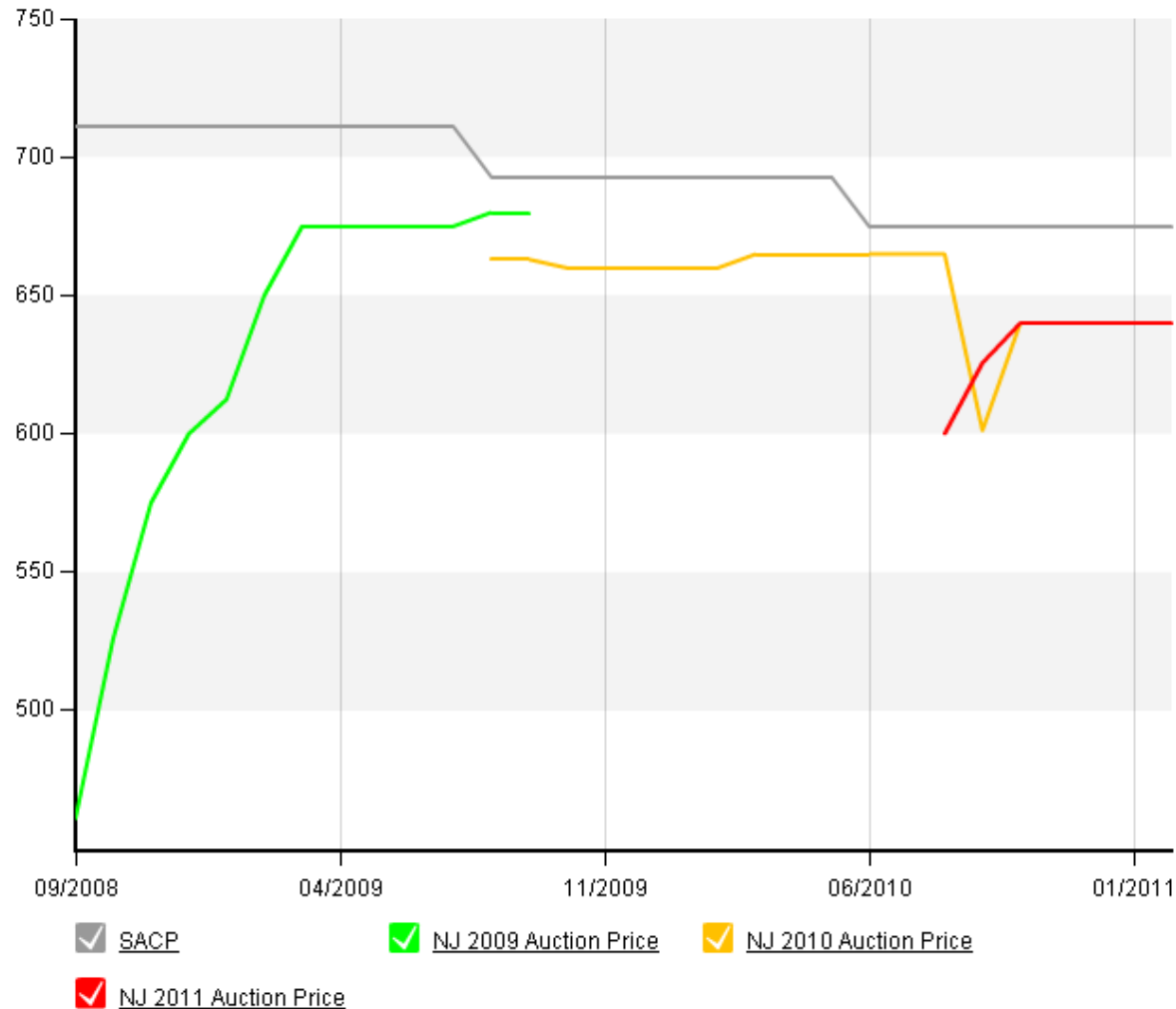
Maryland SRECs

Historical Maryland SREC Prices



New Jersey SRECs

Historical New Jersey SREC Prices Relative to SACP



Technologies - Modules

- Crystalline
 - Leading module type
 - Average efficiency = 14%
- Amorphous Silicon
 - Often referred to as “thin film”
 - Average efficiency = 7 - 9%
- Cadmium Telluride
 - One manufacturer – largest: First Solar
 - Average efficiency = 11%



Technologies – Modules

- Module costs coming down
 - Increased demand (+93% last year)
 - Chinese manufacturing doubled last year
- CEC tested and listed
 - Check PTC rating
 - Check power tolerance of modules
- Warranty Periods
 - 25 year warranty, at 80%, is standard
 - Who administers the warranty? Long time...
 - First Solar has unique end-of-life responsibility

Technologies – Inverters

- Most likely point of failure
 - 10-20 yr warranties are available
- Legacy manufacturers (e.g. Schneider Electric, Siemens)
 - US based
 - Longevity
- CEC tested and listed

Selecting a Site

- Installation Type
 - Rooftop
 - Parking Lot
 - Ground Mount
- South facing slope
- Avoid potential shading (tools)
- Close to point of interconnection
- Wind loading is important

Selecting a Site

- Rooftops
 - At least 6yrs of remaining life on roof
 - Tall buildings present wind load challenges
- Parking Lots
 - Can provide covered parking – premium
 - Most expensive option
- Ground Mount
 - Soil conditions
 - Water table



Financing Structures

- Power Purchase Agreement
 - Third party developer/owner/operator
- MUNI Owned and Operated
- Hybrid Model (aka Morris Model)
 - Municipal low cost bond with third party owner (and tax credits)



Power Purchase Agreement

- Public Private Partnership
 - Private developer can take advantage of 30% ITC and accelerated depreciation benefits
- RFP process to select provider
- Turnkey project including financing and O&M
- Negotiated starting electric rate and escalation factor
- Fair Market Value buyout option at end of contract (PV will continue to generate power)

MUNI Owned & Operated

- Treat like any other D/B or D/B/B MUNI project
- Financing required
- SREC negotiation/contract
 - Need expertise to get good revenue
 - Crucial to financial viability of project
- Need O&M plan
- Performance monitoring and warranty administration



Hybrid (aka Morris Model)

- Two recent applications in NJ townships
- Public financing via bonds or other low cost debt (if MUNI has AAA Rating)
- Structure financing lease and PPA with developer
- Full ownership risks and responsibilities on PPA provider (tax credits still apply)
- Combines best of both previous options
- Should result in lowest cost of electricity (35-60% savings seen in Morris and Somerset Counties)

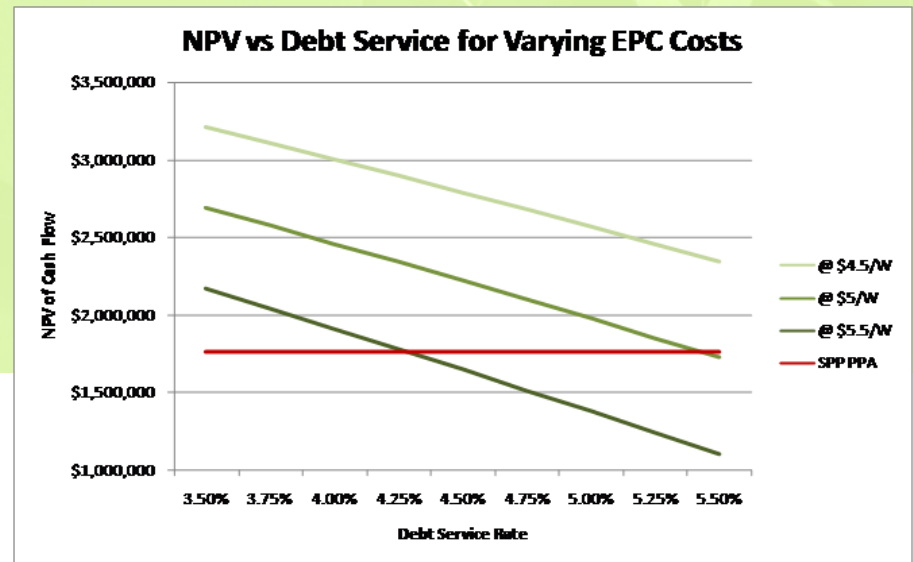
Comparison

PPA	MUNI Owned & Operated	Hybrid
No capital outlay	Financing required	Public (low cost) financing with lease
Monetize federal tax incentives	No federal tax incentives	Monetize federal tax incentives
Turnkey project	Design-build or Design-bid-build	Turnkey project
No performance or SREC revenue risk	Performance and SREC revenue risk	No performance or SREC revenue risk
No O&M requirement	O&M required	No O&M requirement
Highest cost of power	Lower cost of power*	Lowest cost of power*

*Dependent on cost of capital and credit rating of MUNI

Keys to Financial Success

- Monetize the tax benefits
- Take advantage of state incentives
- Low cost of capital
- Don't pay more than your current electric rate
- Do your homework



Simplified Sample Solar Finance Calculation




Project Size	1000 kW dc = 828.75 kW ac
Total Project Price	\$6,000 per kWdc = \$6,000,000 /kWdc
State Incentive Level	\$0 per kW
Federal Tax Credit Rate	30%
State Tax Credit Rate	0.0% (Max 7.5%)
Federal Income Tax Rate	34%
State Income Tax Rate	8%
Federal 1st Year Depreciation Bonus?	0%
5 year MACRS Depreciation Schedule	
	1 20.00%
	2 32.00%
Avoided Electric Rate	\$0.12 per kWh
Electric Escalation Rate	3.0% per year
Annual kWh Production	1,500 kWh per kW dc
Annual Module Degradation	0.50%
O&M Price and Escalation	\$10,000 per year and 3% per year
REC Sale Price, Years, Escalation	\$5 per MWh, 5 years, and 2% per year

Year	Total System Price	System Cost for Tax Purposes	System Incentive	Federal Tax Credit	State Tax Credit	Federal Depreciable Basis	Federal Depreciation Deduction	Federal Depreciation Savings	State Depreciation Deduction	State Depreciation Savings	Energy Production (kWh/yr)	Annual Energy Savings	REC Sales	Net Cash Flow	Cumulative Cash Flow
1	\$6,000,000	\$6,000,000	\$0	\$1,800,000	\$0	\$5,100,000	\$1,020,000	\$346,800	\$500,000	\$40,000	1,500,000	\$170,000	\$7,500	-\$3,635,700	-\$3,635,700
2				\$0	\$0	\$5,100,000	\$1,632,000	\$554,880	\$500,000	\$40,000	1,492,500	\$174,173	\$7,612	\$776,665	-\$2,859,035
3				\$0	\$0	\$5,100,000	\$979,200	\$332,928	\$500,000	\$40,000	1,485,038	\$178,448	\$7,725	\$559,101	-\$2,299,934
4				\$0	\$0	\$5,100,000	\$587,520	\$199,757	\$500,000	\$40,000	1,477,612	\$182,828	\$7,840	\$430,425	-\$1,869,509
5				\$0	\$0	\$5,100,000	\$587,520	\$199,757	\$500,000	\$40,000	1,470,224	\$187,315	\$7,957	\$435,029	-\$1,434,480
6				\$0	\$0	\$5,100,000	\$293,760	\$99,878	\$500,000	\$40,000	1,462,873	\$191,912	\$0	\$331,790	-\$1,102,690
7				\$0	\$0				\$500,000	\$40,000	1,455,559	\$196,621	\$0	\$236,621	-\$866,069
8				\$0	\$0				\$500,000	\$40,000	1,448,281	\$201,446	\$0	\$241,446	-\$624,623
9				\$0	\$0				\$500,000	\$40,000	1,441,040	\$206,388	\$0	\$246,388	-\$378,235
10				\$0	\$0				\$500,000	\$40,000	1,433,834	\$211,452	\$0	\$251,452	-\$126,783
11				\$0	\$0				\$500,000	\$40,000	1,426,665	\$216,639	\$0	\$256,639	\$129,856
12				\$0	\$0				\$500,000	\$40,000	1,419,532	\$221,953	\$0	\$261,953	\$391,809
13				\$0	\$0						1,412,434	\$227,398	\$0	\$227,398	\$619,207
14				\$0	\$0						1,405,372	\$232,975	\$0	\$232,975	\$852,182
15				\$0	\$0						1,398,345	\$238,689	\$0	\$238,689	\$1,090,871
16				\$0	\$0						1,391,353	\$244,542	\$0	\$244,542	\$1,335,413
17				\$0	\$0						1,384,397	\$250,539	\$0	\$250,539	\$1,585,952
18				\$0	\$0						1,377,475	\$256,682	\$0	\$256,682	\$1,842,634
19				\$0	\$0						1,370,587	\$262,976	\$0	\$262,976	\$2,105,610
20				\$0	\$0						1,363,734	\$269,423	\$0	\$269,423	\$2,375,033
TOTAL				\$1,800,000			\$5,100,000	\$1,734,000	\$6,000,000	\$480,000		\$4,322,398	\$38,634	\$2,375,033	

After-tax IRR: 7.2%
Energy-Only Simple Payback: 35.3 years

Note, does not include tax effects of energy savings and REC sales

Simplified Sample Solar Finance Calculation

Project Size	1000 kW dc =	828.75 kW ac		
Total Project Price	\$6,000 per kWdc =	\$6,000,000 /kWdc		
State Incentive Level	\$0 per kW			
Federal Tax Credit Rate	0%			
State Tax Credit Rate	0.0% (Max 7.5%)			
Federal Income Tax Rate	34%			
State Income Tax Rate	8%			
Federal 1st Year Depreciation Bonus?	0%		5 year MACRS Depreciation Schedule	
Avoided Electric Rate	\$0.12 per kWh		1	20.00%
Electric Escalation Rate	3.0% per year		2	32.00%
Annual kWh Production	1,500 kWh per kW dc		3	19.20%
Annual Module Degradation	0.50%		4	11.52%
O&M Price and Escalation	\$10,000 per year and	3% per year	5	11.52%
REC Sale Price, Years, Escalation	\$5 per MWh,	5 years, and	6	5.76%
				2% per year

Year	Total System Price	System Cost for Tax Purposes	Incentive	Federal Tax Credit	State Tax Credit	Federal Depreciable Basis	Federal Depreciation Deduction	Federal Depreciation Savings	State Depreciation Deduction	State Depreciation Savings	Energy Production (kWh/yr)	Annual Energy Savings	REC Sales	Net Cash Flow	Cumulative Cash Flow
1	\$6,000,000	\$6,000,000	\$0	\$0	\$0	\$6,000,000	\$1,200,000	\$408,000	\$500,000	\$40,000	1,500,000	\$170,000	\$7,500	-\$5,374,500	-\$5,374,500
2				\$0	\$0	\$6,000,000	\$1,920,000	\$652,800	\$500,000	\$40,000	1,492,500	\$174,173	\$7,612	\$874,585	-\$4,499,915
3				\$0	\$0	\$6,000,000	\$1,152,000	\$391,680	\$500,000	\$40,000	1,485,038	\$178,448	\$7,725	\$617,853	-\$3,882,062
4				\$0	\$0	\$6,000,000	\$691,200	\$235,008	\$500,000	\$40,000	1,477,612	\$182,828	\$7,840	\$465,676	-\$3,416,386
5				\$0	\$0	\$6,000,000	\$691,200	\$235,008	\$500,000	\$40,000	1,470,224	\$187,315	\$7,957	\$470,280	-\$2,946,106
6				\$0	\$0	\$6,000,000	\$345,600	\$117,504	\$500,000	\$40,000	1,462,873	\$191,912	\$0	\$349,416	-\$2,596,690
7				\$0	\$0				\$500,000	\$40,000	1,455,559	\$196,621	\$0	\$236,621	-\$2,360,069
8				\$0	\$0				\$500,000	\$40,000	1,448,281	\$201,446	\$0	\$241,446	-\$2,118,623
9				\$0	\$0				\$500,000	\$40,000	1,441,040	\$206,388	\$0	\$246,388	-\$1,872,235
10				\$0	\$0				\$500,000	\$40,000	1,433,834	\$211,452	\$0	\$251,452	-\$1,620,783
11				\$0	\$0				\$500,000	\$40,000	1,426,665	\$216,639	\$0	\$256,639	-\$1,364,144
12				\$0	\$0				\$500,000	\$40,000	1,419,532	\$221,953	\$0	\$261,953	-\$1,102,191
13				\$0	\$0						1,412,434	\$227,398	\$0	\$227,398	-\$874,793
14				\$0	\$0						1,405,372	\$232,975	\$0	\$232,975	-\$641,818
15				\$0	\$0						1,398,345	\$238,689	\$0	\$238,689	-\$403,129
16				\$0	\$0						1,391,353	\$244,542	\$0	\$244,542	-\$158,587
17				\$0	\$0						1,384,397	\$250,539	\$0	\$250,539	\$91,952
18				\$0	\$0						1,377,475	\$256,682	\$0	\$256,682	\$348,634
19				\$0	\$0						1,370,587	\$262,976	\$0	\$262,976	\$611,610
20				\$0	\$0						1,363,734	\$269,423	\$0	\$269,423	\$881,033
TOTAL				\$0			\$6,000,000	\$2,040,000	\$6,000,000	\$480,000		\$4,322,398	\$38,634	\$881,033	
													After-tax IRR:	2.0%	
													Energy-Only Simple Payback:	35.3 years	

Note, does not include tax effects of energy savings and REC sales