

Creating and Demonstrating Incentives for Electricity Providers to  
Integrate Distributed Energy Resources on January 25-26

Business Case Base Case Assumptions

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	1:Utility-Owned CCHP		2:Utility-Owned Residential PV		3:Utility-Owned Biogas		4:Customer-Owned CCHP		5:Commercial Customer-owned PV	
	2007		2007		2007		2007		2007	
Base Case Year	2007		2007		2007		2007		2007	
Utility or Customer Owned (1=utility)	1		1		1		2		2	
Behind the meter or Grid Connected (1=Behind, 2=Utility)	2		1		2		1		1	
Technology Name	Large CHP		Res PV Roof		Biogas-fired Recip		Large CHP		Com PV Roof	
Technology Type	1		2		3		1		4	
DG Nameplate Capacity (A/C Output)	\$	5,998	\$	5	\$	200	\$	5,998	\$	100
DG Installed Cost \$ per net kW Output	1200		8000.0		1500		1200		7000.00	
Fixed O&M \$/kW-yr	60		71.42857143		25		60		20	
Variable O&M \$/kWh	0.0094		0		0.02		0.0094		0	
Electric Heat Rate Fuel LHV Btu per kWh out	10790		0		12590		10790		0	
Useful Thermal Output without Supplementary Fuel	548900%		0%		0%		548900%		0%	
Supplementary fuel to prime mover ratio	0		-		-		0		-	
Useful Thermal Output (Btu/kWh generated)	9994		0		5018		9994		0	
Operating Hours/ Year	8000		1576.8		7446		8000		1576.8	
Wholesale Market Price Multiplier (Value / Annual Average)	1		1.2		1		1		1.2	
Fuel Type (Index)	3		1		4		3		1	
Book Life	20		30		20		20		20	
Export Rate Treatment; 1=Net Metered, 2=Wholesale, 3=No Va	3		1		3		2		1	
State Incentive Index	\$	1	\$	2	\$	3	\$	1	\$	4
State Incentive (\$/kW)	-		2,500		800		-		2,500	
Qualifying Incentive Size (kW)	-		5		200		-		100	
Federal Incentive Index	100%		200%		300%		1		400%	
Federal Tax Credit (%)	\$	-	\$	0.30	\$	0.30	\$	-	\$	0.30
Maximum Federal Tax Credit Amount \$/kW	0		2000		0		0		0	
Utility Qualifies to Receive Upfront State Incentive	FALSE		TRUE		FALSE		FALSE		FALSE	
Utility Qualifies to Receive the Federal Tax Credit	FALSE		FALSE		FALSE		FALSE		FALSE	
Utility DG Financing Index	1		2		1		0		0	
Participant Discount Rate Index	1		1		1		1		1	
Customer DG Financing Index	0		0		0		1		1	
Utility Aux. / EE Financing Type Index	1		1		1		1		1	
Description of Utility Aux. Equipment	None		EE Program Cost		Digester (1500 cows)		None		None	
Installed Cost of Utility Purchased Aux. Equip.	0%		0%		50000000%		0%		0%	
% Participant Paid through on-bill financing	1		1		1		1		1	
Book life of utility Aux. Equip	20		20		20		20		20	
Description of Customer Aux. / EE Equipment	None		None		None		None		None	
Installed Cost of Customer Purchased Aux. Equip.	-		-		-		-		-	
Customer Financing Type Aux. Equip	1		1		1		1		1	
Book life of customer aux. equip	2000%		2000%		2000%		2000%		2000%	
Percent Waste heat displacing natural gas enduses	100%		0%		0%		100%		0%	
Efficiency of Displaced Natural Gas Use	80%		100%		100%		80%		100%	
Percent Peak Operation	50%		100%		50%		50%		100%	

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Percent Energy Exported	0%	15%	0%	35%	10%
DG Utility Peak Coincidence Factor	100%	40%	100%	100%	40%
Incentive as a Percent of Gen Cap Avoided Cost	50%	50%	50%	75%	75%
Incentive as a Percent of T&D Cap Avoided Cost	0.5	0.5	1	0.5	1
Marginal Plant Type (Peak)	1	1	1	1	1
Marginal Plant Type (Off-Peak)	\$ 1.00	\$ 1.00	\$ 1.00	\$ 1.00	\$ 1.00
Constrained Area T&D Avoided Cost - Base Case is \$0 for all c	37.73584906	37.73584906	37.73584906	37.73584906	37.73584906
	Large Commercial	Large Residential	Dairy	University Campus	Commercial
Customer Profile Index	1	2	3	4	5
Original Consumption - kWh	3,500,000	16,000	250,000	35,000,000	800,000
Original Consumption - coincident kW	600	3	50	6,000	250
Original Consumption - billed kW	1,000	-	50	10,000	300
Annual Gas Usage for Existing Boiler (MMBtu)	100000000%	0%	0%	100000000%	0%
Annual Electric Usage for Chilling	50000000%	0%	0%	50000000%	16000000%
EE Savings (% of kWh, coincident kW, billed kW saved)	\$0	\$0	\$0	\$0	\$0
EE Savings (% of natural gas saved)	0%	0%	0%	0%	0%
Installed Cost of EE Equip.	0%	0%	0%	0%	0%
% Participant Paid	0	0.5	0	0	0.5
Utility On-bill Financing	FALSE	TRUE	FALSE	FALSE	FALSE
Rate Type	Commercial	Large Residential	Commercial	Commercial	Commercial
Rate Type Index	100%	200%	100%	100%	100%
Discount on Energy Charge	0.05	0	0	0	0
Discount Basis (1=all consumption, 2=DG output)	2	1	1	1	1
DG Avg. Demand Charge Reduction (% of Nameplate DG kW)	0	0	0	1	0.5
Standby kW	0	0	0	5000	-
DG Backup Case Index	1	3	3	1	3.00
Base Case Backup Value? (True / False)	FALSE	TRUE	TRUE	TRUE	TRUE
Customer Backup Value (\$/kW)	\$ -	\$ -	\$ -	\$ 200.00	\$ -
Required DG Size for Backup (kW)	0	-	-	500	0
Renewable Energy Credit (REC) \$/kWh	0	0.04	\$ 0	0	\$ 0.04
Ownership of REC (utility = 1, customer=2, neither=3)	0	2	1	0	2
Avoided Waste Stream - Other Customer Benefits (\$/year)	0	0	20000	0	0
Thermal Charge to Customer for Waste Heat (\$/MMBtu)	6.25	\$0.000	0	\$ -	0
Utility Payment to Customer for Fuel (\$/MMBtu)	0	0	2	0	0
Utility Subsidy for Natural Gas Delivery Charge (\$/MMBtu)	0	0	0	0	0
Payment for DG Generated Electricity (\$/kWh)	0%	45%	0%	0%	0%
Include Incentives as INCREMENTAL non-participant cost?	FALSE	FALSE	FALSE	FALSE	FALSE
Inflation Rate	0.02	0.02	0.02	0.02	0.02
Levelization Period	20	20	20	20	20

		Wholesale Energy Market Price	Gen Capacity Market Price	Fuel Costs \$/MMBtu			
				EG Case	Cogen / EG	Com	Ind
2007	Level (chp owner)			\$6.180	\$6.180	\$6.930	\$6.330
2	Level (utility)	\$0.063	\$102.491	\$6.234	\$6.234	\$6.984	\$6.384
	Level (society) *	\$0.063	\$102.491	\$6.234	\$6.234	\$6.234	\$6.234
1	2005	\$ 0.065	\$ 85.00	6.74	6.74	7.49	6.89
2	2006	\$ 0.066	\$ 86.70	6.27	6.27	7.02	6.42
3	2007	\$ 0.064	\$ 88.43	5.75	5.75	6.5	5.9
4	2008	\$ 0.056	\$ 90.20	5.31	5.31	6.06	5.46
5	2009	\$ 0.060	\$ 92.01	5.81	5.81	6.56	5.96
6	2010	\$ 0.061	\$ 93.85	5.94	5.94	6.69	6.09
7	2011	\$ 0.062	\$ 95.72	6.04	6.04	6.79	6.19
8	2012	\$ 0.062	\$ 97.64	6.14	6.14	6.89	6.29
9	2013	\$ 0.063	\$ 99.59	6.24	6.24	6.99	6.39
10	2014	\$ 0.064	\$ 101.58	6.32	6.32	7.07	6.47
11	2015	\$ 0.064	\$ 103.61	6.39	6.39	7.14	6.54
12	2016	\$ 0.065	\$ 105.69	6.45	6.45	7.2	6.6
13	2017	\$ 0.065	\$ 107.80	6.52	6.52	7.27	6.67
14	2018	\$ 0.066	\$ 109.96	6.57	6.57	7.32	6.72
15	2019	\$ 0.066	\$ 112.16	6.63	6.63	7.38	6.78
16	2020	\$ 0.067	\$ 114.40	6.68	6.68	7.43	6.83
17	2021	\$ 0.067	\$ 116.69	6.78	6.78	7.53	6.93
18	2022	\$ 0.068	\$ 119.02	6.85	6.85	7.60	7.00
19	2023	\$ 0.068	\$ 121.40	6.92	6.92	7.67	7.07
20	2024	\$ 0.069	\$ 123.83	6.99	6.99	7.74	7.14
21	2025	\$ 0.069	\$ 126.31	7.06	7.06	7.81	7.21
22	2026	\$ 0.070	\$ 128.83	7.13	7.13	7.88	7.28
23	2027	\$ 0.071	\$ 131.41	7.20	7.20	7.95	7.35
24	2028	\$ 0.071	\$ 134.04	7.27	7.27	8.02	7.42
25	2029	\$ 0.072	\$ 136.72	7.34	7.34	8.09	7.49
26	2030	\$ 0.072	\$ 139.45	7.41	7.41	8.16	7.56
27	2031	\$ 0.073	\$ 142.24	7.48	7.48	8.23	7.63
28	2032	\$ 0.073	\$ 145.09	7.55	7.55	8.30	7.70
29	2033	\$ 0.074	\$ 147.99	7.62	7.62	8.37	7.77
30	2034	\$ 0.074	\$ 150.95	7.69	7.69	8.44	7.84
31	2035	\$ 0.075	\$ 153.97	7.76	7.76	8.51	7.91
32	2036	\$ 0.075	\$ 157.05	7.83	7.83	8.58	7.98
33	2037	\$ 0.076	\$ 160.19	7.90	7.90	8.65	8.05
34	2038	\$ 0.077	\$ 163.39	7.97	7.97	8.72	8.12
35	2039	\$ 0.077	\$ 166.66	8.04	8.04	8.79	8.19

Note:

Forecasted with trend

<b>EMISSIONS DATA:</b>						
<b>Rates per Technology:</b>	<b>Coal</b>	<b>Biogas Recip</b>	<b>Gas CCGT</b>	<b>Gas CHP</b>	<b>Other</b>	<b>PV</b>
Tons CO2 per MWh	1.012	0.442962	0.429	0.400		0
lbs NOx per MWh	0.672	0.68	0.078	1.049		0
lbs PM-10 per MWh	0.144	0	0.04	0.552		0
lbs SOx per MWh	1.15	0	0.004	0.058		0
lbs CO per MWh	1.438	0	0.01	1.058		0
lbs VOC per MWh	0.028	0	0.0006	0.060		0
Tons Methane	0	0	0	0		0

## **UTILITY ASSUMPTIONS**

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### **Load & Rates**

- 600 Peak Load (MW) - Year0
- 0.45 Annual Load Factor - Year 0
- 0.02 Forecast Sales Growth Rate
- 1,600 Rate Base Assets \$MM (book and tax)
- 0.12 Average Rate (\$/kWh) - Year 0

### **Average Energy Cost Forecasts (Distribution utility = market purchases, Vertical utility = production)**

- 61.06 Average Cost of Purchased Power or Average Production Cost (\$/MWh)
- 0.06 Average Marginal Losses (for Energy Savings)
- 0.18 Capacity - Planning Reserve Requirement (increase over peak load)
- 102.49 Levelized Annual Capacity Cost \$/kW-yr

### **Electric Marginal Costs**

- FALSE Use Market Price for Marginal Cost (false = use wholesale price above, true = select market if Market Price is active)

### **Capital Expenditure and Depreciation**

- 30 Average Asset Book Depreciation (years)
- 20 Tax depreciation (years)
- 70 Total Year0 CapEx (\$M) - Except Line Item Schedule
- 30% Percent Capex Growth Related

### **Financing and Taxes**

- 7.00% Debt Cost
- 50% Debt %
- 11.00% Target Return on Equity
- 50% Equity %
- 9.00% WACC
- 7.60% Utility After-tax WACC
- 40.00% All-in (federal & state) tax rate

### **Other Expenses, Maintenance**

- 0.05 O&M, other expense as % of yr0 revenue
- 14.19 Annual expense - Year0 \$M

### **Rate Setting**

- 1 1=Regular Cycle, 2=Earnings Band
- 4 Years between rate cases
- 0 Switch for PBR (1=use PBR, 0=no PBR)
- 0.02 Band on earnings (+/- ROE) for earnings band rate cycle
- 2.5% PBR inflation %
- 0.5% PBR X-factor % (subtracted)
- 0.0% PBR Z-factor % (added)
- 2.0% Total PBR Rate Adjustment %
- 7 Term of PBR (years)

### **Shareholder Incentives**

- 0% Target Incentive (% of DER & EE Budget)
- 0% Additional EE Implemented (resulting from above incentive)

OR see below - Upfront \$/nameplate kW incentive for shareholders, funds program co

**Revenue Requirement and Decoupling Inputs**

TRUE Base Case  
TRUE With EE/DER Case

**Sensitivities**

0% % Variation in actual average purchased energy/capacity cost (no DER/EE)  
0% % Variation in actual EE/DER marginal energy cost  
0% % Variation in actual sales growth rate  
0% % EE/DER Decrease in Ave & marginal energy cost

**Marginal Electric Generation Technology for Emissions**

gas ccgt <---- Peak Period  
gas ccgt <---- Off-Peak Period

**Year 1 Cost for Monetized Emissions - (Sensitivity)**

\$ 8.00 \$/Ton CO2  
\$ - \$/lb Nox  
\$ - \$/lb PM-10  
\$ - \$/lb Sox  
\$ - \$/lb CO  
\$ - \$/lb VOC  
\$ 128.00 \$/Ton Methane  
0 Escalation Rate (zero if levelized costs)

**DER Program**

**DER Costs and Budget**

\$/kW installed 3.5