

Appendix A: Solicitation of Interest

WOODY BIOMASS-FIRED COMBINED HEAT AND POWER PROJECT ON THE NORTHERN COAST OF CALIFORNIA

TSS Consultants, in coordination with the North Coast Resource Conservation and Development Council (NCRC&D) and the California Department of Forestry and Fire Protection (CALFIRE), has determined that your company is involved with technologies to convert woody biomass into energy. TSS and the NCRC&D/CALFIRE are actively seeking your interest in providing information and potential involvement in a 1 Megawatt Combined Heat and Power (CHP) that would utilize primarily forest-sourced woody biomass (from timber harvest and hazardous forest fuels reduction activities in western Mendocino County). The project is to be located at a CALFIRE Conservation Camp (Parlin Fork), at which fire fighting personnel are housed and conduct wildfire fighting activities. This will make this project have a high-visibility within the large California State Government system, thus increasing its potential for duplication throughout the state and at many state facilities.

It is the intent of this solicitation to identify appropriate biomass conversion technology systems that can be used for a biomass conversion facility at the Parlin Fork site.

Project Objective: Identify a small, commercially available, woody biomass-fired CHP system that can be installed and operated at the Parlin Fork facility.

Project Overview: CALFIRE is intending to restart commercial timber harvest operations in the Jackson State Forest (a 55,000 acre heavily-forested area owned by the State of California). In addition, CALFIRE is undertaking hazardous forest fuels reduction activities to significantly reduce the possibility of cat. These forest thinnings can produce a significant volume of woody biomass material that can become a disposal issue. Because this biomass material currently has very little commercial value, it is currently disposed of by pile burning, chipping and spreading, or hauling it to disposal sites at considerable expense. Utilizing woody biomass generated from the thinning of hazardous forest fuels to generate electrical power and heat is a conversion option that the project proponents would like to pursue. A biomass fuels assessment study has been previously performed which indicates that ample woody biomass would be available for a power plant of this size.

Technology Requirements: A electrical generating unit(s) producing up to a net 1 MW of base load electricity delivered to the grid and operating at 86+% of capacity. The Conservation Camp facility may use a portion of the electricity generated as well (peak load up to 450 kW). Waste heat or excess steam would be used to heat facility buildings. It is currently planned to entirely rebuild the Conservation Camp over the next few years. Both gasification technologies and low emissions direct combustion technologies will be considered.

Air Emissions & Water Supply/Discharge: The site is located in the Mendocino County Air Pollution Control District (<http://www.co.mendocino.ca.us/aqmd/index.htm>). Water supply is somewhat constrained at the project site, so system design which uses less water and/or maximizes recycling is needed.

Feedstock Parameters (estimated): Forest residues at 40 to 50% moisture content (MC). Heating Value: 7,000 to 8,500 BTUs/pound. Proposals should include fuel-handling system for feedstock delivered to a fuel bin with a 40+/- hour capacity.

Utility: Pacific Gas & Electric

Project Schedule: Operational in 2010/2011

Selection for Further Consideration Criteria: Responses will be evaluated based on the following criteria: (1) Ability to produce base load electricity connecting to the grid, as well as supply waste heat to adjacent building structures; (2) Ability to operate at 86+% capacity (3) Technical and commercial viability within above cited operating parameters, including experience with fuel handling systems for automated delivery to feedstock bins; (4) Experience with woody biomass fired units and a variety of woody biomass fuels with a range of specifications; (5) Environmental impacts including air, water supply needed, and water discharge requirements; (6) Estimated Capital and operating costs.

Contents of Response Submittal: All responses should include the following at a minimum: (A) Technical description of the unit from fuel bin through delivery of electricity to substation and waste heat/steam to adjacent buildings [cite exceptions to parameters provided in project description] (B) Identify required resources, i.e. footprint, water supply, etc.; (C) Environmental impact summary, including air emissions, water supply requirements, wastewater discharges, ash disposal; (D) Estimated turn-key price of the unit and/or \$/MW delivered (not installed) from fuel feeding containment through delivery of electricity to substation [provide a breakdown of major components and cite exclusions to turn key price] and waste heat to adjacent buildings; (E) Statement of qualifications of manufacturer, including experience with woody biomass fuels, contact information for proposed or currently operating systems, available operating histories and references.

Deadline for Responses: May 7, 2008. Electronic replies are required to fatoxic@tssconsultants.com unless other arrangements are requested in advance. Please limit your responses to no more than 20 pages.

Contact: All communications should be directed to Frederick Tornatore, TSS Consultants. E-mail: fatoxic@tssconsultants.com, Tel: 916.638.8811 x104, Fax: 916.638.9326

Information regarding TSS Consultants can be obtained via www.tssconsultants.com.



Appendix B: Facility Supplied Energy and Water Information

DOUG -
We're struggling to locate 2007 records.
Here's what we have so far.

DAVE BARSI
Div. Chief
Parlin Fork Co.

**Information/Data Needed for the Parlin Fork Conservation
Camp Proposed Bioenergy Project Heatload Calculations**

Electricity

Electricity usage (Kwhrs) at the site for 2007 and 2008

Electricity cost at the site for 2007 and 2008

Estimated electricity usage at the site after construction of the new building

Sample of a monthly electrical bill

Location of sub-transmission line and ability to transmit up to 1 Mw of power to electrical grid

Thermal Use

Propane use at the site for 2007 and 2008 (in MMBtus or gallons).

Propane cost at the site for 2007 and 2008

Estimated change in propane use at the site after construction of the new building

Are there any uses for heat that are not currently being met with propane but might be met with hot water from a power plant?

Water

Availability of water for power plant cooling. What quantity? From creek or wells?

General

Upon construction of the new camp buildings will any existing buildings be torn down or abandoned?

Architectural plans for the new buildings?



DEPARTMENT OF FORESTRY AND FIRE PROTECTION

Mendocino Unit
17501 North Highway 101
Willits, CA 95490
(707) 459-7414
Website: www.fire.ca.gov

**MEMO**

TO: Dave Barsi, Division Chief

FROM: Steve Horne, Chief Plant Operator

SUBJECT: Power Consumption at Parlin Fork Camp #6

Attached is the request from TSS Consultants Dated 02/06/2009. I will address each line separately.

#1. Electricity

- A- Attached is the KWHS for our site for 2008 and the first 6 months of 2009. Attachment {A}
- B- Attached are the bills for the same period attachment {A}
- C- I believe estimated electrical consumption will remain the same. Some energy efficient lighting will reduce the amount minimally.
- D- Attachment {A} is the only reference we not receive the actual bill.
- E- Call to PG&E States:

#2. Thermal Use

- A- Attached is the gallons used for 2008 & 2009 to date. Attachment {D}
- B- Attachment {B}, {C} for 2009 to date.
- C- I believe with new furnaces and hot water heaters plus the insulation that would be used in modern construction that the propane used would drop by 40% in the winter months and 20% at the warmest month.
- D- We have about 40 KW of electric heat mostly during winter months.

#3. Water

Water, test wells in the area have all been dry. Water from the Noyo is available to us up to 25,000 gallons a day our normal average is about 19,000 a day.

#4.

- A- All buildings to be removed except B.O.Q. and Admin Bld. to be used for other purposes.
- B- Prints are available however, I do not have them.


Steve Horne, Chief Plant Operator

7-28-09
Date:

CONSERVATION IS WISE-KEEP CALIFORNIA GREEN AND GOLDEN

PLEASE REMEMBER TO CONSERVE ENERGY. FOR TIPS AND INFORMATION, VISIT "FLEX YOUR POWER" AT WWW.CA.GOV.

Information/Data Needed for the Parlin Fork Conservation Camp Proposed Bioenergy Project Heatload Calculations

① Electricity

- a Electricity usage (Kwhrs) at the site for 2007 and 2008
- b Electricity cost at the site for 2007 and 2008
- c Estimated electricity usage at the site after construction of the new building
- d Sample of a monthly electrical bill
- e Location of sub-transmission line and ability to transmit up to 1 Mw of power to electrical grid

② Thermal Use

- a Propane use at the site for 2007 and 2008 (in MMBtus or gallons).
- b Propane cost at the site for 2007 and 2008
- c Estimated change in propane use at the site after construction of the new building
- d Are there any uses for heat that are not currently being met with propane but might be met with hot water from a power plant?

③ Water

- a Availability of water for power plant cooling. What quantity? From creek or wells?

④ General

- a Upon construction of the new camp buildings will any existing buildings be torn down or abandoned?
- b Architectural plans for the new buildings?

ATTACHMENT (A)

Electricity Usage for Parlin Fork CC#6

Calendar Year 2007

Month	KW Usage	Amount
Jan	21,851	\$2,361.14
Feb	23,300	\$2,499.99
Mar	20,660	\$2,304.46
Apr	23,135	\$2,868.83
May	21,459	\$3,204.33
Jun	No info	No info
Jul	3049	\$5,584.72
Aug	2874	\$5,878.77
Sept	3152	\$5,795.06
Oct	4095	\$10,803.40
Nov	3143	\$5,252.24
Dec	3626	\$4,854.52

Calendar Year 2009

Month	KW Usage	Amount
Jan	3,080	4,455.08
Feb	3267	4,713.00
Mar	3501	4,422.00
Apr	3144	4,765.00
May	2899	5,943.00
Jun	2881	2,984.00
Jul		
Aug		
Sept		
Oct		
Nov		
Dec		

2009 TO DATE

Suburban Propane		14815320
PO#z:		
Date	Amount	
	5-Jan	2169.88
	21-Jan	5343.62
	9-Feb	5013.12
	25-Feb	4969.06
	17-Mar	3535.9
	8-Apr	3443.65
	6-May	3872.18
	9-Jun	2915.9

Total Expendature:	31263.31
Term Total:	40000
Amendment:	8736.69

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AUTH
ING:SK

LIQUEFIED PETROLEUM GAS
2.1
UN 1075
PRODUCT: PROPANE, NON-COR

No. 742843

PREVIOUS SALE NO.	CODE	METER/READING-START GALLONS	10TH
YOUR SALE NO.		METER/READING-START GALLONS	

Suburban Propane™
DELIVERY TICKET / ON SITE GAS SALES TICKET / CYLINDER LEASE

CUSTOMER NAME: Phyllis Fark ACCOUNT NO.: 106585
 ADDRESS: (707) 263-5428 CITY: 2255 S. Main St., Lakeport, CA 95453 ST: CA ZIP: 95619
 SUBURBAN'S PHONE & ADDRESS: 2255 S. Main St., Lakeport, CA 95453 FILLED BY: (Suburban Employee Name)

SUBURBAN LEASES CUSTOMER THE CYLINDER(S) LISTED BELOW. CUSTOMER AGREES TO RETURN CYLINDERS TO THIS SUBURBAN LOCATION DURING BUSINESS HOURS ON OR BEFORE 20 IN THE SAME CONDITIONS AS LEASED AND TO PAY THE REPLACEMENT COST OF ANY CYLINDER(S) LOST OR DAMAGED BEYOND REPAIR. AGREED:

CUSTOMER SIGNATURE: _____

QTY	CYL SIZE	SERIAL NO.	UNIT LEASE FEE	AMOUNT
20	33.5	<u>5-6-09</u>		
40	60	<u>14805310</u>	<u>CAMP #</u>	<u>6</u>
60	100	<u>REC'D BY:</u>		
OTHER				

READ AND PROVIDE IMPORTANT SAFETY INFO ON REVERSE SIDE TO ALL END USERS
 WHERE REQUIRED: LP GAS VOLUME DELIVERED HAS BEEN ADJUSTED TO THE VOLUME AT 60 FAHRENHEIT (16 CELSIUS)
 ORIGINAL

Form No. OPR-5230 Rev. 0307 Item No. 1528422

GAL'S DELIV'D	RATE	AMOUNT
3220	824	2653.28
FEDERAL FUEL TAX		
STATE FUEL TAX		
MUNIC. FUEL TAX		
LOCAL & STATE SALES TAX		218.90
GROSS RCPT SALES TAX		
TOTAL		\$ 2872.18

Attachment {D}

<u>Date:</u>	<u>Gallons:</u>	<u>Cost:</u>	<u>Price/Gallon w/ Tax:</u>
1/24/2008	4020		
2/10/2008	1920		
2/23/2008	3000		
3/7/2008	3100		
3/20/2008	3180		
4/12/2008	4235		
9/24/2008	2164		
10/9/2008	2240.1		
11/4/2008	2264.1		
11/18/2008	3500		
12/5/2008	2100		
12/17/2008	4210		
1/5/2009	1800		
1/21/2009	3600		
2/9/2009	3730		
2/25/2009	3526		
3/17/2009	3420	\$3,535.90	\$1.03
4/8/2009	3300	\$3,443.65	\$1.04
5/6/2009	3220	\$2,872.18	\$0.89
6/9/2009	3082	\$2,915.90	\$0.95

Appendix C: Financial Analysis Spreadsheets

APPENDIX C

PARLIN FORK ENERGY USE

<u>Electricity</u>		Use		Generation-1.5 MW	
	<u>Month-2007</u>	<u>Use-Kwhrs</u>			
	Jan	21851		Net Generation-MW	1.25
	Feb	23300		Days/Month	30
	Mar	20660		Hours/day	24
	Apr	23135		Capacity Factor-%	90%
	May	21459		Generation-Kwhr/Mo.	810000
	Average/Mo.	22081		Percent-Average	2.73%
	Max/Mo.	23300		Percent-Maximum	2.88%
<u>Propane</u>				<u>Heat Recovery-1.5 MW Unit</u>	
	<u>Period</u>	<u>Days</u>	<u>Use-Gallons</u>		
				Potential Recovery	
2008	1/24-2/10	17	1920	70% Efficient-MMBtu/yr	77000
	2/10-2/23	13	3000		
	2/23-3/7	12	3100	% Useable at Site	5%
	3/7-3/20	13	3180		
	3/20-4/12	23	4235		
	9/24-10/9	14	2240		
	10/9-11/4	25	2264		
	11/4-11/18	14	3500	Sawmill	
	11/18-12/5	17	2100		
	12/5-12/17	12	4210	Board feet per month	100000
	12/17-1/5	19	1800	Board feet per year	1200000
	1/5-1/21	16	3600	Heat to dry 1000 board feet*	2.7 MMBtu
	1/21-2/9	19	3730	Heat required per year	3240 MMBtu
2009	1/21-2/9	19	5013		
	2/9-2/25	16	4969		
	2/25-3/17	20	3536	Total Heat Utilized	
	3/17-4/8	22	3444		
	4/8-5/6	28	3872	Buildings	4152
	5/6-6/9	34	2916	Sawmill	3240
				Total	7392
Totals		353	62629	Use	7400 MMBtu/yr.
Ave use/day-gal		177		*Darrel Kelly-Warm Springs Forest Products	
Use/Year-gal		64758			
Propane HV-Btu/gal		91600			
Heat/Year-MMBtu		5932			
Heat Reduction		30%			
Heat with new bldgs		4152			

**RETURN ON INVESTMENT - LEVELIZED COST OF ELECTRICITY MODEL
COGENERATION FACILITY - BIOMASS FIRED**

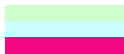
PHOENIX ENERGY - Gasifier with IC Engine
Parlin Fork Cogeneration Facility-\$35/ton Fuel Cost
 Financing: 100% Debt at 3.5% Interest
 Heat Recovered Worth \$11/MMBtu

This computer model allows the user to calculate the return on equity (ROE) on a capital investment in a cogeneration facility, given operating expenses, the prices for electricity and heat, and the cost of fuel, other operating expenses and income taxes.

If the ROE Achieved does not equal the ROE Required on the investment, the sale price of electricity (cell B23) can be adjusted to equate the two ROEs.

If the project is financed with 100% debt, adjust the sale price of electricity (cell B23) until the NPV of Cash Flow is 0. Income tax rates (cells B82 & B83) must be set to 0 if the investing entity is non-profit.

Input values are highlighted in green
 Calculated values are highlighted in blue
 Key output values are highlighted in lavender



Sale Prices - Base Year	
Electricity (Cents/Kwh)	11.99
Heat (\$/MMBtu)	11
ROE Required	0

Fuel Cost - Base Year (\$/ton)	35
---------------------------------------	----

Capital Costs (\$)	
Generating Facility	3,500,000
Heat Recovery System	100,000
Heat Distribution System	50,000
Total Capital Costs	3,650,000

Electrical - Base Year	
Gross Electrical Capacity (kWe)	1,000
Parasitic Load (Kwe)	170
Net Electrical Capacity (kWe)	830
Capacity Factor (%)	90
Annual Hours	7,884
Net Station Electrical Efficiency (%)	25
Gross Station Electrical Efficiency (%)	30
Annual Net Generation (kWh)	6,543,720
Capital cost per net electrical capacity (\$/kWe)	4,217
Income From Electricity Sales (\$/yr)	784,592

Fuel - Base Year	
Fuel Heating Value (Btu/lb)	8,500
Fuel Consumption Rate (t/h)	0.67
Fuel in Electric Units (kW)	3,320
Annual Fuel Consumption (t/yr)	5,258
Fuel Ash Concentration (%)	5
Annual Ash Disposal (t/yr)	263

Heat-base year	
Total heat produced (MMBtu/yr)	89,387
Cogeneration efficiency (%)	38
Aggregate fraction of heat recovered (%)	8
Heat recovered and sold (MMBtu/yr)	7,446
Total income from heat sales (\$/yr)	81,901

Expenses-base year	
Fuel Cost (\$/yr)	184,033
Labor Cost (\$/yr)	100,000
Maintenance Cost (\$/yr)	50,000

If financing includes equity, adjust electricity price until ROE Achieved equals ROE Required.
 If 100% debt financed, adjust electricity price until NPV of Cash Flow is 0.

ROE Achieved	NA
Levelized Price/Cost of Electricity	14.2
NPV of Cash Flow	309

Insurance/Property Tax (\$/y)	20,000
Utilities (\$/y)	10,000
Ash Disposal (\$/y)-use negative value for sales	15,700
Administrative and General (\$/y)	34,300
Other Operating Expenses (\$/y)	20,000
Total Non-Fuel Expenses (\$/y)	250,000
Total Expenses Including Fuel (\$/y)	434,033

Taxes & Royalties	
Federal Income Tax Rate (%)	0.00
State Income Tax Rate (%)	0.00
Production Tax Credit (\$/kWh)	0.000
Number of years PTC received	5
Royalty Payment (% of total revenue)	0
Tax Depreciation Method	SL
Investment Tax Credit (%)	0

SL = Straight line depreciation
M-5 = MACRS-5 five year schedule depreciation
M-10 = MACRS-10 ten year schedule depreciation

Income other than energy	
Electricity Capacity Payment (\$/kW-y)	0
Annual Capacity Payment (\$/y)	0
Debt Reserve Required?	No
Interest Rate on Debt Reserve (%/yr)	5
Annual Debt Reserve Interest (\$/y)	0

Enter: Yes or No

Escalation	
Escalation-Fuel (%/y)	2.00
Escalation for Production Tax Credit (%/y)	0.00
Escalation - Electricity sales price (%/yr)	2.00
Escalation-Heat sales price (%/y)	2.00
Escalation - Capacity payments (\$/yr)	0.00
Escalation-Other (%/y)	2.00

Financing	
Debt ratio (%)	100.00
Equity ratio (%)	0.00
Interest Rate on Debt (%/y)	3.50
Economic Life (y)	20
Rate of equity required (%/y)	0.00
Weighted Cost of Capital (%/y)	3.50
Total Cost of Plant (\$)	3,650,000
Salvage Value (%)	0
Total Equity Invested (\$)	0
Total Debt Invested (\$)	3,650,000
Capital Recovery Factor (Equity)	#DIV/0!
Capital Recovery Factor (Debt)	0.0704
Annual Debt Payment (\$/y)	256,818
Debt Reserve (\$)	256,818

Debt Schedule				
Year	Remaining Principal	Annual Payment	Annual Interest	Principal Reduction
1	3,650,000	256,818	127750	129,068
2	3,520,932	256,818	123233	133,585
3	3,387,347	256,818	118557	138,261
4	3,249,086	256,818	113718	143,100
5	3,105,986	256,818	108710	148,108
6	2,957,878	256,818	103526	153,292
7	2,804,585	256,818	98160	158,657
8	2,645,928	256,818	92607	164,210
9	2,481,718	256,818	86860	169,958
10	2,311,760	256,818	80912	175,906
11	2,135,853	256,818	74755	182,063
12	1,953,790	256,818	68383	188,435
13	1,765,355	256,818	61787	195,031
14	1,570,325	256,818	54961	201,857
15	1,368,468	256,818	47896	208,922
16	1,159,546	256,818	40584	216,234
17	943,313	256,818	33016	223,802
18	719,511	256,818	25183	231,635
19	487,876	256,818	17076	239,742
20	248,133	256,818	8685	248,133

Tax Depreciation Schedule			
Year	MACRS-5 year	MACRS-10 year	Straight Line-20 year
1	0.2000	0.1000	0.0500
2	0.3200	0.1800	0.0500
3	0.1920	0.1440	0.0500
4	0.1152	0.1152	0.0500
5	0.1152	0.0922	0.0500
6	0.0576	0.0737	0.0500
7	0.0000	0.0655	0.0500
8	0.0000	0.0655	0.0500
9	0.0000	0.0655	0.0500
10	0.0000	0.0655	0.0500
11	0.0000	0.0329	0.0500
12	0.0000	0.0000	0.0500
13	0.0000	0.0000	0.0500
14	0.0000	0.0000	0.0500
15	0.0000	0.0000	0.0500
16	0.0000	0.0000	0.0500
17	0.0000	0.0000	0.0500
18	0.0000	0.0000	0.0500
19	0.0000	0.0000	0.0500
20	0.0000	0.0000	0.0500
	1.0000	1.0000	1.0000

Production Tax Credit Schedule	
Year	Received ?
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	No
7	No
8	No
9	No
10	No
11	No
12	No
13	No
14	No
15	No
16	No
17	No
18	No
19	No
20	No

Annual Cash Flow (\$)																				
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Revenue																				
Electricity Sales	784,592	800,284	816,290	832,615	849,268	866,253	883,578	901,250	919,275	937,660	956,413	975,542	995,052	1,014,953	1,035,253	1,055,958	1,077,077	1,098,618	1,120,591	1,143,002
Heat Sales	81,901	83,539	85,210	86,914	88,652	90,425	92,234	94,078	95,960	97,879	99,837	101,833	103,870	105,947	108,066	110,228	112,432	114,681	116,974	119,314
Capacity Payments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Production Tax Credit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest on Debt Reserve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Revenue	866,493	883,823	901,499	919,529	937,920	956,678	975,812	995,328	1,015,234	1,035,539	1,056,250	1,077,375	1,098,922	1,120,901	1,143,319	1,166,185	1,189,509	1,213,299	1,237,565	1,262,316
Expenses																				
Fuel	184,033	187,713	191,467	195,297	199,203	203,187	207,250	211,395	215,623	219,936	224,335	228,821	233,398	238,066	242,827	247,684	252,637	257,690	262,844	268,101
Other Operating Expenses	250,000	255,000	260,100	265,302	270,608	276,020	281,541	287,171	292,915	298,773	304,749	310,844	317,060	323,402	329,870	336,467	343,196	350,060	357,062	364,203
Royalties	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Expense	434,033	442,713	451,567	460,599	469,811	479,207	488,791	498,567	508,538	518,709	529,083	539,665	550,458	561,467	572,697	584,151	595,834	607,750	619,905	632,303
Operating Cash Flow	432,460	441,109	449,932	458,930	468,109	477,471	487,021	496,761	506,696	516,830	527,167	537,710	548,464	559,434	570,622	582,035	593,675	605,549	617,660	630,013

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Income Tax																					
Debt Interest	127,750	123,233	118,557	113,718	108,710	103,526	98,160	92,607	86,860	80,912	74,755	68,383	61,787	54,961	47,896	40,584	33,016	25,183	17,076	8,685	
Tax Depreciation	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	
SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MACRS-5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MACRS-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Taxable Income	122,210	135,377	148,875	162,712	176,899	191,445	206,360	221,653	237,336	253,418	269,912	286,827	304,177	321,972	340,226	358,950	378,159	397,866	418,084	438,828	
Federal Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
State Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Investment Tax Credit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Income Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Debt Payment	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	
Owner's Equity	0																				
Debt Reserve	0																				
Return of Debt Reserve																				0	
Debt Outlay (No cost financing only)	-3,650,000																				
Salvage Value Recovered																				0	
Total Owner's Capital	-3,650,000																				
Cash Flow	-3,650,000	175,642	184,292	193,114	202,112	211,291	220,653	230,203	239,943	249,878	260,012	270,349	280,892	291,646	302,616	313,804	325,217	336,857	348,731	360,842	373,195
IRR	NA																				
NPV	309																				
Annual Electrical Generation (Kwh)	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	
Annual Electricity Price - cents/Kwh	11.99	12.2	12.5	12.7	13.0	13.2	13.5	13.8	14.0	14.3	14.6	14.9	15.2	15.5	15.8	16.1	16.5	16.8	17.1	17.5	
PV Electric Revenue (\$)	13,244,621																				
Levelized Annual Revenue (\$)	931,906																				
Levelized Electricity Price (cents/Kwh)	14.2																				

Property of TSS Consultants, Sacramento, CA
Contact Fred Tomatore, 916-601-0531, or
David Augustine, 916-359-6303

**RETURN ON INVESTMENT - LEVELIZED COST OF ELECTRICITY MODEL
COGENERATION FACILITY - BIOMASS FIRED**

PHOENIX ENERGY - Gasifier with IC Engine
Parlin Fork Cogeneration Facility-\$45/ton Fuel Cost
 Financing: 100% Debt at 3.5% Interest
 Heat Recovered Worth \$11/MMBtu

This computer model allows the user to calculate the return on equity (ROE) on a capital investment in a cogeneration facility, given operating expenses, the prices for electricity and heat, and the cost of fuel, other operating expenses and income taxes.

If the ROE Achieved does not equal the ROE Required on the investment, the sale price of electricity (cell B23) can be adjusted to equate the two ROEs.

If the project is financed with 100% debt, adjust the sale price of electricity (cell B23) until the NPV of Cash Flow is 0. Income tax rates (cells B82 & B83) must be set to 0 if the investing entity is non-profit.

Input values are highlighted in green
 Calculated values are highlighted in blue
 Key output values are highlighted in lavender



Sale Prices - Base Year	
Electricity (Cents/Kwh)	12.79
Heat (\$/MMBtu)	11
ROE Required	0

Fuel Cost - Base Year (\$/ton)	45
---------------------------------------	----

Capital Costs (\$)	
Generating Facility	3,500,000
Heat Recovery System	100,000
Heat Distribution System	50,000
Total Capital Costs	3,650,000

Electrical - Base Year	
Gross Electrical Capacity (kWe)	1,000
Parasitic Load (Kwe)	170
Net Electrical Capacity (kWe)	830
Capacity Factor (%)	90
Annual Hours	7,884
Net Station Electrical Efficiency (%)	25
Gross Station Electrical Efficiency (%)	30
Annual Net Generation (kWh)	6,543,720
Capital cost per net electrical capacity (\$/kWe)	4,217
Income From Electricity Sales (\$/yr)	836,942

Fuel - Base Year	
Fuel Heating Value (Btu/lb)	8,500
Fuel Consumption Rate (t/h)	0.67
Fuel in Electric Units (kW)	3,320
Annual Fuel Consumption (t/yr)	5,258
Fuel Ash Concentration (%)	5
Annual Ash Disposal (t/yr)	263

Heat-base year	
Total heat produced (MMBtu/yr)	89,387
Cogeneration efficiency (%)	38
Aggregate fraction of heat recovered (%)	8
Heat recovered and sold (MMBtu/yr)	7,446
Total income from heat sales (\$/yr)	81,901

Expenses-base year	
Fuel Cost (\$/yr)	236,613
Labor Cost (\$/yr)	100,000
Maintenance Cost (\$/yr)	50,000

If financing includes equity, adjust electricity price until ROE Achieved equals ROE Required.
 If 100% debt financed, adjust electricity price until NPV of Cash Flow is 0.

ROE Achieved	NA
Levelized Price/Cost of Electricity	15.2
NPV of Cash Flow	-3458

Insurance/Property Tax (\$/y)	20,000
Utilities (\$/y)	10,000
Ash Disposal (\$/y)-use negative value for sales	15,700
Administrative and General (\$/y)	34,300
Other Operating Expenses (\$/y)	20,000
Total Non-Fuel Expenses (\$/y)	250,000
Total Expenses Including Fuel (\$/y)	486,613

Taxes & Royalties

Federal Income Tax Rate (%)	0.00
State Income Tax Rate (%)	0.00
Production Tax Credit (\$/kWh)	0.000
Number of years PTC received	5
Royalty Payment (% of total revenue)	0
Tax Depreciation Method	SL
Investment Tax Credit (%)	0

SL = Straight line depreciation
M-5 = MACRS-5 five year schedule depreciation
M-10 = MACRS-10 ten year schedule depreciation

Income other than energy

Electricity Capacity Payment (\$/kW-y)	0
Annual Capacity Payment (\$/y)	0
Debt Reserve Required?	No
Interest Rate on Debt Reserve (%/yr)	5
Annual Debt Reserve Interest (\$/y)	0

Enter: Yes or No

Escalation

Escalation-Fuel (%/y)	2.00
Escalation for Production Tax Credit (%/y)	0.00
Escalation - Electricity sales price (%/yr)	2.00
Escalation-Heat sales price (%/y)	2.00
Escalation - Capacity payments (\$/yr)	0.00
Escalation-Other (%/y)	2.00

Financing

Debt ratio (%)	100.00
Equity ratio (%)	0.00
Interest Rate on Debt (%/y)	3.50
Economic Life (y)	20
Rate of equity required (%/y)	0.00
Weighted Cost of Capital (%/y)	3.50
Total Cost of Plant (\$)	3,650,000
Salvage Value (%)	0
Total Equity Invested (\$)	0
Total Debt Invested (\$)	3,650,000
Capital Recovery Factor (Equity)	#DIV/0!
Capital Recovery Factor (Debt)	0.0704
Annual Debt Payment (\$/y)	256,818
Debt Reserve (\$)	256,818

Debt Schedule

Year	Remaining Principal	Annual Payment	Annual Interest	Principal Reduction
1	3,650,000	256,818	127750	129,068
2	3,520,932	256,818	123233	133,585
3	3,387,347	256,818	118557	138,261
4	3,249,086	256,818	113718	143,100
5	3,105,986	256,818	108710	148,108
6	2,957,878	256,818	103526	153,292
7	2,804,585	256,818	98160	158,657
8	2,645,928	256,818	92607	164,210
9	2,481,718	256,818	86860	169,958
10	2,311,760	256,818	80912	175,906
11	2,135,853	256,818	74755	182,063
12	1,953,790	256,818	68383	188,435
13	1,765,355	256,818	61787	195,031
14	1,570,325	256,818	54961	201,857
15	1,368,468	256,818	47896	208,922
16	1,159,546	256,818	40584	216,234
17	943,313	256,818	33016	223,802
18	719,511	256,818	25183	231,635
19	487,876	256,818	17076	239,742
20	248,133	256,818	8685	248,133

Tax Depreciation Schedule

Year	MACRS-5 year	MACRS-10 year	Straight Line-20 year
1	0.2000	0.1000	0.0500
2	0.3200	0.1800	0.0500
3	0.1920	0.1440	0.0500
4	0.1152	0.1152	0.0500
5	0.1152	0.0922	0.0500
6	0.0576	0.0737	0.0500
7	0.0000	0.0655	0.0500
8	0.0000	0.0655	0.0500
9	0.0000	0.0655	0.0500
10	0.0000	0.0655	0.0500
11	0.0000	0.0329	0.0500
12	0.0000	0.0000	0.0500
13	0.0000	0.0000	0.0500
14	0.0000	0.0000	0.0500
15	0.0000	0.0000	0.0500
16	0.0000	0.0000	0.0500
17	0.0000	0.0000	0.0500
18	0.0000	0.0000	0.0500
19	0.0000	0.0000	0.0500
20	0.0000	0.0000	0.0500
	1.0000	1.0000	1.0000

Production Tax Credit Schedule

Year	Received ?
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	No
7	No
8	No
9	No
10	No
11	No
12	No
13	No
14	No
15	No
16	No
17	No
18	No
19	No
20	No

Annual Cash Flow (\$)

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Revenue																				
Electricity Sales	836,942	853,681	870,754	888,169	905,933	924,051	942,532	961,383	980,611	1,000,223	1,020,227	1,040,632	1,061,445	1,082,673	1,104,327	1,126,413	1,148,942	1,171,921	1,195,359	1,219,266
Heat Sales	81,901	83,539	85,210	86,914	88,652	90,425	92,234	94,078	95,960	97,879	99,837	101,833	103,870	105,947	108,066	110,228	112,432	114,681	116,974	119,314
Capacity Payments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Production Tax Credit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest on Debt Reserve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Revenue	918,843	937,219	955,964	975,083	994,585	1,014,476	1,034,766	1,055,461	1,076,570	1,098,102	1,120,064	1,142,465	1,165,315	1,188,621	1,212,393	1,236,641	1,261,374	1,286,601	1,312,333	1,338,580
Expenses																				
Fuel	236,613	241,345	246,172	251,096	256,118	261,240	266,465	271,794	277,230	282,775	288,430	294,199	300,083	306,084	312,206	318,450	324,819	331,316	337,942	344,701
Other Operating Expenses	250,000	255,000	260,100	265,302	270,608	276,020	281,541	287,171	292,915	298,773	304,749	310,844	317,060	323,402	329,870	336,467	343,196	350,060	357,062	364,203
Royalties	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Expense	486,613	496,345	506,272	516,398	526,726	537,260	548,006	558,966	570,145	581,548	593,179	605,042	617,143	629,486	642,076	654,917	668,016	681,376	695,004	708,904
Operating Cash Flow	432,229	440,874	449,691	458,685	467,859	477,216	486,760	496,496	506,426	516,554	526,885	537,423	548,171	559,135	570,317	581,724	593,358	605,225	617,330	629,677

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Income Tax																					
Debt Interest	127,750	123,233	118,557	113,718	108,710	103,526	98,160	92,607	86,860	80,912	74,755	68,383	61,787	54,961	47,896	40,584	33,016	25,183	17,076	8,685	
Tax Depreciation	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	
SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MACRS-5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MACRS-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Taxable Income	121,979	135,141	148,634	162,467	176,649	191,190	206,100	221,388	237,065	253,142	269,630	286,540	303,884	321,673	339,921	358,640	377,842	397,543	417,754	438,492	
Federal Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
State Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Investment Tax Credit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Income Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Debt Payment	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	256,818	
Owner's Equity	0																				
Debt Reserve	0																				
Return of Debt Reserve																				0	
Debt Outlay (No cost financing only)																				-3,650,000	
Salvage Value Recovered																				0	
Total Owner's Capital																				-3,650,000	
Cash Flow	-3,650,000	175,411	184,056	192,873	201,867	211,041	220,398	229,943	239,678	249,608	259,736	270,067	280,605	291,353	302,317	313,500	324,906	336,540	348,407	360,512	372,859
IRR																					NA
NPV																					-3,458
Annual Electrical Generation (Kwh)	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	
Annual Electricity Price - cents/Kwh	12.79	13.0	13.3	13.6	13.8	14.1	14.4	14.7	15.0	15.3	15.6	15.9	16.2	16.5	16.9	17.2	17.6	17.9	18.3	18.6	
PV Electric Revenue (\$)																					14,128,332
Levelized Annual Revenue (\$)																					994,085
Levelized Electricity Price (cents/Kwh)																					15.2

Property of TSS Consultants, Sacramento, CA
Contact Fred Tomatore, 916-601-0531, or
David Augustine, 916-359-6303

**RETURN ON INVESTMENT - LEVELIZED COST OF ELECTRICITY MODEL
COGENERATION FACILITY - BIOMASS FIRED**

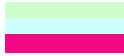
PHOENIX ENERGY - Gasifier with IC Engine
Parlin Fork Cogeneration Facility-\$35/ton Fuel Cost
 Financing: 100% Grant
 Heat Recovered Worth \$11/MMBtu

This computer model allows the user to calculate the return on equity (ROE) on a capital investment in a cogeneration facility, given operating expenses, the prices for electricity and heat, and the cost of fuel, other operating expenses and income taxes.

If the ROE Achieved does not equal the ROE Required on the investment, the sale price of electricity (cell B23) can be adjusted to equate the two ROEs.

If the project is financed with 100% debt, adjust the sale price of electricity (cell B23) until the NPV of Cash Flow is 0. Income tax rates (cells B82 & B83) must be set to 0 if the investing entity is non-profit.

Input values are highlighted in green
 Calculated values are highlighted in blue
 Key output values are highlighted in lavender



Sale Prices - Base Year	
Electricity (Cents/Kwh)	7.68
Heat (\$/MMBtu)	11
ROE Required	0

Fuel Cost - Base Year (\$/ton)	35
---------------------------------------	----

Capital Costs (\$)	
Generating Facility	3,500,000
Heat Recovery System	100,000
Heat Distribution System	50,000
Total Capital Costs	3,650,000

Electrical - Base Year	
Gross Electrical Capacity (kWe)	1,000
Parasitic Load (Kwe)	170
Net Electrical Capacity (kWe)	830
Capacity Factor (%)	90
Annual Hours	7,884
Net Station Electrical Efficiency (%)	25
Gross Station Electrical Efficiency (%)	30
Annual Net Generation (kWh)	6,543,720
Capital cost per net electrical capacity (\$/kWe)	4,217
Income From Electricity Sales (\$/yr)	502,558

Fuel - Base Year	
Fuel Heating Value (Btu/lb)	8,500
Fuel Consumption Rate (t/h)	0.67
Fuel in Electric Units (kW)	3,320
Annual Fuel Consumption (t/yr)	5,258
Fuel Ash Concentration (%)	5
Annual Ash Disposal (t/yr)	263

Heat-base year	
Total heat produced (MMBtu/yr)	89,387
Cogeneration efficiency (%)	38
Aggregate fraction of heat recovered (%)	8
Heat recovered and sold (MMBtu/yr)	7,446
Total income from heat sales (\$/yr)	81,901

Expenses-base year	
Fuel Cost (\$/yr)	184,033
Labor Cost (\$/yr)	100,000
Maintenance Cost (\$/yr)	50,000

If financing includes equity, adjust electricity price until ROE Achieved equals ROE Required.
 If 100% debt financed, adjust electricity price until NPV of Cash Flow is 0.

ROE Achieved	NA
Levelized Price/Cost of Electricity	9.3
NPV of Cash Flow	4914

Insurance/Property Tax (\$/y)	20,000
Utilities (\$/y)	10,000
Ash Disposal (\$/y)-use negative value for sales	15,700
Administrative and General (\$/y)	34,300
Other Operating Expenses (\$/y)	20,000
Total Non-Fuel Expenses (\$/y)	250,000
Total Expenses Including Fuel (\$/y)	434,033

Taxes & Royalties

Federal Income Tax Rate (%)	0.00
State Income Tax Rate (%)	0.00
Production Tax Credit (\$/kWh)	0.000
Number of years PTC received	5
Royalty Payment (% of total revenue)	0
Tax Depreciation Method	SL
Investment Tax Credit (%)	0

SL = Straight line depreciation
M-5 = MACRS-5 five year schedule depreciation
M-10 = MACRS-10 ten year schedule depreciation

Income other than energy

Electricity Capacity Payment (\$/kW-y)	0
Annual Capacity Payment (\$/y)	0
Debt Reserve Required?	No
Interest Rate on Debt Reserve (%/yr)	5
Annual Debt Reserve Interest (\$/y)	0

Enter: Yes or No

Escalation

Escalation-Fuel (%/y)	2.00
Escalation for Production Tax Credit (%/y)	0.00
Escalation - Electricity sales price (%/yr)	2.00
Escalation-Heat sales price (%/y)	2.00
Escalation - Capacity payments (\$/yr)	0.00
Escalation-Other (%/y)	2.00

Financing

Debt ratio (%)	100.00
Equity ratio (%)	0.00
Interest Rate on Debt (%/y)	0.00
Economic Life (y)	20
Rate of equity required (%/y)	0.00
Weighted Cost of Capital (%/y)	0.00
Total Cost of Plant (\$)	3,650,000
Salvage Value (%)	10
Total Equity Invested (\$)	0
Total Debt Invested (\$)	3,650,000
Capital Recovery Factor (Equity)	#DIV/0!
Capital Recovery Factor (Debt)	0.0500
Annual Debt Payment (\$/y)	182,502
Debt Reserve (\$)	182,502

Debt Schedule

Year	Remaining Principal	Annual Payment	Annual Interest	Principal Reduction
1	3,650,000	182,502	3.65	182,498
2	3,467,502	182,502	3	182,498
3	3,285,003	182,502	3	182,499
4	3,102,505	182,502	3	182,499
5	2,920,006	182,502	3	182,499
6	2,737,507	182,502	3	182,499
7	2,555,008	182,502	3	182,499
8	2,372,508	182,502	2	182,500
9	2,190,009	182,502	2	182,500
10	2,007,509	182,502	2	182,500
11	1,825,009	182,502	2	182,500
12	1,642,509	182,502	2	182,500
13	1,460,009	182,502	1	182,500
14	1,277,508	182,502	1	182,501
15	1,095,008	182,502	1	182,501
16	912,507	182,502	1	182,501
17	730,006	182,502	1	182,501
18	547,505	182,502	1	182,501
19	365,003	182,502	0	182,502
20	182,502	182,502	0	182,502

Tax Depreciation Schedule

Year	MACRS-5 year	MACRS-10 year	Straight Line-20 year
1	0.2000	0.1000	0.0500
2	0.3200	0.1800	0.0500
3	0.1920	0.1440	0.0500
4	0.1152	0.1152	0.0500
5	0.1152	0.0922	0.0500
6	0.0576	0.0737	0.0500
7	0.0000	0.0655	0.0500
8	0.0000	0.0655	0.0500
9	0.0000	0.0655	0.0500
10	0.0000	0.0655	0.0500
11	0.0000	0.0329	0.0500
12	0.0000	0.0000	0.0500
13	0.0000	0.0000	0.0500
14	0.0000	0.0000	0.0500
15	0.0000	0.0000	0.0500
16	0.0000	0.0000	0.0500
17	0.0000	0.0000	0.0500
18	0.0000	0.0000	0.0500
19	0.0000	0.0000	0.0500
20	0.0000	0.0000	0.0500
	1.0000	1.0000	1.0000

Production Tax Credit Schedule

Year	Received ?
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	No
7	No
8	No
9	No
10	No
11	No
12	No
13	No
14	No
15	No
16	No
17	No
18	No
19	No
20	No

Annual Cash Flow (\$)

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Revenue																				
Electricity Sales	502,558	512,609	522,861	533,318	543,985	554,864	565,962	577,281	588,826	600,603	612,615	624,867	637,365	650,112	663,114	676,376	689,904	703,702	717,776	732,132
Heat Sales	81,901	83,539	85,210	86,914	88,652	90,425	92,234	94,078	95,960	97,879	99,837	101,833	103,870	105,947	108,066	110,228	112,432	114,681	116,974	119,314
Capacity Payments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Production Tax Credit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest on Debt Reserve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Revenue	584,458	596,148	608,071	620,232	632,637	645,289	658,195	671,359	684,786	698,482	712,452	726,701	741,235	756,059	771,181	786,604	802,336	818,383	834,751	851,446
Expenses																				
Fuel	184,033	187,713	191,467	195,297	199,203	203,187	207,250	211,395	215,623	219,936	224,335	228,821	233,398	238,066	242,827	247,684	252,637	257,690	262,844	268,101
Other Operating Expenses	250,000	255,000	260,100	265,302	270,608	276,020	281,541	287,171	292,915	298,773	304,749	310,844	317,060	323,402	329,870	336,467	343,196	350,060	357,062	364,203
Royalties	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Expense	434,033	442,713	451,567	460,599	469,811	479,207	488,791	498,567	508,538	518,709	529,083	539,665	550,458	561,467	572,697	584,151	595,834	607,750	619,905	632,303
Operating Cash Flow	150,426	153,434	156,503	159,633	162,826	166,082	169,404	172,792	176,248	179,773	183,368	187,036	190,776	194,592	198,484	202,454	206,503	210,633	214,845	219,142

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Income Tax																					
Debt Interest		4	3	3	3	3	3	3	2	2	2	2	2	1	1	1	1	1	1	0	0
Tax Depreciation																					
SL	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500
MACRS-5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MACRS-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxable Income	-32,078	-29,069	-26,000	-22,870	-19,677	-16,420	-13,098	-9,710	-6,254	-2,729	867	4,534	8,275	12,091	15,983	19,953	24,002	28,132	32,345	36,642	
Federal Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
State Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Investment Tax Credit	0																				
Total Income Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Debt Payment	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	
Owner's Equity	0																				
Debt Reserve	0																				
Return of Debt	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	
Debt Outlay (No cost financing only)	-3,650,000																				
Salvage Value Recovered																					365,000
Total Owner's Capital	-3,650,000																				
Cash Flow	-3,650,000	150,426	153,434	156,503	159,633	162,826	166,082	169,404	172,792	176,248	179,773	183,368	187,036	190,776	194,592	198,484	202,454	206,503	210,633	214,845	219,142
IRR		NA																			
NPV		4,914																			
Annual Electrical Generation (Kwh)	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	
Annual Electricity Price - cents/Kwh	7.68	7.8	8.0	8.2	8.3	8.5	8.6	8.8	9.0	9.2	9.4	9.5	9.7	9.9	10.1	10.3	10.5	10.8	11.0	11.2	
PV Electric Revenue (\$)	12,210,694																				
Levelized Annual Revenue (\$)	610,541																				
Levelized Electricity Price (cents/Kwh)		9.3																			

Property of TSS Consultants, Sacramento, CA
Contact Fred Tomatore, 916-601-0531, or
David Augustine, 916-359-6303

**RETURN ON INVESTMENT - LEVELIZED COST OF ELECTRICITY MODEL
COGENERATION FACILITY - BIOMASS FIRED**

PHOENIX ENERGY - Gasifier with IC Engine
Parlin Fork Cogeneration Facility-\$45/ton Fuel Cost
 Financing: 100% Grant
 Heat Recovered Worth \$11/MMBtu

This computer model allows the user to calculate the return on equity (ROE) on a capital investment in a cogeneration facility, given operating expenses, the prices for electricity and heat, and the cost of fuel, other operating expenses and income taxes.

If the ROE Achieved does not equal the ROE Required on the investment, the sale price of electricity (cell B23) can be adjusted to equate the two ROEs.

If the project is financed with 100% debt, adjust the sale price of electricity (cell B23) until the NPV of Cash Flow is 0. Income tax rates (cells B82 & B83) must be set to 0 if the investing entity is non-profit.

Input values are highlighted in green
 Calculated values are highlighted in blue
 Key output values are highlighted in lavender



Sale Prices - Base Year	
Electricity (Cents/Kwh)	8.48
Heat (\$/MMBtu)	11
ROE Required	0

Fuel Cost - Base Year (\$/ton)	45
---------------------------------------	----

Capital Costs (\$)	
Generating Facility	3,500,000
Heat Recovery System	100,000
Heat Distribution System	50,000
Total Capital Costs	3,650,000

Electrical - Base Year	
Gross Electrical Capacity (kWe)	1,000
Parasitic Load (Kwe)	170
Net Electrical Capacity (kWe)	830
Capacity Factor (%)	90
Annual Hours	7,884
Net Station Electrical Efficiency (%)	25
Gross Station Electrical Efficiency (%)	30
Annual Net Generation (kWh)	6,543,720
Capital cost per net electrical capacity (\$/kWe)	4,217
Income From Electricity Sales (\$/yr)	554,907

Fuel - Base Year	
Fuel Heating Value (Btu/lb)	8,500
Fuel Consumption Rate (t/h)	0.67
Fuel in Electric Units (kW)	3,320
Annual Fuel Consumption (t/yr)	5,258
Fuel Ash Concentration (%)	5
Annual Ash Disposal (t/yr)	263

Heat-base year	
Total heat produced (MMBtu/yr)	89,387
Cogeneration efficiency (%)	38
Aggregate fraction of heat recovered (%)	8
Heat recovered and sold (MMBtu/yr)	7,446
Total income from heat sales (\$/yr)	81,901

Expenses-base year	
Fuel Cost (\$/yr)	236,613
Labor Cost (\$/yr)	100,000
Maintenance Cost (\$/yr)	50,000

If financing includes equity, adjust electricity price until ROE Achieved equals ROE Required.
 If 100% debt financed, adjust electricity price until NPV of Cash Flow is 0.

ROE Achieved	NA
Levelized Price/Cost of Electricity	10.3
NPV of Cash Flow	-697

Insurance/Property Tax (\$/y)	20,000
Utilities (\$/y)	10,000
Ash Disposal (\$/y)-use negative value for sales	15,700
Administrative and General (\$/y)	34,300
Other Operating Expenses (\$/y)	20,000
Total Non-Fuel Expenses (\$/y)	250,000
Total Expenses Including Fuel (\$/y)	486,613

Taxes & Royalties

Federal Income Tax Rate (%)	0.00
State Income Tax Rate (%)	0.00
Production Tax Credit (\$/kWh)	0.000
Number of years PTC received	5
Royalty Payment (% of total revenue)	0
Tax Depreciation Method	SL
Investment Tax Credit (%)	0

SL = Straight line depreciation
M-5 = MACRS-5 five year schedule depreciation
M-10 = MACRS-10 ten year schedule depreciation

Income other than energy

Electricity Capacity Payment (\$/kW-y)	0
Annual Capacity Payment (\$/y)	0
Debt Reserve Required?	No
Interest Rate on Debt Reserve (%/yr)	5
Annual Debt Reserve Interest (\$/y)	0

Enter: Yes or No

Escalation

Escalation-Fuel (%/y)	2.00
Escalation for Production Tax Credit (%/y)	0.00
Escalation - Electricity sales price (%/yr)	2.00
Escalation-Heat sales price (%/y)	2.00
Escalation - Capacity payments (\$/yr)	0.00
Escalation-Other (%/y)	2.00

Financing

Debt ratio (%)	100.00
Equity ratio (%)	0.00
Interest Rate on Debt (%/y)	0.00
Economic Life (y)	20
Rate of equity required (%/y)	0.00
Weighted Cost of Capital (%/y)	0.00
Total Cost of Plant (\$)	3,650,000
Salvage Value (%)	10
Total Equity Invested (\$)	0
Total Debt Invested (\$)	3,650,000
Capital Recovery Factor (Equity)	#DIV/0!
Capital Recovery Factor (Debt)	0.0500
Annual Debt Payment (\$/y)	182,502
Debt Reserve (\$)	182,502

Debt Schedule

Year	Remaining Principal	Annual Payment	Annual Interest	Principal Reduction
1	3,650,000	182,502	3.65	182,498
2	3,467,502	182,502	3	182,498
3	3,285,003	182,502	3	182,499
4	3,102,505	182,502	3	182,499
5	2,920,006	182,502	3	182,499
6	2,737,507	182,502	3	182,499
7	2,555,008	182,502	3	182,499
8	2,372,508	182,502	2	182,500
9	2,190,009	182,502	2	182,500
10	2,007,509	182,502	2	182,500
11	1,825,009	182,502	2	182,500
12	1,642,509	182,502	2	182,500
13	1,460,009	182,502	1	182,500
14	1,277,508	182,502	1	182,501
15	1,095,008	182,502	1	182,501
16	912,507	182,502	1	182,501
17	730,006	182,502	1	182,501
18	547,505	182,502	1	182,501
19	365,003	182,502	0	182,502
20	182,502	182,502	0	182,502

Tax Depreciation Schedule

Year	MACRS-5 year	MACRS-10 year	Straight Line-20 year
1	0.2000	0.1000	0.0500
2	0.3200	0.1800	0.0500
3	0.1920	0.1440	0.0500
4	0.1152	0.1152	0.0500
5	0.1152	0.0922	0.0500
6	0.0576	0.0737	0.0500
7	0.0000	0.0655	0.0500
8	0.0000	0.0655	0.0500
9	0.0000	0.0655	0.0500
10	0.0000	0.0655	0.0500
11	0.0000	0.0329	0.0500
12	0.0000	0.0000	0.0500
13	0.0000	0.0000	0.0500
14	0.0000	0.0000	0.0500
15	0.0000	0.0000	0.0500
16	0.0000	0.0000	0.0500
17	0.0000	0.0000	0.0500
18	0.0000	0.0000	0.0500
19	0.0000	0.0000	0.0500
20	0.0000	0.0000	0.0500
	1.0000	1.0000	1.0000

Production Tax Credit Schedule

Year	Received ?
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	No
7	No
8	No
9	No
10	No
11	No
12	No
13	No
14	No
15	No
16	No
17	No
18	No
19	No
20	No

Annual Cash Flow (\$)

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Revenue																				
Electricity Sales	554,907	566,006	577,326	588,872	600,650	612,663	624,916	637,414	650,163	663,166	676,429	689,958	703,757	717,832	732,189	746,832	761,769	777,004	792,544	808,395
Heat Sales	81,901	83,539	85,210	86,914	88,652	90,425	92,234	94,078	95,960	97,879	99,837	101,833	103,870	105,947	108,066	110,228	112,432	114,681	116,974	119,314
Capacity Payments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Production Tax Credit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest on Debt Reserve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Revenue	636,808	649,544	662,535	675,786	689,302	703,088	717,149	731,492	746,122	761,045	776,266	791,791	807,627	823,779	840,255	857,060	874,201	891,685	909,519	927,709
Expenses																				
Fuel	236,613	241,345	246,172	251,096	256,118	261,240	266,465	271,794	277,230	282,775	288,430	294,199	300,083	306,084	312,206	318,450	324,819	331,316	337,942	344,701
Other Operating Expenses	250,000	255,000	260,100	265,302	270,608	276,020	281,541	287,171	292,915	298,773	304,749	310,844	317,060	323,402	329,870	336,467	343,196	350,060	357,062	364,203
Royalties	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Expense	486,613	496,345	506,272	516,398	526,726	537,260	548,006	558,966	570,145	581,548	593,179	605,042	617,143	629,486	642,076	654,917	668,016	681,376	695,004	708,904
Operating Cash Flow	150,195	153,199	156,263	159,388	162,576	165,827	169,144	172,527	175,977	179,497	183,087	186,749	190,484	194,293	198,179	202,143	206,186	210,309	214,515	218,806

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Income Tax																					
Debt Interest		4	3	3	3	3	3	3	2	2	2	2	2	1	1	1	1	1	1	0	0
Tax Depreciation																					
SL	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500	182,500
MACRS-5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MACRS-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxable Income	-32,309	-29,305	-26,240	-23,115	-19,927	-16,675	-13,359	-9,976	-6,525	-3,005	585	4,247	7,982	11,792	15,678	19,642	23,685	27,809	32,015	36,306	
Federal Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
State Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Investment Tax Credit	0																				
Total Income Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Debt Payment	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	
Owner's Equity	0																				
Debt Reserve	0																				
Return of Debt	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	182,502	
Debt Outlay (No cost financing only)	-3,650,000																				
Salvage Value Recovered																				365,000	
Total Owner's Capital	-3,650,000																				
Cash Flow	-3,650,000	150,195	153,199	156,263	159,388	162,576	165,827	169,144	172,527	175,977	179,497	183,087	186,749	190,484	194,293	198,179	202,143	206,186	210,309	214,515	218,806
IRR		NA																			
NPV		-697																			
Annual Electrical Generation (Kwh)	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	6,543,720	
Annual Electricity Price - cents/Kwh	8.48	8.6	8.8	9.0	9.2	9.4	9.5	9.7	9.9	10.1	10.3	10.5	10.8	11.0	11.2	11.4	11.6	11.9	12.1	12.4	
PV Electric Revenue (\$)	13,482,641																				
Levelized Annual Revenue (\$)	674,139																				
Levelized Electricity Price (cents/Kwh)	10.3																				

Property of TSS Consultants, Sacramento, CA
Contact Fred Tomatore, 916-601-0531, or
David Augustine, 916-359-6303

**RETURN ON INVESTMENT - LEVELIZED COST OF ELECTRICITY MODEL
COGENERATION FACILITY - BIOMASS FIRED**

NEXTERRA - Gasifier with IC Engine
Parlin Fork Cogeneration Facility-\$35/ton Fuel Cost
 Financing: 100% Debt at 3.5% Interest
 Heat Recovered Worth \$11/MMBtu

This computer model allows the user to calculate the return on equity (ROE) on a capital investment in a cogeneration facility, given operating expenses, the prices for electricity and heat, and the cost of fuel, other operating expenses and income taxes.

If the ROE Achieved does not equal the ROE Required on the investment, the sale price of electricity (cell B23) can be adjusted to equate the two ROEs.

If the project is financed with 100% debt, adjust the sale price of electricity (cell B23) until the NPV of Cash Flow is 0. Income tax rates (cells B82 & B83) must be set to 0 if the investing entity is non-profit.

Input values are highlighted in green
 Calculated values are highlighted in blue
 Key output values are highlighted in lavender



Sale Prices - Base Year	
Electricity (Cents/Kwh)	12.81
Heat (\$/MMBtu)	11
ROE Required	0

Fuel Cost - Base Year (\$/ton)	35
---------------------------------------	----

Capital Costs (\$)	
Generating Facility	10,000,000
Heat Recovery System	100,000
Heat Distribution System	50,000
Total Capital Costs	10,150,000

Electrical - Base Year	
Gross Electrical Capacity (kWe)	2,000
Parasitic Load (Kwe)	300
Net Electrical Capacity (kWe)	1,700
Capacity Factor (%)	90
Annual Hours	7,884
Net Station Electrical Efficiency (%)	25
Gross Station Electrical Efficiency (%)	29
Annual Net Generation (kWh)	13,402,800
Capital cost per net electrical capacity (\$/kWe)	5,882
Income From Electricity Sales (\$/yr)	1,716,899

Fuel - Base Year	
Fuel Heating Value (Btu/lb)	8,500
Fuel Consumption Rate (t/h)	1.37
Fuel in Electric Units (kW)	6,800
Annual Fuel Consumption (t/yr)	10,770
Fuel Ash Concentration (%)	5
Annual Ash Disposal (t/yr)	538

Heat-base year	
Total heat produced (MMBtu/yr)	183,082
Cogeneration efficiency (%)	34
Aggregate fraction of heat recovered (%)	4
Heat recovered and sold (MMBtu/yr)	7,485
Total income from heat sales (\$/yr)	82,333

Expenses-base year	
Fuel Cost (\$/yr)	376,934
Labor Cost (\$/yr)	100,000
Maintenance Cost (\$/yr)	50,000

If financing includes equity, adjust electricity price until ROE Achieved equals ROE Required.
 If 100% debt financed, adjust electricity price until NPV of Cash Flow is 0.

ROE Achieved	NA
Levelized Price/Cost of Electricity	15.2
NPV of Cash Flow	-436

Insurance/Property Tax (\$/y)	20,000
Utilities (\$/y)	10,000
Ash Disposal (\$/y)-use negative value for sales	15,700
Administrative and General (\$/y)	34,300
Other Operating Expenses (\$/y)	20,000
Total Non-Fuel Expenses (\$/y)	250,000
Total Expenses Including Fuel (\$/y)	626,934

Taxes & Royalties

Federal Income Tax Rate (%)	0.00
State Income Tax Rate (%)	0.00
Production Tax Credit (\$/kWh)	0.000
Number of years PTC received	5
Royalty Payment (% of total revenue)	0
Tax Depreciation Method	SL
Investment Tax Credit (%)	0

SL = Straight line depreciation
M-5 = MACRS-5 five year schedule depreciation
M-10 = MACRS-10 ten year schedule depreciation

Income other than energy

Electricity Capacity Payment (\$/kW-y)	0
Annual Capacity Payment (\$/y)	0
Debt Reserve Required?	No
Interest Rate on Debt Reserve (%/yr)	5
Annual Debt Reserve Interest (\$/y)	0

Enter: Yes or No

Escalation

Escalation-Fuel (%/y)	2.00
Escalation for Production Tax Credit (%/y)	0.00
Escalation - Electricity sales price (%/yr)	2.00
Escalation -Heat sales price (%/y)	2.00
Escalation - Capacity payments (\$/yr)	0.00
Escalation-Other (%/y)	2.00

Financing

Debt ratio (%)	100.00
Equity ratio (%)	0.00
Interest Rate on Debt (%/y)	3.50
Economic Life (y)	20
Rate of equity required (%/y)	0.00
Weighted Cost of Capital (%/y)	3.50
Total Cost of Plant (\$)	10,150,000
Salvage Value (%)	10
Total Equity Invested (\$)	0
Total Debt Invested (\$)	10,150,000
Capital Recovery Factor (Equity)	#DIV/0!
Capital Recovery Factor (Debt)	0.0704
Annual Debt Payment (\$/y)	714,165
Debt Reserve (\$)	714,165

Debt Schedule

Year	Remaining Principal	Annual Payment	Annual Interest	Principal Reduction
1	#####	714,165	355250	358,915
2	9,791,085	714,165	342688	371,477
3	9,419,608	714,165	329686	384,479
4	9,035,129	714,165	316230	397,935
5	8,637,194	714,165	302302	411,863
6	8,225,331	714,165	287887	426,278
7	7,799,053	714,165	272967	441,198
8	7,357,855	714,165	257525	456,640
9	6,901,214	714,165	241543	472,622
10	6,428,592	714,165	225001	489,164
11	5,939,428	714,165	207880	506,285
12	5,433,143	714,165	190160	524,005
13	4,909,138	714,165	171820	542,345
14	4,366,793	714,165	152838	561,327
15	3,805,466	714,165	133191	580,974
16	3,224,492	714,165	112857	601,308
17	2,623,184	714,165	91811	622,353
18	2,000,831	714,165	70029	644,136
19	1,356,695	714,165	47484	666,681
20	690,014	714,165	24151	690,014

Tax Depreciation Schedule

Year	MACRS-5 year	MACRS-10 year	Straight Line-20 year
1	0.2000	0.1000	0.0500
2	0.3200	0.1800	0.0500
3	0.1920	0.1440	0.0500
4	0.1152	0.1152	0.0500
5	0.1152	0.0922	0.0500
6	0.0576	0.0737	0.0500
7	0.0000	0.0655	0.0500
8	0.0000	0.0655	0.0500
9	0.0000	0.0655	0.0500
10	0.0000	0.0655	0.0500
11	0.0000	0.0329	0.0500
12	0.0000	0.0000	0.0500
13	0.0000	0.0000	0.0500
14	0.0000	0.0000	0.0500
15	0.0000	0.0000	0.0500
16	0.0000	0.0000	0.0500
17	0.0000	0.0000	0.0500
18	0.0000	0.0000	0.0500
19	0.0000	0.0000	0.0500
20	0.0000	0.0000	0.0500
	1.0000	1.0000	1.0000

Production Tax Credit Schedule

Year	Received ?
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	No
7	No
8	No
9	No
10	No
11	No
12	No
13	No
14	No
15	No
16	No
17	No
18	No
19	No
20	No

Annual Cash Flow (\$)

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Revenue																				
Electricity Sales	1,716,899	1,751,237	1,786,261	1,821,987	1,858,426	1,895,595	1,933,507	1,972,177	2,011,620	2,051,853	2,092,890	2,134,748	2,177,443	2,220,992	2,265,411	2,310,720	2,356,934	2,404,073	2,452,154	2,501,197
Heat Sales	82,333	83,980	85,659	87,373	89,120	90,902	92,721	94,575	96,466	98,396	100,364	102,371	104,418	106,507	108,637	110,810	113,026	115,286	117,592	119,944
Capacity Payments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Production Tax Credit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest on Debt Reserve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Revenue	1,799,232	1,835,216	1,871,921	1,909,359	1,947,546	1,986,497	2,026,227	2,066,752	2,108,087	2,150,249	2,193,254	2,237,119	2,281,861	2,327,498	2,374,048	2,421,529	2,469,960	2,519,359	2,569,746	2,621,141
Expenses																				
Fuel	376,934	384,473	392,162	400,005	408,006	416,166	424,489	432,979	441,638	450,471	459,480	468,670	478,044	487,604	497,356	507,304	517,450	527,799	538,355	549,122
Other Operating Expenses	250,000	255,000	260,100	265,302	270,608	276,020	281,541	287,171	292,915	298,773	304,749	310,844	317,060	323,402	329,870	336,467	343,196	350,060	357,062	364,203
Royalties	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Expense	626,934	639,473	652,262	665,307	678,614	692,186	706,030	720,150	734,553	749,244	764,229	779,514	795,104	811,006	827,226	843,771	860,646	877,859	895,416	913,325
Operating Cash Flow	1,172,298	1,195,744	1,219,659	1,244,052	1,268,933	1,294,312	1,320,198	1,346,602	1,373,534	1,401,004	1,429,024	1,457,605	1,486,757	1,516,492	1,546,822	1,577,758	1,609,314	1,641,500	1,674,330	1,707,817

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Income Tax																					
Debt Interest	355,250	342,688	329,686	316,230	302,302	287,887	272,967	257,525	241,543	225,001	207,880	190,160	171,820	152,838	133,191	112,857	91,811	70,029	47,484	24,151	
Tax Depreciation	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	
SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MACRS-5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MACRS-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Taxable Income	309,548	345,556	382,472	420,322	459,131	498,925	539,731	581,577	624,491	668,504	713,645	759,945	807,437	856,154	906,131	957,401	1,010,002	1,063,971	1,119,346	1,176,166	
Federal Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
State Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Investment Tax Credit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Income Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Debt Payment	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	
Owner's Equity	0																				
Debt Reserve	0																				
Return of Debt Reserve																				0	
Debt Outlay (No cost financing only)																					
Salvage Value Recovered																				1,015,000	
Total Owner's Capital																					
Cash Flow	-10,150,000	458,133	481,579	505,494	529,887	554,768	580,147	606,033	632,437	659,369	686,839	714,860	743,440	772,592	802,327	832,657	863,594	895,149	927,335	960,165	2,008,652
IRR	NA																				
NPV	-436																				
Annual Electrical Generation (Kwh)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	
Annual Electricity Price - cents/Kwh	12.81	13.1	13.3	13.6	13.9	14.1	14.4	14.7	15.0	15.3	15.6	15.9	16.2	16.6	16.9	17.2	17.6	17.9	18.3	18.7	
PV Electric Revenue (\$)	28,982,799																				
Levelized Annual Revenue (\$)	2,039,261																				
Levelized Electricity Price (cents/Kwh)	15.2																				

Property of TSS Consultants, Sacramento, CA
Contact Fred Tomatore, 916-601-0531, or
David Augustine, 916-359-6303

**RETURN ON INVESTMENT - LEVELIZED COST OF ELECTRICITY MODEL
COGENERATION FACILITY - BIOMASS FIRED**

NEXTERRA - Gasifier with IC Engine
Parlin Fork Cogeneration Facility-\$45/ton Fuel Cost
 Financing: 100% Debt at 3.5% Interest
 Heat Recovered Worth \$11/MMBtu

This computer model allows the user to calculate the return on equity (ROE) on a capital investment in a cogeneration facility, given operating expenses, the prices for electricity and heat, and the cost of fuel, other operating expenses and income taxes.

If the ROE Achieved does not equal the ROE Required on the investment, the sale price of electricity (cell B23) can be adjusted to equate the two ROEs.

If the project is financed with 100% debt, adjust the sale price of electricity (cell B23) until the NPV of Cash Flow is 0. Income tax rates (cells B82 & B83) must be set to 0 if the investing entity is non-profit.

Input values are highlighted in green
 Calculated values are highlighted in blue
 Key output values are highlighted in lavender



Sale Prices - Base Year	
Electricity (Cents/Kwh)	13.61
Heat (\$/MMBtu)	11
ROE Required	0

Fuel Cost - Base Year (\$/ton)	45
---------------------------------------	----

Capital Costs (\$)	
Generating Facility	10,000,000
Heat Recovery System	100,000
Heat Distribution System	50,000
Total Capital Costs	10,150,000

Electrical - Base Year	
Gross Electrical Capacity (kWe)	2,000
Parasitic Load (Kwe)	300
Net Electrical Capacity (kWe)	1,700
Capacity Factor (%)	90
Annual Hours	7,884
Net Station Electrical Efficiency (%)	25
Gross Station Electrical Efficiency (%)	29
Annual Net Generation (kWh)	13,402,800
Capital cost per net electrical capacity (\$/kWe)	5,882
Income From Electricity Sales (\$/yr)	1,824,121

Fuel - Base Year	
Fuel Heating Value (Btu/lb)	8,500
Fuel Consumption Rate (t/h)	1.37
Fuel in Electric Units (kW)	6,800
Annual Fuel Consumption (t/yr)	10,770
Fuel Ash Concentration (%)	5
Annual Ash Disposal (t/yr)	538

Heat-base year	
Total heat produced (MMBtu/yr)	183,082
Cogeneration efficiency (%)	34
Aggregate fraction of heat recovered (%)	4
Heat recovered and sold (MMBtu/yr)	7,485
Total income from heat sales (\$/yr)	82,333

Expenses-base year	
Fuel Cost (\$/yr)	484,629
Labor Cost (\$/yr)	100,000
Maintenance Cost (\$/yr)	50,000

If financing includes equity, adjust electricity price until ROE Achieved equals ROE Required.
 If 100% debt financed, adjust electricity price until NPV of Cash Flow is 0.

ROE Achieved	NA
Levelized Price/Cost of Electricity	16.2
NPV of Cash Flow	-8151

Insurance/Property Tax (\$/y)	20,000
Utilities (\$/y)	10,000
Ash Disposal (\$/y)-use negative value for sales	15,700
Administrative and General (\$/y)	34,300
Other Operating Expenses (\$/y)	20,000
Total Non-Fuel Expenses (\$/y)	250,000
Total Expenses Including Fuel (\$/y)	734,629

Taxes & Royalties	
Federal Income Tax Rate (%)	0.00
State Income Tax Rate (%)	0.00
Production Tax Credit (\$/kWh)	0.000
Number of years PTC received	5
Royalty Payment (% of total revenue)	0
Tax Depreciation Method	SL
Investment Tax Credit (%)	0

SL = Straight line depreciation
M-5 = MACRS-5 five year schedule depreciation
M-10 = MACRS-10 ten year schedule depreciation

Income other than energy	
Electricity Capacity Payment (\$/kW-y)	0
Annual Capacity Payment (\$/y)	0
Debt Reserve Required?	No
Interest Rate on Debt Reserve (%/yr)	5
Annual Debt Reserve Interest (\$/y)	0

Enter: Yes or No

Escalation	
Escalation-Fuel (%/y)	2.00
Escalation for Production Tax Credit (%/y)	0.00
Escalation - Electricity sales price (%/yr)	2.00
Escalation-Heat sales price (%/y)	2.00
Escalation - Capacity payments (\$/yr)	0.00
Escalation-Other (%/y)	2.00

Financing	
Debt ratio (%)	100.00
Equity ratio (%)	0.00
Interest Rate on Debt (%/y)	3.50
Economic Life (y)	20
Rate of equity required (%/y)	0.00
Weighted Cost of Capital (%/y)	3.50
Total Cost of Plant (\$)	10,150,000
Salvage Value (%)	10
Total Equity Invested (\$)	0
Total Debt Invested (\$)	10,150,000
Capital Recovery Factor (Equity)	#DIV/0!
Capital Recovery Factor (Debt)	0.0704
Annual Debt Payment (\$/y)	714,165
Debt Reserve (\$)	714,165

Debt Schedule				
Year	Remaining Principal	Annual Payment	Annual Interest	Principal Reduction
1	#####	714,165	355250	358,915
2	9,791,085	714,165	342688	371,477
3	9,419,608	714,165	329686	384,479
4	9,035,129	714,165	316230	397,935
5	8,637,194	714,165	302302	411,863
6	8,225,331	714,165	287887	426,278
7	7,799,053	714,165	272967	441,198
8	7,357,855	714,165	257525	456,640
9	6,901,214	714,165	241543	472,622
10	6,428,592	714,165	225001	489,164
11	5,939,428	714,165	207880	506,285
12	5,433,143	714,165	190160	524,005
13	4,909,138	714,165	171820	542,345
14	4,366,793	714,165	152838	561,327
15	3,805,466	714,165	133191	580,974
16	3,224,492	714,165	112857	601,308
17	2,623,184	714,165	91811	622,353
18	2,000,831	714,165	70029	644,136
19	1,356,695	714,165	47484	666,681
20	690,014	714,165	24151	690,014

Tax Depreciation Schedule			
Year	MACRS-5 year	MACRS-10 year	Straight Line-20 year
1	0.2000	0.1000	0.0500
2	0.3200	0.1800	0.0500
3	0.1920	0.1440	0.0500
4	0.1152	0.1152	0.0500
5	0.1152	0.0922	0.0500
6	0.0576	0.0737	0.0500
7	0.0000	0.0655	0.0500
8	0.0000	0.0655	0.0500
9	0.0000	0.0655	0.0500
10	0.0000	0.0655	0.0500
11	0.0000	0.0329	0.0500
12	0.0000	0.0000	0.0500
13	0.0000	0.0000	0.0500
14	0.0000	0.0000	0.0500
15	0.0000	0.0000	0.0500
16	0.0000	0.0000	0.0500
17	0.0000	0.0000	0.0500
18	0.0000	0.0000	0.0500
19	0.0000	0.0000	0.0500
20	0.0000	0.0000	0.0500
	1.0000	1.0000	1.0000

Production Tax Credit Schedule	
Year	Received ?
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	No
7	No
8	No
9	No
10	No
11	No
12	No
13	No
14	No
15	No
16	No
17	No
18	No
19	No
20	No

Annual Cash Flow (\$)

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Revenue																				
Electricity Sales	1,824,121	1,860,604	1,897,816	1,935,772	1,974,487	2,013,977	2,054,257	2,095,342	2,137,249	2,179,994	2,223,593	2,268,065	2,313,427	2,359,695	2,406,889	2,455,027	2,504,127	2,554,210	2,605,294	2,657,400
Heat Sales	82,333	83,980	85,659	87,373	89,120	90,902	92,721	94,575	96,466	98,396	100,364	102,371	104,418	106,507	108,637	110,810	113,026	115,286	117,592	119,944
Capacity Payments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Production Tax Credit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest on Debt Reserve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Revenue	1,906,454	1,944,583	1,983,475	2,023,144	2,063,607	2,104,880	2,146,977	2,189,917	2,233,715	2,278,389	2,323,957	2,370,436	2,417,845	2,466,202	2,515,526	2,565,836	2,617,153	2,669,496	2,722,886	2,777,344
Expenses																				
Fuel	484,629	494,322	504,209	514,293	524,579	535,070	545,772	556,687	567,821	579,177	590,761	602,576	614,627	626,920	639,458	652,247	665,292	678,598	692,170	706,014
Other Operating Expenses	250,000	255,000	260,100	265,302	270,608	276,020	281,541	287,171	292,915	298,773	304,749	310,844	317,060	323,402	329,870	336,467	343,196	350,060	357,062	364,203
Royalties	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Expense	734,629	749,322	764,309	779,595	795,187	811,090	827,312	843,858	860,736	877,950	895,509	913,419	931,688	950,322	969,328	988,715	1,008,489	1,028,659	1,049,232	1,070,216
Operating Cash Flow	1,171,825	1,195,261	1,219,166	1,243,550	1,268,421	1,293,789	1,319,665	1,346,058	1,372,979	1,400,439	1,428,448	1,457,017	1,486,157	1,515,880	1,546,198	1,577,122	1,608,664	1,640,838	1,673,654	1,707,127

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Income Tax																					
Debt Interest	355,250	342,688	329,686	316,230	302,302	287,887	272,967	257,525	241,543	225,001	207,880	190,160	171,820	152,838	133,191	112,857	91,811	70,029	47,484	24,151	
Tax Depreciation	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	
SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MACRS-5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MACRS-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Taxable Income	309,075	345,073	381,980	419,820	458,619	498,403	539,198	581,033	623,937	667,938	713,068	759,357	806,837	855,543	905,507	956,765	1,009,353	1,063,308	1,118,670	1,175,477	
Federal Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
State Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Investment Tax Credit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Income Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Debt Payment	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	714,165	
Owner's Equity	0																				
Debt Reserve	0																				
Return of Debt Reserve																				0	
Debt Outlay (No cost financing only)																					
Salvage Value Recovered																				1,015,000	
Total Owner's Capital																					
Cash Flow	-10,150,000	457,660	481,096	505,002	529,385	554,256	579,624	605,500	631,893	658,815	686,274	714,283	742,852	771,992	801,715	832,033	862,957	894,499	926,673	959,489	2,007,962
IRR	NA																				
NPV	-8,151																				
Annual Electrical Generation (Kwh)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	
Annual Electricity Price - cents/Kwh	13.61	13.9	14.2	14.4	14.7	15.0	15.3	15.6	15.9	16.3	16.6	16.9	17.3	17.6	18.0	18.3	18.7	19.1	19.4	19.8	
PV Electric Revenue (\$)	30,792,810																				
Levelized Annual Revenue (\$)	2,166,615																				
Levelized Electricity Price (cents/Kwh)	16.2																				

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Contact Fred Tomatore, 916-601-0531, or
David Augustine, 916-359-6303

**RETURN ON INVESTMENT - LEVELIZED COST OF ELECTRICITY MODEL
COGENERATION FACILITY - BIOMASS FIRED**

NEXTERRA - Gasifier with IC Engine
Parlin Fork Cogeneration Facility-\$35/ton Fuel Cost
 Financing: 100% Grant
 Heat Recovered Worth \$11/MMBtu

This computer model allows the user to calculate the return on equity (ROE) on a capital investment in a cogeneration facility, given operating expenses, the prices for electricity and heat, and the cost of fuel, other operating expenses and income taxes.

If the ROE Achieved does not equal the ROE Required on the investment, the sale price of electricity (cell B23) can be adjusted to equate the two ROEs.

If the project is financed with 100% debt, adjust the sale price of electricity (cell B23) until the NPV of Cash Flow is 0. Income tax rates (cells B82 & B83) must be set to 0 if the investing entity is non-profit.

Input values are highlighted in green
 Calculated values are highlighted in blue
 Key output values are highlighted in lavender

Sale Prices - Base Year	
Electricity (Cents/Kwh)	7.18
Heat (\$/MMBtu)	11
ROE Required	0

Fuel Cost - Base Year (\$/ton)	35
---------------------------------------	----

Capital Costs (\$)	
Generating Facility	10,000,000
Heat Recovery System	100,000
Heat Distribution System	50,000
Total Capital Costs	10,150,000

Electrical - Base Year	
Gross Electrical Capacity (kWe)	2,000
Parasitic Load (Kwe)	300
Net Electrical Capacity (kWe)	1,700
Capacity Factor (%)	90
Annual Hours	7,884
Net Station Electrical Efficiency (%)	25
Gross Station Electrical Efficiency (%)	29
Annual Net Generation (kWh)	13,402,800
Capital cost per net electrical capacity (\$/kWe)	5,882
Income From Electricity Sales (\$/yr)	962,321

Fuel - Base Year	
Fuel Heating Value (Btu/lb)	8,500
Fuel Consumption Rate (t/h)	1.37
Fuel in Electric Units (kW)	6,800
Annual Fuel Consumption (t/yr)	10,770
Fuel Ash Concentration (%)	5
Annual Ash Disposal (t/yr)	538

Heat-base year	
Total heat produced (MMBtu/yr)	183,082
Cogeneration efficiency (%)	34
Aggregate fraction of heat recovered (%)	4
Heat recovered and sold (MMBtu/yr)	7,485
Total income from heat sales (\$/yr)	82,333

Expenses-base year	
Fuel Cost (\$/yr)	376,934
Labor Cost (\$/yr)	100,000
Maintenance Cost (\$/yr)	50,000

If financing includes equity, adjust electricity price until ROE Achieved equals ROE Required.
 If 100% debt financed, adjust electricity price until NPV of Cash Flow is 0.

ROE Achieved	NA
Levelized Price/Cost of Electricity	8.7
NPV of Cash Flow	-612

Insurance/Property Tax (\$/y)	20,000
Utilities (\$/y)	10,000
Ash Disposal (\$/y)-use negative value for sales	15,700
Administrative and General (\$/y)	34,300
Other Operating Expenses (\$/y)	20,000
Total Non-Fuel Expenses (\$/y)	250,000
Total Expenses Including Fuel (\$/y)	626,934

Taxes & Royalties

Federal Income Tax Rate (%)	0.00
State Income Tax Rate (%)	0.00
Production Tax Credit (\$/kWh)	0.000
Number of years PTC received	5
Royalty Payment (% of total revenue)	0
Tax Depreciation Method	SL
Investment Tax Credit (%)	0

SL = Straight line depreciation
M-5 = MACRS-5 five year schedule depreciation
M-10 = MACRS-10 ten year schedule depreciation

Income other than energy

Electricity Capacity Payment (\$/kW-y)	0
Annual Capacity Payment (\$/y)	0
Debt Reserve Required?	No
Interest Rate on Debt Reserve (%/yr)	5
Annual Debt Reserve Interest (\$/y)	0

Enter: Yes or No

Escalation

Escalation-Fuel (%/y)	2.00
Escalation for Production Tax Credit (%/y)	0.00
Escalation - Electricity sales price (%/yr)	2.00
Escalation-Heat sales price (%/y)	2.00
Escalation - Capacity payments (\$/yr)	0.00
Escalation-Other (%/y)	2.00

Financing

Debt ratio (%)	100.00
Equity ratio (%)	0.00
Interest Rate on Debt (%/y)	0.00
Economic Life (y)	20
Rate of equity required (%/y)	0.00
Weighted Cost of Capital (%/y)	0.00
Total Cost of Plant (\$)	10,150,000
Salvage Value (%)	10
Total Equity Invested (\$)	0
Total Debt Invested (\$)	10,150,000
Capital Recovery Factor (Equity)	#DIV/0!
Capital Recovery Factor (Debt)	0.0500
Annual Debt Payment (\$/y)	507,505
Debt Reserve (\$)	507,505

Debt Schedule

Year	Remaining Principal	Annual Payment	Annual Interest	Principal Reduction
1	#####	507,505	10.15	507,495
2	9,642,505	507,505	10	507,496
3	9,135,009	507,505	9	507,496
4	8,627,513	507,505	9	507,497
5	8,120,016	507,505	8	507,497
6	7,612,519	507,505	8	507,498
7	7,105,021	507,505	7	507,498
8	6,597,523	507,505	7	507,499
9	6,090,024	507,505	6	507,499
10	5,582,525	507,505	6	507,500
11	5,075,025	507,505	5	507,500
12	4,567,525	507,505	5	507,501
13	4,060,024	507,505	4	507,501
14	3,552,523	507,505	4	507,502
15	3,045,021	507,505	3	507,502
16	2,537,519	507,505	3	507,503
17	2,030,016	507,505	2	507,503
18	1,522,513	507,505	2	507,504
19	1,015,009	507,505	1	507,504
20	507,505	507,505	1	507,505

Tax Depreciation Schedule

Year	MACRS-5 year	MACRS-10 year	Straight Line-20 year
1	0.2000	0.1000	0.0500
2	0.3200	0.1800	0.0500
3	0.1920	0.1440	0.0500
4	0.1152	0.1152	0.0500
5	0.1152	0.0922	0.0500
6	0.0576	0.0737	0.0500
7	0.0000	0.0655	0.0500
8	0.0000	0.0655	0.0500
9	0.0000	0.0655	0.0500
10	0.0000	0.0655	0.0500
11	0.0000	0.0329	0.0500
12	0.0000	0.0000	0.0500
13	0.0000	0.0000	0.0500
14	0.0000	0.0000	0.0500
15	0.0000	0.0000	0.0500
16	0.0000	0.0000	0.0500
17	0.0000	0.0000	0.0500
18	0.0000	0.0000	0.0500
19	0.0000	0.0000	0.0500
20	0.0000	0.0000	0.0500
	1.0000	1.0000	1.0000

Production Tax Credit Schedule

Year	Received ?
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	No
7	No
8	No
9	No
10	No
11	No
12	No
13	No
14	No
15	No
16	No
17	No
18	No
19	No
20	No

Annual Cash Flow (\$)

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Revenue																				
Electricity Sales	962,321	981,567	1,001,199	1,021,223	1,041,647	1,062,480	1,083,730	1,105,404	1,127,512	1,150,063	1,173,064	1,196,525	1,220,456	1,244,865	1,269,762	1,295,157	1,321,061	1,347,482	1,374,431	1,401,920
Heat Sales	82,333	83,980	85,659	87,373	89,120	90,902	92,721	94,575	96,466	98,396	100,364	102,371	104,418	106,507	108,637	110,810	113,026	115,286	117,592	119,944
Capacity Payments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Production Tax Credit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest on Debt Reserve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Revenue	1,044,654	1,065,547	1,086,858	1,108,595	1,130,767	1,153,383	1,176,450	1,199,979	1,223,979	1,248,458	1,273,428	1,298,896	1,324,874	1,351,372	1,378,399	1,405,967	1,434,086	1,462,768	1,492,023	1,521,864
Expenses																				
Fuel	376,934	384,473	392,162	400,005	408,006	416,166	424,489	432,979	441,638	450,471	459,480	468,670	478,044	487,604	497,356	507,304	517,450	527,799	538,355	549,122
Other Operating Expenses	250,000	255,000	260,100	265,302	270,608	276,020	281,541	287,171	292,915	298,773	304,749	310,844	317,060	323,402	329,870	336,467	343,196	350,060	357,062	364,203
Royalties	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Expense	626,934	639,473	652,262	665,307	678,614	692,186	706,030	720,150	734,553	749,244	764,229	779,514	795,104	811,006	827,226	843,771	860,646	877,859	895,416	913,325
Operating Cash Flow	417,720	426,075	434,596	443,288	452,154	461,197	470,421	479,829	489,426	499,214	509,199	519,383	529,770	540,366	551,173	562,196	573,440	584,909	596,607	608,539

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Income Tax																					
Debt Interest		10	10	9	9	8	8	7	7	6	6	5	5	4	4	3	3	2	2	1	1
Tax Depreciation																					
SL	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	
MACRS-5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MACRS-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Taxable Income	-89,790	-81,435	-72,913	-64,221	-55,354	-46,311	-37,086	-27,677	-18,080	-8,291	1,693	11,878	22,266	32,862	43,670	54,694	65,938	77,408	89,106	101,039	
Federal Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
State Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Investment Tax Credit	0																				
Total Income Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Debt Payment	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	
Owner's Equity	0																				
Debt Reserve	0																				
Return of Debt	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	
Debt Outlay (No cost financing only)	-10,150,000																				
Salvage Value Recovered																					1,015,000
Total Owner's Capital	-10,150,000																				
Cash Flow	-10,150,000	417,720	426,075	434,596	443,288	452,154	461,197	470,421	479,829	489,426	499,214	509,199	519,383	529,770	540,366	551,173	562,196	573,440	584,909	596,607	608,539
IRR	NA																				
NPV	-612																				
Annual Electrical Generation (Kwh)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
Annual Electricity Price - cents/Kwh		7.18	7.3	7.5	7.6	7.8	7.9	8.1	8.2	8.4	8.6	8.8	8.9	9.1	9.3	9.5	9.7	9.9	10.1	10.3	10.5
PV Electric Revenue (\$)	23,381,609																				
Levelized Annual Revenue (\$)	1,169,093																				
Levelized Electricity Price (cents/Kwh)	8.7																				

Property of TSS Consultants, Sacramento, CA
Contact Fred Tornatore, 916-601-0531, or
David Augustine, 916-359-6303

**RETURN ON INVESTMENT - LEVELIZED COST OF ELECTRICITY MODEL
COGENERATION FACILITY - BIOMASS FIRED**

NEXTERRA - Gasifier with IC Engine
Parlin Fork Cogeneration Facility-\$45/ton Fuel Cost
 Financing: 100% Grant
 Heat Recovered Worth \$11/MMBtu

This computer model allows the user to calculate the return on equity (ROE) on a capital investment in a cogeneration facility, given operating expenses, the prices for electricity and heat, and the cost of fuel, other operating expenses and income taxes.

If the ROE Achieved does not equal the ROE Required on the investment, the sale price of electricity (cell B23) can be adjusted to equate the two ROEs.

If the project is financed with 100% debt, adjust the sale price of electricity (cell B23) until the NPV of Cash Flow is 0. Income tax rates (cells B82 & B83) must be set to 0 if the investing entity is non-profit.

Input values are highlighted in green
 Calculated values are highlighted in blue
 Key output values are highlighted in lavender

Sale Prices - Base Year	
Electricity (Cents/Kwh)	7.98
Heat (\$/MMBtu)	11
ROE Required	0

Fuel Cost - Base Year (\$/ton)	
	45

Capital Costs (\$)	
Generating Facility	10,000,000
Heat Recovery System	100,000
Heat Distribution System	50,000
Total Capital Costs	10,150,000

Electrical - Base Year	
Gross Electrical Capacity (kWe)	2,000
Parasitic Load (Kwe)	300
Net Electrical Capacity (kWe)	1,700
Capacity Factor (%)	90
Annual Hours	7,884
Net Station Electrical Efficiency (%)	25
Gross Station Electrical Efficiency (%)	29
Annual Net Generation (kWh)	13,402,800
Capital cost per net electrical capacity (\$/kWe)	5,882
Income From Electricity Sales (\$/yr)	1,069,543

Fuel - Base Year	
Fuel Heating Value (Btu/lb)	8,500
Fuel Consumption Rate (t/h)	1.37
Fuel in Electric Units (kW)	6,800
Annual Fuel Consumption (t/yr)	10,770
Fuel Ash Concentration (%)	5
Annual Ash Disposal (t/yr)	538

Heat-base year	
Total heat produced (MMBtu/yr)	183,082
Cogeneration efficiency (%)	34
Aggregate fraction of heat recovered (%)	4
Heat recovered and sold (MMBtu/yr)	7,485
Total income from heat sales (\$/yr)	82,333

Expenses-base year	
Fuel Cost (\$/yr)	484,629
Labor Cost (\$/yr)	100,000
Maintenance Cost (\$/yr)	50,000

If financing includes equity, adjust electricity price until ROE Achieved equals ROE Required.
 If 100% debt financed, adjust electricity price until NPV of Cash Flow is 0.

ROE Achieved	NA
Levelized Price/Cost of Electricity	9.7
NPV of Cash Flow	-12105

Insurance/Property Tax (\$/y)	20,000
Utilities (\$/y)	10,000
Ash Disposal (\$/y)-use negative value for sales	15,700
Administrative and General (\$/y)	34,300
Other Operating Expenses (\$/y)	20,000
Total Non-Fuel Expenses (\$/y)	250,000
Total Expenses Including Fuel (\$/y)	734,629

Taxes & Royalties	
Federal Income Tax Rate (%)	0.00
State Income Tax Rate (%)	0.00
Production Tax Credit (\$/kWh)	0.000
Number of years PTC received	5
Royalty Payment (% of total revenue)	0
Tax Depreciation Method	SL
Investment Tax Credit (%)	0

SL = Straight line depreciation
M-5 = MACRS-5 five year schedule depreciation
M-10 = MACRS-10 ten year schedule depreciation

Income other than energy	
Electricity Capacity Payment (\$/kW-y)	0
Annual Capacity Payment (\$/y)	0
Debt Reserve Required?	No
Interest Rate on Debt Reserve (%/yr)	5
Annual Debt Reserve Interest (\$/y)	0

Enter: Yes or No

Escalation	
Escalation-Fuel (%/y)	2.00
Escalation for Production Tax Credit (%/y)	0.00
Escalation - Electricity sales price (%/yr)	2.00
Escalation-Heat sales price (%/y)	2.00
Escalation - Capacity payments (\$/yr)	0.00
Escalation-Other (%/y)	2.00

Financing	
Debt ratio (%)	100.00
Equity ratio (%)	0.00
Interest Rate on Debt (%/y)	0.00
Economic Life (y)	20
Rate of equity required (%/y)	0.00
Weighted Cost of Capital (%/y)	0.00
Total Cost of Plant (\$)	10,150,000
Salvage Value (%)	10
Total Equity Invested (\$)	0
Total Debt Invested (\$)	10,150,000
Capital Recovery Factor (Equity)	#DIV/0!
Capital Recovery Factor (Debt)	0.0500
Annual Debt Payment (\$/y)	507,505
Debt Reserve (\$)	507,505

Debt Schedule				
Year	Remaining Principal	Annual Payment	Annual Interest	Principal Reduction
1	#####	507,505	10.15	507,495
2	9,642,505	507,505	10	507,496
3	9,135,009	507,505	9	507,496
4	8,627,513	507,505	9	507,497
5	8,120,016	507,505	8	507,497
6	7,612,519	507,505	8	507,498
7	7,105,021	507,505	7	507,498
8	6,597,523	507,505	7	507,499
9	6,090,024	507,505	6	507,499
10	5,582,525	507,505	6	507,500
11	5,075,025	507,505	5	507,500
12	4,567,525	507,505	5	507,501
13	4,060,024	507,505	4	507,501
14	3,552,523	507,505	4	507,502
15	3,045,021	507,505	3	507,502
16	2,537,519	507,505	3	507,503
17	2,030,016	507,505	2	507,503
18	1,522,513	507,505	2	507,504
19	1,015,009	507,505	1	507,504
20	507,505	507,505	1	507,505

Tax Depreciation Schedule			
Year	MACRS-5 year	MACRS-10 year	Straight Line-20 year
1	0.2000	0.1000	0.0500
2	0.3200	0.1800	0.0500
3	0.1920	0.1440	0.0500
4	0.1152	0.1152	0.0500
5	0.1152	0.0922	0.0500
6	0.0576	0.0737	0.0500
7	0.0000	0.0655	0.0500
8	0.0000	0.0655	0.0500
9	0.0000	0.0655	0.0500
10	0.0000	0.0655	0.0500
11	0.0000	0.0329	0.0500
12	0.0000	0.0000	0.0500
13	0.0000	0.0000	0.0500
14	0.0000	0.0000	0.0500
15	0.0000	0.0000	0.0500
16	0.0000	0.0000	0.0500
17	0.0000	0.0000	0.0500
18	0.0000	0.0000	0.0500
19	0.0000	0.0000	0.0500
20	0.0000	0.0000	0.0500
	1.0000	1.0000	1.0000

Production Tax Credit Schedule	
Year	Received ?
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	No
7	No
8	No
9	No
10	No
11	No
12	No
13	No
14	No
15	No
16	No
17	No
18	No
19	No
20	No

Annual Cash Flow (\$)																				
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Revenue																				
Electricity Sales	1,069,543	1,090,934	1,112,753	1,135,008	1,157,708	1,180,862	1,204,480	1,228,569	1,253,141	1,278,203	1,303,767	1,329,843	1,356,440	1,383,568	1,411,240	1,439,465	1,468,254	1,497,619	1,527,571	1,558,123
Heat Sales	82,333	83,980	85,659	87,373	89,120	90,902	92,721	94,575	96,466	98,396	100,364	102,371	104,418	106,507	108,637	110,810	113,026	115,286	117,592	119,944
Capacity Payments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Production Tax Credit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest on Debt Reserve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Revenue	1,151,877	1,174,914	1,198,412	1,222,381	1,246,828	1,271,765	1,297,200	1,323,144	1,349,607	1,376,599	1,404,131	1,432,214	1,460,858	1,490,075	1,519,877	1,550,274	1,581,280	1,612,905	1,645,163	1,678,067
Expenses																				
Fuel	484,629	494,322	504,209	514,293	524,579	535,070	545,772	556,687	567,821	579,177	590,761	602,576	614,627	626,920	639,458	652,247	665,292	678,598	692,170	706,014
Other Operating Expenses	250,000	255,000	260,100	265,302	270,608	276,020	281,541	287,171	292,915	298,773	304,749	310,844	317,060	323,402	329,870	336,467	343,196	350,060	357,062	364,203
Royalties	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Expense	734,629	749,322	764,309	779,595	795,187	811,090	827,312	843,858	860,736	877,950	895,509	913,419	931,688	950,322	969,328	988,715	1,008,489	1,028,659	1,049,232	1,070,216
Operating Cash Flow	417,247	425,592	434,104	442,786	451,642	460,675	469,888	479,286	488,872	498,649	508,622	518,794	529,170	539,754	550,549	561,560	572,791	584,247	595,932	607,850

Income Tax

	10	10	9	9	8	8	7	7	6	6	5	5	4	4	3	3	2	2	1	1	
Debt Interest																					
Tax Depreciation																					
SL	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	507,500	
MACRS-5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MACRS-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Taxable Income	-90,263	-81,918	-73,405	-64,723	-55,866	-46,833	-37,619	-28,221	-18,635	-8,857	1,117	11,290	21,666	32,250	43,046	54,057	65,289	76,745	88,431	100,350	
Federal Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
State Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Investment Tax Credit	0																				
Total Income Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Debt Payment	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	
Owner's Equity	0																				
Debt Reserve	0																				
Return of Debt	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	507,505	
Debt Outlay (No cost financing only)	-10,150,000																				
Salvage Value Recovered																				1,015,000	
Total Owner's Capital	-10,150,000																				
Cash Flow	-10,150,000	417,247	425,592	434,104	442,786	451,642	460,675	469,888	479,286	488,872	498,649	508,622	518,794	529,170	539,754	550,549	561,560	572,791	584,247	595,932	607,850
IRR	NA																				
NPV	-12,105																				
Annual Electrical Generation (Kwh)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
Annual Electricity Price - cents/Kwh	7.98	8.1	8.3	8.5	8.6	8.8	9.0	9.2	9.3	9.5	9.7	9.9	10.1	10.3	10.5	10.7	11.0	11.2	11.4	11.6	
PV Electric Revenue (\$)	25,986,803																				
Levelized Annual Revenue (\$)	1,299,354																				
Levelized Electricity Price (cents/Kwh)	9.7																				

Property of TSS Consultants, Sacramento, CA
 Contact Fred Tomatore, 916-601-0531, or
 David Augustine, 916-359-6303

**RETURN ON INVESTMENT - LEVELIZED COST OF ELECTRICITY MODEL
COGENERATION FACILITY - BIOMASS FIRED**

ENVIO ENERGI - Direct Fired Steam Cycle
Parlin Fork Cogeneration Facility-\$35/ton Fuel Cost
 Financing: 100% Debt at 3.5% Interest
 Heat Recovered Worth \$11/MMBtu

This computer model allows the user to calculate the return on equity (ROE) on a capital investment in a cogeneration facility, given operating expenses, the prices for electricity and heat, and the cost of fuel, other operating expenses and income taxes.

If the ROE Achieved does not equal the ROE Required on the investment, the sale price of electricity (cell B23) can be adjusted to equate the two ROEs.

If the project is financed with 100% debt, adjust the sale price of electricity (cell B23) until the NPV of Cash Flow is 0. Income tax rates (cells B82 & B83) must be set to 0 if the investing entity is non-profit.

Input values are highlighted in green
 Calculated values are highlighted in blue
 Key output values are highlighted in lavender



Sale Prices - Base Year	
Electricity (Cents/Kwh)	15.15
Heat (\$/MMBtu)	11
ROE Required	0

Fuel Cost - Base Year (\$/ton)	35
---------------------------------------	----

Capital Costs (\$)	
Generating Facility	6,000,000
Heat Recovery System	100,000
Heat Distribution System	50,000
Total Capital Costs	6,150,000

Electrical - Base Year	
Gross Electrical Capacity (kWe)	1,500
Parasitic Load (Kwe)	250
Net Electrical Capacity (kWe)	1,250
Capacity Factor (%)	90
Annual Hours	7,884
Net Station Electrical Efficiency (%)	22
Gross Station Electrical Efficiency (%)	26
Annual Net Generation (kWh)	9,855,000
Capital cost per net electrical capacity (\$/kWe)	4,800
Income From Electricity Sales (\$/yr)	1,493,033

Fuel - Base Year	
Fuel Heating Value (Btu/lb)	8,500
Fuel Consumption Rate (t/h)	1.14
Fuel in Electric Units (kW)	5,682
Annual Fuel Consumption (t/yr)	8,999
Fuel Ash Concentration (%)	5
Annual Ash Disposal (t/yr)	450

Heat-base year	
Total heat produced (MMBtu/yr)	152,976
Cogeneration efficiency (%)	31
Aggregate fraction of heat recovered (%)	5
Heat recovered and sold (MMBtu/yr)	7,496
Total income from heat sales (\$/yr)	82,454

Expenses-base year	
Fuel Cost (\$/yr)	314,952
Labor Cost (\$/yr)	300,000
Maintenance Cost (\$/yr)	160,000

If financing includes equity, adjust electricity price until ROE Achieved equals ROE Required.
 If 100% debt financed, adjust electricity price until NPV of Cash Flow is 0.

ROE Achieved	NA
Levelized Price/Cost of Electricity	18.0
NPV of Cash Flow	-7983

Insurance/Property Tax (\$/y)	20,000
Utilities (\$/y)	10,000
Ash Disposal (\$/y)-use negative value for sales	15,700
Administrative and General (\$/y)	25,000
Other Operating Expenses (\$/y)	20,000
Total Non-Fuel Expenses (\$/y)	550,700
Total Expenses Including Fuel (\$/y)	865,652

Taxes & Royalties	
Federal Income Tax Rate (%)	0.00
State Income Tax Rate (%)	0.00
Production Tax Credit (\$/kWh)	0.000
Number of years PTC received	5
Royalty Payment (% of total revenue)	0
Tax Depreciation Method	SL
Investment Tax Credit (%)	0

SL = Straight line depreciation
M-5 = MACRS-5 five year schedule depreciation
M-10 = MACRS-10 ten year schedule depreciation

Income other than energy	
Electricity Capacity Payment (\$/kW-y)	0
Annual Capacity Payment (\$/y)	0
Debt Reserve Required?	No
Interest Rate on Debt Reserve (%/yr)	5
Annual Debt Reserve Interest (\$/y)	0

Enter: Yes or No

Escalation	
Escalation-Fuel (%/y)	2.00
Escalation for Production Tax Credit (%/y)	0.00
Escalation - Electricity sales price (%/yr)	2.00
Escalation-Heat sales price (%/y)	2.00
Escalation - Capacity payments (\$/yr)	0.00
Escalation-Other (%/y)	2.00

Financing	
Debt ratio (%)	100.00
Equity ratio (%)	0.00
Interest Rate on Debt (%/y)	3.50
Economic Life (y)	20
Rate of equity required (%/y)	0.00
Weighted Cost of Capital (%/y)	3.50
Total Cost of Plant (\$)	6,150,000
Salvage Value (%)	10
Total Equity Invested (\$)	0
Total Debt Invested (\$)	6,150,000
Capital Recovery Factor (Equity)	#DIV/0!
Capital Recovery Factor (Debt)	0.0704
Annual Debt Payment (\$/y)	432,721
Debt Reserve (\$)	432,721

Debt Schedule				
Year	Remaining Principal	Annual Payment	Annual Interest	Principal Reduction
1	6,150,000	432,721	215,250	217,471
2	5,932,529	432,721	207,639	225,082
3	5,707,447	432,721	199,761	232,960
4	5,474,487	432,721	191,607	241,114
5	5,233,374	432,721	183,168	249,553
6	4,983,821	432,721	174,434	258,287
7	4,725,534	432,721	165,394	267,327
8	4,458,207	432,721	156,037	276,683
9	4,181,524	432,721	146,353	286,367
10	3,895,157	432,721	136,330	296,390
11	3,598,767	432,721	125,957	306,764
12	3,292,003	432,721	115,220	317,501
13	2,974,502	432,721	104,108	328,613
14	2,645,889	432,721	92,606	340,114
15	2,305,775	432,721	80,702	352,019
16	1,953,756	432,721	68,381	364,339
17	1,589,417	432,721	55,630	377,091
18	1,212,326	432,721	42,431	390,289
19	822,037	432,721	28,771	403,949
20	418,088	432,721	14,633	418,088

Tax Depreciation Schedule			
Year	MACRS-5 year	MACRS-10 year	Straight Line-20 year
1	0.2000	0.1000	0.0500
2	0.3200	0.1800	0.0500
3	0.1920	0.1440	0.0500
4	0.1152	0.1152	0.0500
5	0.1152	0.0922	0.0500
6	0.0576	0.0737	0.0500
7	0.0000	0.0655	0.0500
8	0.0000	0.0655	0.0500
9	0.0000	0.0655	0.0500
10	0.0000	0.0655	0.0500
11	0.0000	0.0329	0.0500
12	0.0000	0.0000	0.0500
13	0.0000	0.0000	0.0500
14	0.0000	0.0000	0.0500
15	0.0000	0.0000	0.0500
16	0.0000	0.0000	0.0500
17	0.0000	0.0000	0.0500
18	0.0000	0.0000	0.0500
19	0.0000	0.0000	0.0500
20	0.0000	0.0000	0.0500
	1.0000	1.0000	1.0000

Production Tax Credit Schedule	
Year	Received ?
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	No
7	No
8	No
9	No
10	No
11	No
12	No
13	No
14	No
15	No
16	No
17	No
18	No
19	No
20	No

Annual Cash Flow (\$)																				
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Revenue																				
Electricity Sales	1,493,033	1,522,893	1,553,351	1,584,418	1,616,106	1,648,429	1,681,397	1,715,025	1,749,326	1,784,312	1,819,998	1,856,398	1,893,526	1,931,397	1,970,025	2,009,425	2,049,614	2,090,606	2,132,418	2,175,066
Heat Sales	82,454	84,103	85,785	87,501	89,251	91,036	92,857	94,714	96,608	98,541	100,511	102,522	104,572	106,663	108,797	110,973	113,192	115,456	117,765	120,120
Capacity Payments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Production Tax Credit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest on Debt Reserve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Revenue	1,575,487	1,606,997	1,639,136	1,671,919	1,705,358	1,739,465	1,774,254	1,809,739	1,845,934	1,882,853	1,920,510	1,958,920	1,998,098	2,038,060	2,078,821	2,120,398	2,162,806	2,206,062	2,250,183	2,295,187
Expenses																				
Fuel	314,952	321,251	327,676	334,229	340,914	347,732	354,687	361,780	369,016	376,396	383,924	391,603	399,435	407,423	415,572	423,883	432,361	441,008	449,828	458,825
Other Operating Expenses	550,700	561,714	572,948	584,407	596,095	608,017	620,178	632,581	645,233	658,137	671,300	684,726	698,421	712,389	726,637	741,170	755,993	771,113	786,535	802,266
Royalties	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Expense	865,652	882,965	900,624	918,636	937,009	955,749	974,864	994,362	1,014,249	1,034,534	1,055,224	1,076,329	1,097,856	1,119,813	1,142,209	1,165,053	1,188,354	1,212,121	1,236,364	1,261,091
Operating Cash Flow	709,835	724,032	738,513	753,283	768,349	783,715	799,390	815,378	831,685	848,319	865,285	882,591	900,243	918,248	936,613	955,345	974,452	993,941	1,013,820	1,034,096

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Income Tax																					
Debt Interest	215,250	207,639	199,761	191,607	183,168	174,434	165,394	156,037	146,353	136,330	125,957	115,220	104,108	92,606	80,702	68,381	55,630	42,431	28,771	14,633	
Tax Depreciation	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	
SL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MACRS-5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MACRS-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Taxable Income	187,085	208,893	231,252	254,176	277,680	301,782	326,496	351,840	377,832	404,488	431,828	459,871	488,635	518,141	548,410	579,463	611,322	644,009	677,548	711,963	
Federal Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
State Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Investment Tax Credit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Income Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Debt Payment	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	
Owner's Equity	0																				
Debt Reserve	0																				
Return of Debt Reserve																				0	
Debt Outlay (No cost financing only)																					
Salvage Value Recovered																				615,000	
Total Owner's Capital	-6,150,000																				
Cash Flow	-6,150,000	277,115	291,311	305,792	320,562	335,628	350,995	366,669	382,657	398,965	415,598	432,565	449,870	467,522	485,527	503,892	522,624	541,731	561,220	581,099	1,216,375
IRR	NA																				
NPV	-7,983																				
Annual Electrical Generation (Kwh)	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	
Annual Electricity Price - cents/Kwh	15.15	15.5	15.8	16.1	16.4	16.7	17.1	17.4	17.8	18.1	18.5	18.8	19.2	19.6	20.0	20.4	20.8	21.2	21.6	22.1	
PV Electric Revenue (\$)	25,203,736																				
Levelized Annual Revenue (\$)	1,773,362																				
Levelized Electricity Price (cents/Kwh)	18.0																				

Property of TSS Consultants, Sacramento, CA
Contact Fred Tomatore, 916-601-0531, or
David Augustine, 916-359-6303

**RETURN ON INVESTMENT - LEVELIZED COST OF ELECTRICITY MODEL
COGENERATION FACILITY - BIOMASS FIRED**

ENVIO ENERGI - Direct Fired Steam Cycle
Parlin Fork Cogeneration Facility-\$45/ton Fuel Cost
 Financing: 100% Debt at 3.5% Interest
 Heat Recovered Worth \$11/MMBtu

This computer model allows the user to calculate the return on equity (ROE) on a capital investment in a cogeneration facility, given operating expenses, the prices for electricity and heat, and the cost of fuel, other operating expenses and income taxes.

If the ROE Achieved does not equal the ROE Required on the investment, the sale price of electricity (cell B23) can be adjusted to equate the two ROEs.

If the project is financed with 100% debt, adjust the sale price of electricity (cell B23) until the NPV of Cash Flow is 0. Income tax rates (cells B82 & B83) must be set to 0 if the investing entity is non-profit.

Input values are highlighted in green
 Calculated values are highlighted in blue
 Key output values are highlighted in lavender



Sale Prices - Base Year	
Electricity (Cents/Kwh)	16.07
Heat (\$/MMBtu)	11
ROE Required	0

Fuel Cost - Base Year (\$/ton)	45
---------------------------------------	----

Capital Costs (\$)	
Generating Facility	6,000,000
Heat Recovery System	100,000
Heat Distribution System	50,000
Total Capital Costs	6,150,000

Electrical - Base Year	
Gross Electrical Capacity (kWe)	1,500
Parasitic Load (Kwe)	250
Net Electrical Capacity (kWe)	1,250
Capacity Factor (%)	90
Annual Hours	7,884
Net Station Electrical Efficiency (%)	22
Gross Station Electrical Efficiency (%)	26
Annual Net Generation (kWh)	9,855,000
Capital cost per net electrical capacity (\$/kWe)	4,800
Income From Electricity Sales (\$/yr)	1,583,699

Fuel - Base Year	
Fuel Heating Value (Btu/lb)	8,500
Fuel Consumption Rate (t/h)	1.14
Fuel in Electric Units (kW)	5,682
Annual Fuel Consumption (t/yr)	8,999
Fuel Ash Concentration (%)	5
Annual Ash Disposal (t/yr)	450

Heat-base year	
Total heat produced (MMBtu/yr)	152,976
Cogeneration efficiency (%)	31
Aggregate fraction of heat recovered (%)	5
Heat recovered and sold (MMBtu/yr)	7,496
Total income from heat sales (\$/yr)	82,454

Expenses-base year	
Fuel Cost (\$/yr)	404,938
Labor Cost (\$/yr)	300,000
Maintenance Cost (\$/yr)	160,000

If financing includes equity, adjust electricity price until ROE Achieved equals ROE Required.
 If 100% debt financed, adjust electricity price until NPV of Cash Flow is 0.

ROE Achieved	NA
Levelized Price/Cost of Electricity	19.1
NPV of Cash Flow	3105

Insurance/Property Tax (\$/y)	20,000
Utilities (\$/y)	10,000
Ash Disposal (\$/y)-use negative value for sales	15,700
Administrative and General (\$/y)	25,000
Other Operating Expenses (\$/y)	20,000
Total Non-Fuel Expenses (\$/y)	550,700
Total Expenses Including Fuel (\$/y)	955,638

Taxes & Royalties

Federal Income Tax Rate (%)	0.00
State Income Tax Rate (%)	0.00
Production Tax Credit (\$/kWh)	0.000
Number of years PTC received	5
Royalty Payment (% of total revenue)	0
Tax Depreciation Method	SL
Investment Tax Credit (%)	0

SL = Straight line depreciation
M-5 = MACRS-5 five year schedule depreciation
M-10 = MACRS-10 ten year schedule depreciation

Income other than energy

Electricity Capacity Payment (\$/kW-y)	0
Annual Capacity Payment (\$/y)	0
Debt Reserve Required?	No
Interest Rate on Debt Reserve (%/yr)	5
Annual Debt Reserve Interest (\$/y)	0

Enter: Yes or No

Escalation

Escalation-Fuel (%/y)	2.00
Escalation for Production Tax Credit (%/y)	0.00
Escalation - Electricity sales price (%/yr)	2.00
Escalation-Heat sales price (%/y)	2.00
Escalation - Capacity payments (\$/yr)	0.00
Escalation-Other (%/y)	2.00

Financing

Debt ratio (%)	100.00
Equity ratio (%)	0.00
Interest Rate on Debt (%/y)	3.50
Economic Life (y)	20
Rate of equity required (%/y)	0.00
Weighted Cost of Capital (%/y)	3.50
Total Cost of Plant (\$)	6,150,000
Salvage Value (%)	10
Total Equity Invested (\$)	0
Total Debt Invested (\$)	6,150,000
Capital Recovery Factor (Equity)	#DIV/0!
Capital Recovery Factor (Debt)	0.0704
Annual Debt Payment (\$/y)	432,721
Debt Reserve (\$)	432,721

Debt Schedule

Year	Remaining Principal	Annual Payment	Annual Interest	Principal Reduction
1	6,150,000	432,721	215,250	217,471
2	5,932,529	432,721	207,639	225,082
3	5,707,447	432,721	199,761	232,960
4	5,474,487	432,721	191,607	241,114
5	5,233,374	432,721	183,168	249,553
6	4,983,821	432,721	174,434	258,287
7	4,725,534	432,721	165,394	267,327
8	4,458,207	432,721	156,037	276,683
9	4,181,524	432,721	146,353	286,367
10	3,895,157	432,721	136,330	296,390
11	3,598,767	432,721	125,957	306,764
12	3,292,003	432,721	115,220	317,501
13	2,974,502	432,721	104,108	328,613
14	2,645,889	432,721	92,606	340,114
15	2,305,775	432,721	80,702	352,019
16	1,953,756	432,721	68,381	364,339
17	1,589,417	432,721	55,630	377,091
18	1,212,326	432,721	42,431	390,289
19	822,037	432,721	28,771	403,949
20	418,088	432,721	14,633	418,088

Tax Depreciation Schedule

Year	MACRS-5 year	MACRS-10 year	Straight Line-20 year
1	0.2000	0.1000	0.0500
2	0.3200	0.1800	0.0500
3	0.1920	0.1440	0.0500
4	0.1152	0.1152	0.0500
5	0.1152	0.0922	0.0500
6	0.0576	0.0737	0.0500
7	0.0000	0.0655	0.0500
8	0.0000	0.0655	0.0500
9	0.0000	0.0655	0.0500
10	0.0000	0.0655	0.0500
11	0.0000	0.0329	0.0500
12	0.0000	0.0000	0.0500
13	0.0000	0.0000	0.0500
14	0.0000	0.0000	0.0500
15	0.0000	0.0000	0.0500
16	0.0000	0.0000	0.0500
17	0.0000	0.0000	0.0500
18	0.0000	0.0000	0.0500
19	0.0000	0.0000	0.0500
20	0.0000	0.0000	0.0500
	1.0000	1.0000	1.0000

Production Tax Credit Schedule

Year	Received ?
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	No
7	No
8	No
9	No
10	No
11	No
12	No
13	No
14	No
15	No
16	No
17	No
18	No
19	No
20	No

Annual Cash Flow (\$)

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Revenue																					
Electricity Sales	1,583,699	1,615,372	1,647,680	1,680,634	1,714,246	1,748,531	1,783,502	1,819,172	1,855,555	1,892,666	1,930,520	1,969,130	2,008,513	2,048,683	2,089,657	2,131,450	2,174,079	2,217,560	2,261,911	2,307,150	
Heat Sales	82,454	84,103	85,785	87,501	89,251	91,036	92,857	94,714	96,608	98,541	100,511	102,522	104,572	106,663	108,797	110,973	113,192	115,456	117,765	120,120	
Capacity Payments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Production Tax Credit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Interest on Debt Reserve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Revenue	1,666,153	1,699,476	1,733,465	1,768,135	1,803,497	1,839,567	1,876,359	1,913,886	1,952,164	1,991,207	2,031,031	2,071,652	2,113,085	2,155,346	2,198,453	2,242,422	2,287,271	2,333,016	2,379,677	2,427,270	
Expenses																					
Fuel	404,938	413,036	421,297	429,723	438,318	447,084	456,026	465,146	474,449	483,938	493,617	503,489	513,559	523,830	534,307	544,993	555,893	567,011	578,351	589,918	
Other Operating Expenses	550,700	561,714	572,948	584,407	596,095	608,017	620,178	632,581	645,233	658,137	671,300	684,726	698,421	712,389	726,637	741,170	755,993	771,113	786,535	802,266	
Royalties	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Expense	955,638	974,750	994,245	1,014,130	1,034,413	1,055,101	1,076,203	1,097,727	1,119,682	1,142,076	1,164,917	1,188,215	1,211,980	1,236,219	1,260,944	1,286,163	1,311,886	1,338,124	1,364,886	1,392,184	
Operating Cash Flow	710,515	724,725	739,220	754,004	769,084	784,466	800,155	816,158	832,482	849,131	866,114	883,436	901,105	919,127	937,510	956,260	975,385	994,893	1,014,791	1,035,086	

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Income Tax																					
Debt Interest	215,250	207,639	199,761	191,607	183,168	174,434	165,394	156,037	146,353	136,330	125,957	115,220	104,108	92,606	80,702	68,381	55,630	42,431	28,771	14,633	
Tax Depreciation																					
SL	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	
MACRS-5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MACRS-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Taxable Income	187,765	209,587	231,959	254,897	278,416	302,532	327,262	352,621	378,628	405,301	432,657	460,716	489,497	519,021	549,307	580,378	612,255	644,961	678,519	712,953	
Federal Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
State Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Investment Tax Credit	0																				
Total Income Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Debt Payment	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	432,721	
Owner's Equity	0																				
Debt Reserve	0																				
Return of Debt Reserve																				0	
Debt Outlay (No cost financing only)																					
Salvage Value Recovered																				615,000	
Total Owner's Capital	-6,150,000																				
Cash Flow	-6,150,000	277,794	292,005	306,499	321,284	336,364	351,745	367,435	383,438	399,761	416,411	433,393	450,716	468,384	486,406	504,789	523,539	542,664	562,172	582,070	1,217,366
IRR	NA																				
NPV	3,105																				
Annual Electrical Generation (Kwh)	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	
Annual Electricity Price - cents/Kwh	16.07	16.4	16.7	17.1	17.4	17.7	18.1	18.5	18.8	19.2	19.6	20.0	20.4	20.8	21.2	21.6	22.1	22.5	23.0	23.4	
PV Electric Revenue (\$)	26,734,259																				
Levelized Annual Revenue (\$)	1,881,051																				
Levelized Electricity Price (cents/Kwh)	19.1																				

Property of TSS Consultants, Sacramento, CA
Contact Fred Tomatore, 916-601-0531, or
David Augustine, 916-359-6303

**RETURN ON INVESTMENT - LEVELIZED COST OF ELECTRICITY MODEL
COGENERATION FACILITY - BIOMASS FIRED**

ENVIO ENERGI - Direct Fired Steam Cycle
Parlin Fork Cogeneration Facility-\$35/ton Fuel Cost
 Financing: 100% Grant
 Heat Recovered Worth \$11/MMBtu

This computer model allows the user to calculate the return on equity (ROE) on a capital investment in a cogeneration facility, given operating expenses, the prices for electricity and heat, and the cost of fuel, other operating expenses and income taxes.

If the ROE Achieved does not equal the ROE Required on the investment, the sale price of electricity (cell B23) can be adjusted to equate the two ROEs.

If the project is financed with 100% debt, adjust the sale price of electricity (cell B23) until the NPV of Cash Flow is 0. Income tax rates (cells B82 & B83) must be set to 0 if the investing entity is non-profit.

Input values are highlighted in green
 Calculated values are highlighted in blue
 Key output values are highlighted in lavender



Sale Prices - Base Year	
Electricity (Cents/Kwh)	10.52
Heat (\$/MMBtu)	11
ROE Required	0

Fuel Cost - Base Year (\$/ton)	35
---------------------------------------	----

Capital Costs (\$)	
Generating Facility	6,000,000
Heat Recovery System	100,000
Heat Distribution System	50,000
Total Capital Costs	6,150,000

Electrical - Base Year	
Gross Electrical Capacity (kWe)	1,500
Parasitic Load (Kwe)	250
Net Electrical Capacity (kWe)	1,250
Capacity Factor (%)	90
Annual Hours	7,884
Net Station Electrical Efficiency (%)	22
Gross Station Electrical Efficiency (%)	26
Annual Net Generation (kWh)	9,855,000
Capital cost per net electrical capacity (\$/kWe)	4,800
Income From Electricity Sales (\$/yr)	1,036,746

Fuel - Base Year	
Fuel Heating Value (Btu/lb)	8,500
Fuel Consumption Rate (t/h)	1.14
Fuel in Electric Units (kW)	5,682
Annual Fuel Consumption (t/yr)	8,999
Fuel Ash Concentration (%)	5
Annual Ash Disposal (t/yr)	450

Heat-base year	
Total heat produced (MMBtu/yr)	152,976
Cogeneration efficiency (%)	31
Aggregate fraction of heat recovered (%)	5
Heat recovered and sold (MMBtu/yr)	7,496
Total income from heat sales (\$/yr)	82,454

Expenses-base year	
Fuel Cost (\$/yr)	314,952
Labor Cost (\$/yr)	300,000
Maintenance Cost (\$/yr)	160,000

If financing includes equity, adjust electricity price until ROE Achieved equals ROE Required.
 If 100% debt financed, adjust electricity price until NPV of Cash Flow is 0.

ROE Achieved	NA
Levelized Price/Cost of Electricity	12.8
NPV of Cash Flow	10499

Insurance/Property Tax (\$/y)	20,000
Utilities (\$/y)	10,000
Ash Disposal (\$/y)-use negative value for sales	15,700
Administrative and General (\$/y)	25,000
Other Operating Expenses (\$/y)	20,000
Total Non-Fuel Expenses (\$/y)	550,700
Total Expenses Including Fuel (\$/y)	865,652

Taxes & Royalties	
Federal Income Tax Rate (%)	0.00
State Income Tax Rate (%)	0.00
Production Tax Credit (\$/kWh)	0.000
Number of years PTC received	5
Royalty Payment (% of total revenue)	0
Tax Depreciation Method	SL
Investment Tax Credit (%)	0

SL = Straight line depreciation
M-5 = MACRS-5 five year schedule depreciation
M-10 = MACRS-10 ten year schedule depreciation

Income other than energy	
Electricity Capacity Payment (\$/kW-y)	0
Annual Capacity Payment (\$/y)	0
Debt Reserve Required?	No
Interest Rate on Debt Reserve (%/yr)	5
Annual Debt Reserve Interest (\$/y)	0

Enter: Yes or No

Escalation	
Escalation-Fuel (%/y)	2.00
Escalation for Production Tax Credit (%/y)	0.00
Escalation - Electricity sales price (%/yr)	2.00
Escalation-Heat sales price (%/y)	2.00
Escalation - Capacity payments (\$/yr)	0.00
Escalation-Other (%/y)	2.00

Financing	
Debt ratio (%)	100.00
Equity ratio (%)	0.00
Interest Rate on Debt (%/y)	0.00
Economic Life (y)	20
Rate of equity required (%/y)	0.00
Weighted Cost of Capital (%/y)	0.00
Total Cost of Plant (\$)	6,150,000
Salvage Value (%)	10
Total Equity Invested (\$)	0
Total Debt Invested (\$)	6,150,000
Capital Recovery Factor (Equity)	#DIV/0!
Capital Recovery Factor (Debt)	0.0500
Annual Debt Payment (\$/y)	307,503
Debt Reserve (\$)	307,503

Debt Schedule				
Year	Remaining Principal	Annual Payment	Annual Interest	Principal Reduction
1	6,150,000	307,503	6.15	307,497
2	5,842,503	307,503	6	307,497
3	5,535,006	307,503	6	307,498
4	5,227,508	307,503	5	307,498
5	4,920,010	307,503	5	307,498
6	4,612,512	307,503	5	307,499
7	4,305,013	307,503	4	307,499
8	3,997,514	307,503	4	307,499
9	3,690,015	307,503	4	307,500
10	3,382,515	307,503	3	307,500
11	3,075,015	307,503	3	307,500
12	2,767,515	307,503	3	307,500
13	2,460,015	307,503	2	307,501
14	2,152,514	307,503	2	307,501
15	1,845,013	307,503	2	307,501
16	1,537,512	307,503	2	307,502
17	1,230,010	307,503	1	307,502
18	922,508	307,503	1	307,502
19	615,006	307,503	1	307,503
20	307,503	307,503	0	307,503

Tax Depreciation Schedule			
Year	MACRS-5 year	MACRS-10 year	Straight Line-20 year
1	0.2000	0.1000	0.0500
2	0.3200	0.1800	0.0500
3	0.1920	0.1440	0.0500
4	0.1152	0.1152	0.0500
5	0.1152	0.0922	0.0500
6	0.0576	0.0737	0.0500
7	0.0000	0.0655	0.0500
8	0.0000	0.0655	0.0500
9	0.0000	0.0655	0.0500
10	0.0000	0.0655	0.0500
11	0.0000	0.0329	0.0500
12	0.0000	0.0000	0.0500
13	0.0000	0.0000	0.0500
14	0.0000	0.0000	0.0500
15	0.0000	0.0000	0.0500
16	0.0000	0.0000	0.0500
17	0.0000	0.0000	0.0500
18	0.0000	0.0000	0.0500
19	0.0000	0.0000	0.0500
20	0.0000	0.0000	0.0500
	1.0000	1.0000	1.0000

Production Tax Credit Schedule	
Year	Received ?
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	No
7	No
8	No
9	No
10	No
11	No
12	No
13	No
14	No
15	No
16	No
17	No
18	No
19	No
20	No

Annual Cash Flow (\$)																				
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Revenue																				
Electricity Sales	1,036,746	1,057,481	1,078,631	1,100,203	1,122,207	1,144,651	1,167,544	1,190,895	1,214,713	1,239,007	1,263,788	1,289,063	1,314,845	1,341,141	1,367,964	1,395,324	1,423,230	1,451,695	1,480,729	1,510,343
Heat Sales	82,454	84,103	85,785	87,501	89,251	91,036	92,857	94,714	96,608	98,541	100,511	102,522	104,572	106,663	108,797	110,973	113,192	115,456	117,765	120,120
Capacity Payments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Production Tax Credit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest on Debt Reserve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Revenue	1,119,200	1,141,584	1,164,416	1,187,704	1,211,458	1,235,688	1,260,401	1,285,609	1,311,322	1,337,548	1,364,299	1,391,585	1,419,417	1,447,805	1,476,761	1,506,296	1,536,422	1,567,151	1,598,494	1,630,464
Expenses																				
Fuel	314,952	321,251	327,676	334,229	340,914	347,732	354,687	361,780	369,016	376,396	383,924	391,603	399,435	407,423	415,572	423,883	432,361	441,008	449,828	458,825
Other Operating Expenses	550,700	561,714	572,948	584,407	596,095	608,017	620,178	632,581	645,233	658,137	671,300	684,726	698,421	712,389	726,637	741,170	755,993	771,113	786,535	802,266
Royalties	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Expense	865,652	882,965	900,624	918,636	937,009	955,749	974,864	994,362	1,014,249	1,034,534	1,055,224	1,076,329	1,097,856	1,119,813	1,142,209	1,165,053	1,188,354	1,212,121	1,236,364	1,261,091
Operating Cash Flow	253,549	258,620	263,792	269,068	274,449	279,938	285,537	291,248	297,073	303,014	309,075	315,256	321,561	327,992	334,552	341,243	348,068	355,029	362,130	369,373

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
Income Tax																						
Debt Interest		6	6	6	5	5	5	4	4	4	3	3	3	2	2	2	2	1	1	1	0	
Tax Depreciation		307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	
SL		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MACRS-5		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MACRS-10		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Taxable Income		-53,957	-48,886	-43,713	-38,437	-33,056	-27,566	-21,967	-16,256	-10,431	-4,489	1,571	7,753	14,059	20,490	27,050	33,742	40,567	47,529	54,629	61,872	
Federal Tax		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
State Tax		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Investment Tax Credit		0																				
Total Income Tax		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Debt Payment																						
		307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	
Owner's Equity		0																				
Debt Reserve		0																				
Return of Debt		307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	
Debt Outlay (No cost financing only)		-6,150,000																				
Salvage Value Recovered																					615,000	
Total Owner's Capital		-6,150,000																				
Cash Flow																						
		-6,150,000	253,549	258,620	263,792	269,068	274,449	279,938	285,537	291,248	297,073	303,014	309,075	315,256	321,561	327,992	334,552	341,243	348,068	355,029	362,130	369,373
IRR		NA																				
NPV		10,499																				
Annual Electrical Generation (Kwh)		9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	
Annual Electricity Price - cents/Kwh		10.52	10.7	10.9	11.2	11.4	11.6	11.8	12.1	12.3	12.6	12.8	13.1	13.3	13.6	13.9	14.2	14.4	14.7	15.0	15.3	
PV Electric Revenue (\$)		25,189,920																				
Levelized Annual Revenue (\$)		1,259,509																				
Levelized Electricity Price (cents/Kwh)		12.8																				

Property of TSS Consultants, Sacramento, CA
Contact Fred Tornatore, 916-601-0531, or
David Augustine, 916-359-6303

**RETURN ON INVESTMENT - LEVELIZED COST OF ELECTRICITY MODEL
COGENERATION FACILITY - BIOMASS FIRED**

ENVIO ENERGI - Direct Fired Steam Cycle
Parlin Fork Cogeneration Facility-\$45/ton Fuel Cost
 Financing: 100% Grant
 Heat Recovered Worth \$11/MMBtu

This computer model allows the user to calculate the return on equity (ROE) on a capital investment in a cogeneration facility, given operating expenses, the prices for electricity and heat, and the cost of fuel, other operating expenses and income taxes.

If the ROE Achieved does not equal the ROE Required on the investment, the sale price of electricity (cell B23) can be adjusted to equate the two ROEs.

If the project is financed with 100% debt, adjust the sale price of electricity (cell B23) until the NPV of Cash Flow is 0. Income tax rates (cells B82 & B83) must be set to 0 if the investing entity is non-profit.

Input values are highlighted in green
 Calculated values are highlighted in blue
 Key output values are highlighted in lavender

Sale Prices - Base Year	
Electricity (Cents/Kwh)	11.43
Heat (\$/MMBtu)	11
ROE Required	0

Fuel Cost - Base Year (\$/ton)	
	45

Capital Costs (\$)	
Generating Facility	6,000,000
Heat Recovery System	100,000
Heat Distribution System	50,000
Total Capital Costs	6,150,000

Electrical - Base Year	
Gross Electrical Capacity (kWe)	1,500
Parasitic Load (Kwe)	250
Net Electrical Capacity (kWe)	1,250
Capacity Factor (%)	90
Annual Hours	7,884
Net Station Electrical Efficiency (%)	22
Gross Station Electrical Efficiency (%)	26
Annual Net Generation (kWh)	9,855,000
Capital cost per net electrical capacity (\$/kWe)	4,800
Income From Electricity Sales (\$/yr)	1,126,427

Fuel - Base Year	
Fuel Heating Value (Btu/lb)	8,500
Fuel Consumption Rate (t/h)	1.14
Fuel in Electric Units (kW)	5,682
Annual Fuel Consumption (t/yr)	8,999
Fuel Ash Concentration (%)	5
Annual Ash Disposal (t/yr)	450

Heat-base year	
Total heat produced (MMBtu/yr)	152,976
Cogeneration efficiency (%)	31
Aggregate fraction of heat recovered (%)	5
Heat recovered and sold (MMBtu/yr)	7,496
Total income from heat sales (\$/yr)	82,454

Expenses-base year	
Fuel Cost (\$/yr)	404,938
Labor Cost (\$/yr)	300,000
Maintenance Cost (\$/yr)	160,000

If financing includes equity, adjust electricity price until ROE Achieved equals ROE Required.
 If 100% debt financed, adjust electricity price until NPV of Cash Flow is 0.

ROE Achieved	NA
Levelized Price/Cost of Electricity	13.9
NPV of Cash Flow	3072

Insurance/Property Tax (\$/y)	20,000
Utilities (\$/y)	10,000
Ash Disposal (\$/y)-use negative value for sales	15,700
Administrative and General (\$/y)	25,000
Other Operating Expenses (\$/y)	20,000
Total Non-Fuel Expenses (\$/y)	550,700
Total Expenses Including Fuel (\$/y)	955,638

Taxes & Royalties

Federal Income Tax Rate (%)	0.00
State Income Tax Rate (%)	0.00
Production Tax Credit (\$/kWh)	0.000
Number of years PTC received	5
Royalty Payment (% of total revenue)	0
Tax Depreciation Method	SL
Investment Tax Credit (%)	0

SL = Straight line depreciation
M-5 = MACRS-5 five year schedule depreciation
M-10 = MACRS-10 ten year schedule depreciation

Income other than energy

Electricity Capacity Payment (\$/kW-y)	0
Annual Capacity Payment (\$/y)	0
Debt Reserve Required?	No
Interest Rate on Debt Reserve (%/yr)	5
Annual Debt Reserve Interest (\$/y)	0

Enter: Yes or No

Escalation

Escalation-Fuel (%/y)	2.00
Escalation for Production Tax Credit (%/y)	0.00
Escalation - Electricity sales price (%/yr)	2.00
Escalation-Heat sales price (%/y)	2.00
Escalation - Capacity payments (\$/yr)	0.00
Escalation-Other (%/y)	2.00

Financing

Debt ratio (%)	100.00
Equity ratio (%)	0.00
Interest Rate on Debt (%/y)	0.00
Economic Life (y)	20
Rate of equity required (%/y)	0.00
Weighted Cost of Capital (%/y)	0.00
Total Cost of Plant (\$)	6,150,000
Salvage Value (%)	10
Total Equity Invested (\$)	0
Total Debt Invested (\$)	6,150,000
Capital Recovery Factor (Equity)	#DIV/0!
Capital Recovery Factor (Debt)	0.0500
Annual Debt Payment (\$/y)	307,503
Debt Reserve (\$)	307,503

Debt Schedule

Year	Remaining Principal	Annual Payment	Annual Interest	Principal Reduction
1	6,150,000	307,503	6.15	307,497
2	5,842,503	307,503	6	307,497
3	5,535,006	307,503	6	307,498
4	5,227,508	307,503	5	307,498
5	4,920,010	307,503	5	307,498
6	4,612,512	307,503	5	307,499
7	4,305,013	307,503	4	307,499
8	3,997,514	307,503	4	307,499
9	3,690,015	307,503	4	307,500
10	3,382,515	307,503	3	307,500
11	3,075,015	307,503	3	307,500
12	2,767,515	307,503	3	307,500
13	2,460,015	307,503	2	307,501
14	2,152,514	307,503	2	307,501
15	1,845,013	307,503	2	307,501
16	1,537,512	307,503	2	307,502
17	1,230,010	307,503	1	307,502
18	922,508	307,503	1	307,502
19	615,006	307,503	1	307,503
20	307,503	307,503	0	307,503

Tax Depreciation Schedule

Year	MACRS-5 year	MACRS-10 year	Straight Line-20 year
1	0.2000	0.1000	0.0500
2	0.3200	0.1800	0.0500
3	0.1920	0.1440	0.0500
4	0.1152	0.1152	0.0500
5	0.1152	0.0922	0.0500
6	0.0576	0.0737	0.0500
7	0.0000	0.0655	0.0500
8	0.0000	0.0655	0.0500
9	0.0000	0.0655	0.0500
10	0.0000	0.0655	0.0500
11	0.0000	0.0329	0.0500
12	0.0000	0.0000	0.0500
13	0.0000	0.0000	0.0500
14	0.0000	0.0000	0.0500
15	0.0000	0.0000	0.0500
16	0.0000	0.0000	0.0500
17	0.0000	0.0000	0.0500
18	0.0000	0.0000	0.0500
19	0.0000	0.0000	0.0500
20	0.0000	0.0000	0.0500
	1.0000	1.0000	1.0000

Production Tax Credit Schedule

Year	Received ?
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	No
7	No
8	No
9	No
10	No
11	No
12	No
13	No
14	No
15	No
16	No
17	No
18	No
19	No
20	No

Annual Cash Flow (\$)

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Revenue																				
Electricity Sales	1,126,427	1,148,955	1,171,934	1,195,373	1,219,280	1,243,666	1,268,539	1,293,910	1,319,788	1,346,184	1,373,108	1,400,570	1,428,581	1,457,153	1,486,296	1,516,022	1,546,342	1,577,269	1,608,814	1,640,991
Heat Sales	82,454	84,103	85,785	87,501	89,251	91,036	92,857	94,714	96,608	98,541	100,511	102,522	104,572	106,663	108,797	110,973	113,192	115,456	117,765	120,120
Capacity Payments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Production Tax Credit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest on Debt Reserve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Revenue	1,208,881	1,233,058	1,257,720	1,282,874	1,308,531	1,334,702	1,361,396	1,388,624	1,416,397	1,444,724	1,473,619	1,503,091	1,533,153	1,563,816	1,595,093	1,626,994	1,659,534	1,692,725	1,726,579	1,761,111
Expenses																				
Fuel	404,938	413,036	421,297	429,723	438,318	447,084	456,026	465,146	474,449	483,938	493,617	503,489	513,559	523,830	534,307	544,993	555,893	567,011	578,351	589,918
Other Operating Expenses	550,700	561,714	572,948	584,407	596,095	608,017	620,178	632,581	645,233	658,137	671,300	684,726	698,421	712,389	726,637	741,170	755,993	771,113	786,535	802,266
Royalties	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Expense	955,638	974,750	994,245	1,014,130	1,034,413	1,055,101	1,076,203	1,097,727	1,119,682	1,142,076	1,164,917	1,188,215	1,211,980	1,236,219	1,260,944	1,286,163	1,311,886	1,338,124	1,364,886	1,392,184
Operating Cash Flow	253,243	258,308	263,474	268,744	274,118	279,601	285,193	290,897	296,715	302,649	308,702	314,876	321,173	327,597	334,149	340,832	347,648	354,601	361,693	368,927

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Income Tax																					
Debt Interest		6	6	6	5	5	5	4	4	4	3	3	3	2	2	2	2	1	1	1	0
Tax Depreciation																					
SL	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500	307,500
MACRS-5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MACRS-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxable Income	-54,263	-49,198	-44,031	-38,762	-33,386	-27,904	-22,311	-16,607	-10,789	-4,854	1,199	7,373	13,671	20,095	26,647	33,330	40,147	47,101	54,193	61,427	
Federal Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
State Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Investment Tax Credit	0																				
Total Income Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Debt Payment																					
Owner's Equity	0																				
Debt Reserve	0																				
Return of Debt	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	307,503	
Debt Outlay (No cost financing only)	-6,150,000																				
Salvage Value Recovered																					615,000
Total Owner's Capital	-6,150,000																				
Cash Flow																					
	-6,150,000	253,243	258,308	263,474	268,744	274,118	279,601	285,193	290,897	296,715	302,649	308,702	314,876	321,173	327,597	334,149	340,832	347,648	354,601	361,693	368,927
IRR		NA																			
NPV		3,072																			
Annual Electrical Generation (Kwh)	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	9,855,000	
Annual Electricity Price - cents/Kwh	11.43	11.7	11.9	12.1	12.4	12.6	12.9	13.1	13.4	13.7	13.9	14.2	14.5	14.8	15.1	15.4	15.7	16.0	16.3	16.7	
PV Electric Revenue (\$)	27,368,896																				
Levelized Annual Revenue (\$)	1,368,459																				
Levelized Electricity Price (cents/Kwh)		13.9																			

Property of TSS Consultants, Sacramento, CA
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