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Response of
Interstate Power and Light Company
to
OFFICE OF CONSUMER ADVOCATE
Data Request No. 9

Docket Number:	EEP-08-1
Date of Request:	May 14, 2008
Response Due:	May 21, 2008
Information Requested By:	Jennifer Easler
Date Responded:	May 21, 2008
Author:	Sarah Else
Author's Title:	Dir Renewable Energy Resources
Author's Telephone No.:	(319) 786-7722
Subject:	Renewable Programs Cost-Effectiveness
Reference:	Direct Testimony of Sarah J. Else, p. 5

Data Request No. 9

Please provide complete analyses of all renewable energy resources considered for inclusion in IPL's renewable energy program that lead to the conclusion that the renewable programs are not cost-effective. Provide all calculations in paper copy as well as in Excel electronic file. Please make sure your response contain the following information:

A. Assumptions relied upon with narrative explaining the rationale;

B. Thoroughly sourced Excel file or other equivalent documentation showing the step-by-step derivation of savings or avoided generation by each type of program in the renewable portfolio;

C. Avoided Costs relevant to renewable sources, including all necessary calibrations that reflect the load pattern of the renewable sources;

D. Calculation of B/C ratios with all components explicitly identified;

E. Installed cost assumptions for various renewable technologies evaluated and basis for cost assumptions.

Response

A. In order to best respond to this data request, IPL will present the rationale behind the data by using Excel workbooks as the guide. Since the workbooks do not present the data in the same order as the Data Requests, the response will follow the logic of the workbooks. For example, IPL will respond to Data Request 9E (assumptions on installed cost) before responding to Data Requests 9C and 9D.

B. Two Excel workbooks are attached as hardcopy and included electronically on a CD filed as part of this response. The first one is titled "OCA 9 Attachment A Annual Cost Savings Calcs.xls" and the second is titled "OCA 9 Attachment B Participation Table.xls." References below to these workbooks are to the electronic specifications of these attachments.

Attachment A, the "Annual Cost Savings Calcs" workbook, has three tabs: Calcs, CF, and Annual. The Calcs tab calculates the total cost and savings for each technology within each sector (residential and nonresidential) for a given year.[1] That year is selected in cell M2 which references the Annual tab that calculates the assumed installations by technology and year.

Attachment B, the "Participation Table" workbook, is used to calculate the benefit and cost ratios for the different programs. This workbook has four tabs: Res, NonRes, Total, and Assumptions. Res tab has the costs, savings and cost-effectiveness analysis for the residential program. NonRes has the equivalent for the non-residential program, Total is the sum of the two and Assumptions includes maximum incentive levels assumed for each technology.

E. The specifics on the average size and installed cost ($/kW) of a typical unit are described in the Joint Utility Assessment (Assessment, Appendix J (Volume I) and Appendix K (Volume II) of the Application) for the different technologies. As stated in the Assessment:

"The primary resource for the installed cost of CHP technologies is the California's Self-Generation Incentive Program (SGIP).[2] This program, funded by the main investor-owned utilities of California, provides varying levels of incentives for individual customers to install various dispersed generation technologies, including CHP, with a maximum capacity of 5 MW. The program has been in effect since 2001 and has a publicly available database of all installations, including generation technology, capacity, fuel, and total cost. For this assessment, nameplate capacity is based on the average of the units installed through California's SGIP for anaerobic digesters.

1 Note solar water heaters which replace gas water heaters are treated separately, as they are the only resource which offsets gas use. These calculations are shown in Rows 35-41.

2 http://www.cpuc.ca.gov/static/energy/electric/051005_sgip.htm

"Typical nameplate capacities for steam turbines vary widely. Although larger or smaller capacity units can be installed for any of these technologies, a 4.8 MW unit is used as a proxy based on a study for the Energy Trust of Oregon.[3] . Different-sized units would have the same measure life and capacity factors, but they may have different costs. Generally, smaller units are more expensive on a $/kW basis. These values are summarized in Table 63. Note that no fuel costs are used as it is assumed that fuel is generated and combusted on site." (Appendix J, page 85).

For anaerobic digesters, multiple generator technologies could be used, but for simplicity, an assumed cost and capacity, based on a weighted average of the options, was used. Costs for the other generation technologies are calculated as described below, again taken from the Assessment:

"PV Energy Costs. The primary and secondary resources for PV installed costs are from the California Energy Commission (CEC), the Energy Trust of Oregon (ETO), the U.S. Department of Energy (DOE), and other on-line sources. Cost analysis for PV installation of other programs results in an average installation cost in 2006 of $9/W, which is assumed in this analysis.[4] Other technical data have been acquired from multiple primary and secondary resources to determine measure life, and O&M costs. A PV system has a measure life of 25 years.[5] O&M costs include inverter replacement every ten years and seasonal module washing.[6]" (Appendix J, page 91)

"Hydro Energy Costs. Installing a hydro system includes the following costs: Penstock, Intake, *Powerhouse*, Generating Equipment, Access Road, Switchyard, and Transmission Line. In addition, a percentage of these are included for Engineering (20%) and Contingency (30%). Costs vary considerably according to the size of the system installed, with the cost per kW going down as the system size increases. For this study, costs were taken from a study prepared for BC Hydro that included all of the costs listed above.[7] Data from sites less than 500 kW in capacity and with less than three miles of transmission required to be installed were used. Estimated installed costs were $4,862/kW, with additional O&M costs of $457/kW per year (calculated as 9.4% of installed cost). Details on the cost analysis are provided in Volume II, Appendix E." (Appendix J, page 89-90)

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3 "Sizing and Characterizing the Market for Oregon Biopower Projects," prepared for Energy Trust of Oregon, by CH2MHill, 2005.

4 "Solar Trends: California Energy Commission" by SunPower Consulting LLC provided cost analysis, August 2006, ETO, and DOE.

5 Data was averaged from the following sources: NREL, NW Power, and Conservation Council, and typical warranty periods.

6 NREL, "A Review of PV Inverter Technology Cost and Performance Projections", 2006.

7 *Green Energy Study for British Columbia Phase 2: Mainland*; Small Hydro, October 2002, Prepared for BC Hydro by Sigma Engineering Ltd.

"Small Wind Energy Costs. The cost for a wind turbine varies by the size of the system installed. In general, as the installed capacity of wind turbines increases, the installed cost per kW decreases. Costs are assumed to be nominally constant. However, it should be recognized that costs may increase due to tighter steel supplies. Costs were taken primarily from turbine manufacturer and distributor websites or discussions with manufacturers. Details on the cost analysis and distribution of turbines according to size and customer sector are also provided in Volume II, Appendix E." (Appendix J, page 92)

The assumed sizes of these units are based on typical installations for each sector.

For geothermal heat pumps and solar water heaters, costs were obtained from public sources. The costs of geothermal heat pumps were determined from the Department of Energy, Energy Efficiency and Renewable Energy web page, and http://www.toolbase.org/Technology-Inventory/HVAC/geothermal-heat-pumps. The costs given are incremental to air-source heat pumps, which are the assumed baseline option. Solar water heater costs were based on personal communication with installers at the Energy Trust of Oregon. Again, further detail is provided in the Assessment.

To calculate annual savings for the generation technologies, the capacity factor is multiplied by the nameplate capacity of the unit and then multiplied by 8760 hours. The capacity factors are explicitly provided in tab CF and are based on average annual production for the different technologies and are described further in the Assessment. For the biomass units (industrial biomass and anaerobic digesters), the capacity factors were obtained from the reference literature.[8] The capacity factor is less than 100 percent because it is assumed that the unit will need to be down for routine maintenance some percentage of the time. For PV, Wind and Hydro, the capacity factors are calculated based on resource availability. These were calculated based on data from national or regional sources (e.g. PV Watts from National Renewable Energy Laboratory, TMY2 database from National Oceanographic and Atmospheric Administration, Iowa Wind Energy Institute, Idaho National Laboratory Hydro Prospector). Again, further details are provided in the Assessment.

For geothermal heat pumps, the savings are based on engineering calculations, using an air-source heat pump as the baseline. RETScreen, a publicly available tool from National Resources Canada, that includes weather data from across the continent, was used to calculate the estimated savings of a solar water heater.

For capacity savings, the average capacity factor at peak time is used (row 10 and 26 of Tab Calc). These were calculated from the same tools as the average annual

[8] "Gas-Fired Distributed Energy Resource Technology Characterization," National Renewable Energy Laboratory, NREL-TP-620-34783, 2003.

capacity factors which give hourly (for PV and Wind) or monthly (for hydro) expected outputs. The biomass units are assumed to be running at 100 percent during peak hours. For solar water heaters and geothermal heat pumps, which serve to offset the load related to a particular end use, the coincidence factor between the load shape of the end use and the avoided costs is given instead of a capacity factor.

Together, the installed costs and savings are used to calculate the levelized costs. These levelized costs for each of the technologies can be found in the Assessment, and are summarized in Table 1 below.

Table 1. Levelized Cost by Technology, $/kWh

nology	nass	erobic Digesters	d	ro	thermal t Pump		ır Water
Cost	.02	.05	15	16	36	52	57

The total cost and savings for all technologies (column I of Tab Calc) are inputted into the Participation Table workbook for each year.

In addition, on the Annual sheet, the net present value of the savings is calculated, assuming an average 15 year measure life. This number (cells D21, D26, and D30) is inputted into the Participation Table workbook to calculate the net benefits of the program. Although the different technologies have varying expected lifetimes, 15 years was chosen to be a representative value. Measure lives for all technologies are given in the Assessment.

D. As provided previously, the energy and demand savings and costs are calculated in the Calcs tab of the Annual Cost Savings Calcs workbook. These are inputted, on the Res sheet of the Attachment B workbook, in rows 11, 12, and 31, respectively. On the Non-Res sheet, they are provided in rows 12, 13 and 31, respectively. Various assumptions used in the calculations are provided in columns K and L. For example, IPL assumed that three feasibility studies would be required, on average, for every installation (col K, row 18) and the cost of the feasibility study for residential customers is $400 (col K, row 19). These data are used to calculate the annual cost of the feasibility study (row 19, col D-H). Incentives are based on the assumed rebate of 30 percent of the installation cost, with maximum allowed amounts provided on the Assumptions Tab. Other direct utility costs were determined using prior experience of program managers.

The calculation of benefits and costs are shown for the residential programs in rows 25-29 for the electric program, rows 54-58 for the gas program (Res sheet), and rows 25-29 for the non-residential program (Non-Res sheet). The costs are based on the retail rate of electricity for the specific sectors. The benefits are calculated using the net present value of the savings from the Annual Savings and Costs workbook (saved in cells K11, K41 for the residential programs and K12 for the non-

residential program), and a levelized avoided cost (cells K26 and K55 for the residential programs and cell K26 for the non-residential programs).

C. As the benefits are calculated at the program level, IPL uses a single representative levelized avoided cost to best represent the program as a whole. Since generation technologies do not have a specific end use associated with them since they provide power at the whole building level, IPL chose an avoided cost based on a prominent, but non-weather dependent end use. The lighting end use was determined to best fill that need.

ELECTRIC

Res	Wind	Hydro	PV	Geothermal	solar water heater	Total
avg size (kW)/unit	5	30	3			
MWh/unit	7	131	4	2.7	1.3	
10-yr potential MWh	22,145	700	5,100			
total # units (10 yrs)	2,989	5	1,366			
units/year	299	1	137			
$/kW	$ 5,000	$ 5,500	$ 9,000			
$/unit	$ 25,000	$ 165,000	$ 27,000	$5,500	$ 7,500	
CF at peak (aug 3pm)	13%	6%	40%	0.000114	0.000110	
year 2010 installations	5	0	10	255	10	
MWh savings	37	0	37	689	13	776
kW savings	3	0	12	78	1.4	95
Cost	$ 125,000	$ -	$ 270,000	$1,402,500	$75,000	$ 1,872,500

Year	2010
Total # of installs	
Wind	5
PV	10
Hydro	0
Geotherma	255
SWH	10

Non-Res	Ind Biomass	Anaerobic Digesters	Wind	Hydro	PV	Geothermal	Total
avg size (kW)/unit	4800	600	100	200	20		
MWh/unit	33,638	4,730	186	876	22	8.168	
10-yr potential MWh	55,411	25,960	30,031	2,300	7,800		
total # units (10 yrs)	2	5	162	3	361		
units/year	0	0.5	16	0	36		
$/kW	$ 1,800	$ 3,200	$ 3,700	$ 5,000	$ 9,000		
$/unit	$ 8,640,000	$ 1,920,000	$ 370,000	$ 1,000,000	$ 180,000	$ 32,000	
CF at peak (aug 3pm)	100%	100%	13%	6%	40%	0.000209	
year 2010 installation	0	1	1	0	10	41	
MWh savings	-	4,730	186	-	216	335	5,467
kW savings	-	600	13	0	80	70	763
Cost	$ -	$ 1,920,000	$ 370,000	$ -	$ 1,800,000	$1,312,000	$ 5,402,000
	$ 2,592,000	$ 576,000	$ 111,000	$ 300,000	$ 54,000	$ 9,600	

Year	2010
Total # of installs	
Wind	1
PV	10
Hydro	0
An Dig	1
Ind Biomas	0
Geotherma	41

GAS (res only)

solar water heater	2009	2010	2011	2012	2013
# installations	1	5	15	30	50
therm impact	90	450	1,350	2,700	4,500
Total Cost	$ 7,500	$ 37,500	$ 112,500	$ 225,000	$ 375,000

solar water heaters 90 therms/unit

Res		Non-Res	
		Ind Biomas	80%
		An Dig	90%
Wind	17%	Wind	21%
Hydro	50%	Hydro	50%
PV	14%	PV	12%

Total estimated number of installations

Res		2009	2010	2011	2012	2013		
No of Installations								
	Wind	1	5	10	15	20	10	factor reduced from potential study estimate
	PV	3	10	25	50	75		
	Hydro	0	0	0	0	1		
	Geotherma	250	255	260	265	270	2.50%	annual growth
	SWH	2	10	25	45	75		
Non-Res								
No of Installations								
	Wind	0	1	2	3	4	10	factor reduced from potential study estimate
	PV	1	10	15	25	35		
	Hydro	0	0	0	1	1		
	An Dig	0	1	1	1	1		
	Ind Biomas	0	0	0	1	1		
	Geotherma	40	41	42	43	44	2.50%	

		YEAR:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Residential	Elec Savings (MWh)		696	776	902	1,072	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386	1,386
			12,679														
		YEAR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Gas Savings (therms)		90	450	1,350	2,700	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500
			35,192														
		YEAR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Non-Residential	Electric Savings (MWh		348	5,468	5,775	40,700	41,112	41,112	41,112	41,112	41,112	41,112	41,112	41,112	41,112	41,112	41,112
			329,888	19%	0.034												
		YEAR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Total Electric Savings		1,044	6,244	6,677	41,772	42,498	42,498	42,498	42,498	42,498	42,498	42,498	42,498	42,498	42,498	42,498
			342,567														

	3.7%	0.0363
	19%	
discount ra	4.81%	

Benefit/Cost Component	2009	2010	2011	2012	2013	Total
No. of Installations						
Small Wind	1	5	10	15	20	51
Photovoltaics	3	10	25	50	75	163
Small Hydro	-	-	-	-	1	1
Geothermal Heat Pump	250	255	260	265	270	1,300
Solar Water Heater	2	10	25	45	75	157
Savings (MWh)	696	776	902	1,072	1,386	4,832
Capacity Savings (kW)	81	95	120	157	198	
Total Societal Cost	$2,403,200	$2,786,588	$3,464,638	$4,422,800	$5,687,763	$18,764,988
Direct Participant Costs	$1,047,200	$1,310,750	$1,779,750	$2,464,000	$3,316,250	$9,917,950
Direct Utility Costs	$1,356,000	$1,475,838	$1,684,888	$1,958,800	$2,371,513	$8,847,038
Planning and Design	$300,000	$250,000	$200,000	$150,000	$100,000	$1,000,000
Program Administration	$175,000	$175,000	$175,000	$175,000	$175,000	$875,000
Advertising and Promotion	$125,000	$125,000	$125,000	$75,000	$75,000	$525,000
Incentives (Feasibility Studies)	$307,200	$336,000	$384,000	$450,000	$529,200	$2,006,400
Incentives (Buy-down Rebates)	$448,800	$561,750	$762,750	$1,056,000	$1,421,250	$4,250,550
Monitoring and Evaluation	$0	$28,088	$38,138	$52,800	$71,063	$190,088
Annual kWh as % of Retail Sales	***0.00%***	***0.00%***	***0.01%***	***0.01%***	***0.01%***	

Cost-Effectiveness Analysis	Stakeholder Perspective			
	Societal	Participant	Utility	RIM
NPV Benefits	$699,723	$1,029,498	$699,723	$699,723
NPV Costs	$16,000,947	$7,114,492	$7,025,703	$8,055,201
Benefit-Cost Ratio	***0.04***	***0.14***	***0.10***	***0.09***

Installation Costs:	$ 1,496,000	$ 1,872,500	$ 2,542,500	$ 3,520,000	$ 4,737,500

Gas

	Plan Year					
Benefit/Cost Component	2009	2010	2011	2012	2013	Total
No. of Installations						
Solar Water Heater	1	5	15	30	50	101
Savings (therms)	90	450	1,350	2,700	4,500	9,090
Total Societal Cost	78,700	109,063	187,188	309,375	480,625	1,164,950
Direct Participant Costs	$5,250	$26,250	$78,750	$157,500	$262,500	$530,250
Direct Utility Costs	$73,450	$82,813	$108,438	$151,875	$218,125	$634,700
Planning and Design	$25,000	$20,000	$15,000	$10,000	$5,000	$75,000
Program Administration	$25,000	$25,000	$25,000	$25,000	$25,000	$125,000
Advertising and Promotion	$20,000	$20,000	$15,000	$10,000	$10,000	$75,000
Incentives (Feasibility Studies)	$1,200	$6,000	$18,000	$36,000	$60,000	$121,200
Incentives (Buy-down Rebates)	$2,250	$11,250	$33,750	$67,500	$112,500	$227,250
Monitoring and Evaluation	$0	$563	$1,688	$3,375	$5,625	$11,250
Annual thems % of Retail Sales	***0.00%***	***0.00%***	***0.00%***	***0.00%***	***0.00%***	

Cost-Effectiveness Perspectives	Stakeholder Perspective			
	Societal	Participant	Utility	RIM
NPV Benefits	$31,586	$39,821	$31,586	$31,586
NPV Costs	$973,333	$356,199	$493,878	$502,113
Benefit-Cost Ratio	***0.03***	***0.11***	***0.06***	***0.06***

Electric

Benefit/Cost Component	Plan Year 2009	2010	2011	2012	2013	Total
No of Installations						
Small Wind	0	1	2	3	4	10
Photovoltaics	1	10	15	25	35	86
Small Hydro	-	-	-	1	1	2
Geothermal Heat Pump	40	41	42	43	44	210
Anaerobic Digester	-	1	1	1	1	4
Biomass Combustor	-	-	-	1	1	2
Savings (MWh)	348	5,467	5,769	40,693	41,103	93,380
Capacity Savings (kW)	76	763	818	5,723	5,818	
Total Societal Cost	$2,184,200	$6,109,080	$7,302,490	$17,424,631	$19,612,603	$52,633,004
Direct Participant Costs	$1,022,000	$3,781,400	$4,692,800	$12,982,200	$14,523,600	$37,002,000
Direct Utility Costs	$1,162,200	$2,327,680	$2,609,690	$4,442,431	$5,089,003	$15,631,004
Planning and Design	$250,000	$200,000	$150,000	$100,000	$50,000	$750,000
Program Administration	$275,000	$275,000	$275,000	$275,000	$275,000	$1,375,000
Advertising and Promotion	$150,000	$150,000	$75,000	$75,000	$75,000	$525,000
Incentives (Feasibility Studies)	$49,200	$92,400	$100,830	$146,491	$160,983	$549,904
Incentives (Buy-down Rebates)	$438,000	$1,533,600	$1,913,200	$3,662,800	$4,312,400	$11,860,000
Monitoring and Evaluation	$0	$76,680	$95,660	$183,140	$215,620	$571,100
Annual kWh as % of Retail Sales	***0.00%***	***0.04%***	***0.04%***	***0.26%***	***0.26%***	

Cost-Effectiveness Perspectives	Stakeholder Perspective Societal	Participant	Utility	RIM
NPV of Benefits	$17,880,795	$11,216,201	$17,880,795	$17,880,795
NPV of Costs	$43,934,018	$36,600,072	$12,091,036	$23,307,237
Benefit-Cost Ratio	***0.41***	***0.31***	***1.48***	***0.77***
Installation Costs:	$ 1,460,000	$ 5,402,000	$ 6,704,000	$ 18,546,000	$ 20,748,000

2.5% *assumed growth/year*

329,888 *NPV of MWH over 20 years*

2.75 *FTE @* $100,000

3 *# of feasibility studies/install*

$400 *per standa* $10,000 biodigester/biomass combuster

30% *of measure cost covered by incentives*

5% *of incentives (starting year 2)*

$0.05 *lev avoided cost $/kWh*

4.81% *societal discount rate*

10% *participant discount rate*

7.44% *utility discount rate*

$0.03 */kWh retail rate*

Electric

	2009	2010	2011	2012	2013	Total
No of Installations						
Small Wind	1	6	12	18	24	**61**
Photovoltaics	4	20	40	75	110	**249**
Small Hydro	0	0	0	1	2	**3**
Geothermal Heat Pump	290	296	302	308	314	**1510**
Solar Water Heater	2	10	25	45	75	**157**
Biodigester	0	1	1	1	1	**4**
Biomass Combustor	0	0	0	1	1	**2**
Savings (MWh)	1,044	6,243	6,671	41,765	42,489	**98,212**
Capacity Savings (kW)	157	858	938	5,880	6,016	
Total Societal Cost	$ 4,666,100	$ 9,004,730	$ 10,954,315	$ 22,156,806	$ 25,780,991	**$ 72,562,941**
Direct Participant Costs	$ 2,074,450	$ 5,118,400	$ 6,551,300	$ 15,603,700	$ 18,102,350	**$ 47,450,200**
Direct Utilty Costs	$ 2,591,650	$ 3,886,330	$ 4,403,015	$ 6,553,106	$ 7,678,641	**$ 25,112,741**
Planning and Design	$ 575,000	$ 470,000	$ 365,000	$ 260,000	$ 155,000	**$ 1,825,000**
Program Administration	$ 475,000	$ 475,000	$ 475,000	$ 475,000	$ 475,000	**$ 2,375,000**
Advertising and Promotion	$ 295,000	$ 295,000	$ 215,000	$ 160,000	$ 160,000	**$ 1,125,000**
Incentives (Feasibility Studies)	$ 357,600	$ 434,400	$ 502,830	$ 632,491	$ 750,183	**$ 2,677,504**
Incentives (Buy-down Rebates)	$ 889,050	$ 2,106,600	$ 2,709,700	$ 4,786,300	$ 5,846,150	**$ 16,337,800**
Monitoring and Evaluation	$ -	$ 105,330	$ 135,485	$ 239,315	$ 292,308	**$ 772,438**

Cost-Effectiveness Perspectives	**Societal**	**Participant**	**Utility**	**RIM**
NPV of Societal Benefits	$18,906,097	$12,469,432	$18,906,097	$ 18,906,097
NPV of Societal Costs	$60,908,297	$32,935,707	$19,610,618	$ 32,080,050
Benefit-Cost Ratio	**0.31**	**0.38**	**0.96**	**0.59**

342,567 *NPV of MWH over 20 years*

$0.06 *lev avoided cost $/kWh*
4.81% *societal discount rate*
10% *participant discount rate*
7.44% *utility discount rate*
$0.04 */kWh retail rate*

incentive: 30% of cost

Non-Res

technology	technology co	max incentive	30% incentive
Wind	$ 370,000	$100,000	$ 111,000
PV	$ 180,000	$100,000	$ 54,000
Hydro	$ 1,000,000	$100,000	$ 300,000
Geothermal	$ 32,000	$10,000	$ 9,600
biodigester	$ 1,920,000	$500,000	$ 576,000
biomass combustor	$ 8,640,000	$1,000,000	$ 2,592,000

Res

technology	technology co	max incentive	30% incentive
Wind	$ 25,000	$30,000	$ 7,500
PV	$ 27,000	$30,000	$ 8,100
Hydro	$ 165,000	$50,000	$ 49,500
Geothermal	$ 5,500	$5,000	$ 1,650
Solar Water Heater	$ 7,500	$5,000	$ 2,250