

Customer-Meter Unit Cost of Electricity

Customer-Meter Unit Cost of Electricity (\$/kWh) =

$$\frac{[\text{Total Cost (\$/yr)} - \text{Option Capacity Value (\$/yr)}]}{\text{Equivalent Capacity (MW)} * 1000 * 8760}$$

$$\begin{aligned} \text{Total Cost (\$/yr)} = & \text{Nominal Capacity (MW)} * (\text{Total Levelized Costs @ 0\%CF (\$/kW)}) \\ & + [(\text{Total Levelized Costs @100\% CF}) - (\text{Total Levelized Costs @0\%CF})] \end{aligned}$$

Option Capacity Value (\\$/yr) =

$$\frac{\text{Equivalent Capacity (MW)} * \text{Capacity Value for Base (\$/yr)}}{\text{CCI}}$$

CCI = Capacity Contribution Index

(Availability of Option in Reference to a 99.4% Available CT)

**Capacity Value for Base (reference) CT => Cost to have capacity available,
but not cost of use (i.e., T&D, fuel, variable costs)**

Capacity Value for Base, WISC CT, (\\$/yr) = Total Levelized Costs (@ 0% CF)

CF=Capacity Factor

$$\begin{aligned} \text{Total Levelized Costs @ 0\% CF (\$/kW-yr)} = & \text{Fixed Capital Costs (\$/kW-yr)} \\ & + \text{Fixed O\&M Costs (\$/kW-yr)} \end{aligned}$$

$$\begin{aligned} \text{Total Levelized Costs @ 100\% CF (\$/kW-yr)} = & \text{Total Levelized Costs @ 0\% CF (\$/kW-yr)} \quad + \\ & \text{T\&D Costs (\$/kW-yr)} + \text{Variable O\&M Costs (\$/kW-yr)} + \text{Fuel Costs (\$/kW-yr)} \end{aligned}$$

**Equivalent Capacity (MW) = The Available Capacity Less the Peak Energy Loss
(Transmission & Distribution Losses)**

1000 = conversion of MW to kW 8760 = number of hours per year

Table D.1: Customer-Meter Unit Cost of Electricity Example Spread Sheet

Plant Technology	i=5.5%, n=15, n=30 for conventional					CF=0% Capacity Value \$/(kW-yr)	Peak Energy Loss		Equivalent Capacity MW	Delivered Energy kWh
	Nominal Capacity MW	Plant Type	Capitol Cost \$/kW	CCI %	CRCI Ratio Ref-CCI		Tran %	Dist. %		
Adv Nuclear-Passive	600	Base	1609	0.994	1	457.77	0.6	0.6	599.988	599988
IGCC	400	Base	1567	0.994	1	408.31	0.6	0.6	399.988	399988
Combined Cycle	200	Int.	694	0.994	1	294.33	0.6	0.6	199.988	199988
HAT Cycle	200	Int.	694	0.994	1	301.88	0.6	0.6	199.988	199988
WISC CT	83	Peak	323	0.994	1	241.52	0.6	0.6	82.988	82988
Solar 1 30W	0.000238	Renew	2000	0.829	0.829	200.22	0	0	0.000238	2334
Solar 1 PV	0.000238	Renew	2500	0.875	0.875	211.33	0	0	0.000238	2440
Solar 1B 30W	0.000202	Renew	1800	0.946	0.946	228.48	0	0	0.000202	2832
Solar 1B PV	0.000202	Renew	2300	0.991	0.991	239.35	0	0	0.000202	2917
Solar 2 30W	0.000392	Renew	2300	0.846	0.846	204.33	0	0	0.000392	3053
Solar 2 PV	0.000392	Renew	2800	0.885	0.885	213.75	0	0	0.000392	3137
Solar 2B 30W	0.000364	Renew	2100	0.955	0.955	230.65	0	0	0.000364	3521
Solar 2B PV	0.000364	Renew	2600	0.994	0.994	240.07	0	0	0.000364	3606
Solar 3 30W	0.000561	Renew	3500	0.851	0.851	205.53	0	0	0.000561	3639
Solar 3 PV	0.000576	Renew	4000	0.885	0.885	213.75	0	0	0.000576	3719
Solar 3B 30W	0.0005614	Renew	3200	0.96	0.96	231.86	0	0	0.0005614	4114
Solar 3B PV	0.0005614	Renew	3800	0.994	0.994	240.07	0	0	0.0005614	4195

Table D.1: Customer-Meter Unit Cost of Electricity Example Spread Sheet (continued)

Option Capacity Value (\$/yr)	Capitol Cost \$/kW-yr	All Fixed Costs		Distrib. 1993 \$/kW-yr	Fuel+O&M Variable Gen. Cost \$/kW-yr	Zero Avoided Emissions \$/yr	Plant Technology	Nominal Capacity MW	Plant Type
145783805	168.95	82.23	103.3	103.3	61.51	0.00	Adv Nuclear	600	Base
97188231	164.54	37.19	103.3	103.3	147.21	0.00	IGCC	400	Base
48592658	72.87	14.87	103.3	103.3	348.86	0.00	Combined Cyc	200	Int.
48592658	72.87	22.42	103.3	103.3	302.85	0.00	HAT Cycle	200	Int.
20164247	33.92	1.01	103.3	103.3	530.42	0.00	WISC CT	83	Peak
57.83	133.33	25	0	0	0.00	0.00	Solar 1 30W	0.000238	Renew
57.83	166.67	25	0	0	0.00	0.00	Solar 1 PV	0.000238	Renew
49.08	120.00	25	0	0	0.00	0.00	Solar 1B 30W	0.000202	Renew
49.08	153.33	25	0	0	0.00	0.00	Solar 1B PV	0.000202	Renew
95.25	153.33	25	0	0	0.00	0.00	Solar 2 30W	0.000392	Renew
95.25	186.67	25	0	0	0.00	0.00	Solar 2 PV	0.000392	Renew
88.44	140.00	25	0	0	0.00	0.00	Solar 2B 30W	0.000364	Renew
88.44	173.33	25	0	0	0.00	0.00	Solar 2B PV	0.000364	Renew
136.31	233.33	25	0	0	0.00	0.00	Solar 3 30W	0.000561	Renew
139.96	266.67	25	0	0	0.00	0.00	Solar 3 PV	0.000576	Renew
136.41	213.33	25	0	0	0.00	0.00	Solar 3B 30W	0.0005614	Renew
136.41	253.33	25	0	0	0.00	0.00	Solar 3B PV	0.0005614	Renew

Table D.1: Customer-Meter Unit Cost of Electricity Example Spread Sheet (continued)

Plant Technology	Nominal Capacity MW	Plant Type	Zero Avoided Emissions \$/yr	CF=0% Levelized Total Costs \$/kW-yr	CF=100% Levelized Total Costs \$/kW-yr	Total Costs @zero \$/yr
Adv Nuclear	600	Base	0.00	457.78	519.29	311574000
IGCC	400	Base	0.00	408.33	555.54	222216000
Combined Cycle	200	Int.	0.00	294.34	643.20	128640000
HAT Cycle	200	Int.	0.00	301.89	604.74	120948000
WISC CT	83	Peak	0.00	241.53	771.95	64071850
Solar 1 30W	0.000238	Renew	0.00	158.33	158.33	225.57
Solar 1 PV	0.000238	Renew	0.00	191.67	191.67	275.37
Solar 1B 30W	0.000202	Renew	0.00	145.00	145.00	205.65
Solar 1B PV	0.000202	Renew	0.00	178.33	178.33	255.45
Solar 2 30W	0.000392	Renew	0.00	178.33	178.33	255.45
Solar 2 PV	0.000392	Renew	0.00	211.67	211.67	305.25
Solar 2B 30W	0.000364	Renew	0.00	165.00	165.00	235.53
Solar 2B PV	0.000364	Renew	0.00	198.33	198.33	285.33
Solar 3 30W	0.000561	Renew	0.00	258.33	258.33	374.97
Solar 3 PV	0.000576	Renew	0.00	291.67	291.67	424.77
Solar 3B 30W	0.0005614	Renew	0.00	238.33	238.33	345.09
Solar 3B PV	0.0005614	Renew	0.00	278.33	278.33	404.85

Table D.1: Customer-Meter Unit Cost of Electricity Example Spread Sheet (continued)

Plant Technology	Nominal Capacity MW	Plant Type	Total @ zero \$/kWh	PSCW Avoided Emissions \$/yr	Total @ PSCW \$/yr	Total @ PSCW \$/kWh	High Avoided Emissions \$/yr	Total @ high \$/yr	Total @ high \$/kWh
Adv Nuclear-Passive	600	Base	0.032	x	x	x	x	x	x
IGCC	400	Base	0.036	x	x	x	x	x	x
Combined Cycle	200	Int.	0.046	x	x	x	x	x	x
HAT Cycle	200	Int.	0.041	x	x	x	x	x	x
WISC CT	83	Peak	0.060	x	x	x	x	x	x
Solar 1 30W	0.000238	Renew.	0.072	43.52	179.66	0.052	145.48	72.12	0.006
Solar 1 PV	0.000238	Renew.	0.089	45.38	227.50	0.070	151.68	115.38	0.024
Solar 1B 30W	0.000202	Renew.	0.055	52.52	150.26	0.036	174.95	21.12	-0.010
Solar 1B PV	0.000202	Renew.	0.071	54.09	198.40	0.051	180.16	65.42	0.006
Solar 2 30W	0.000392	Renew.	0.052	56.81	195.53	0.033	189.87	55.18	-0.013
Solar 2 PV	0.000392	Renew.	0.067	58.36	243.69	0.047	195.04	99.53	0.001
Solar 2B 30W	0.000364	Renew.	0.042	65.33	166.62	0.022	217.70	5.91	-0.023
Solar 2B PV	0.000364	Renew.	0.055	66.90	214.76	0.035	222.90	50.22	-0.011
Solar 3 30W	0.000561	Renew.	0.066	67.65	303.62	0.046	225.82	136.78	0.000
Solar 3 PV	0.000576	Renew.	0.077	69.11	351.87	0.057	230.69	181.45	0.011
Solar 3B 30W	0.000561	Renew.	0.051	76.30	264.61	0.031	254.13	77.04	-0.014
Solar 3B PV	0.000561	Renew.	0.064	77.80	322.79	0.044	259.09	131.57	-0.001

Table D.3: Monthly Customer Bill Impacts

Postive Impacts = Bill Savings (Reduction), Negative Impact = Bill Increase

Base Case (Default Values)= $i_{fuel}=3.0\%$, $d=5.5\%$, $n=15$ years, Rebates=\$0.0, $Cost_{elec}=\$0.08/kWh$

Monthly Bill Impacts (\$/month)		System Cost	Energy		Peak Dmd Red.	Avoided Gen.	PSCW Values	High Values	Base Case Electricity Cost		
			saved	kWh					0.06	0.08	0.10
System	#	\$	kWh	kW	\$/yr	\$/yr	\$/yr	\$/yr	\$/kWh	\$/kWh	\$/kWh
SYS1: 30W	1	2000	1955	0.465	47.88	43.52	145.48	-7.34	-3.42	0.50	
SYS1:PV	2	2500	2061	0.495	49.33	45.38	151.68	-10.56	-6.72	-2.59	
SYS1B:30W	3	1800	2453	0.577	56.40	52.52	174.95	-2.69	2.24	-7.16	
SYS1B:PV	4	2300	2538	0.607	58.22	54.09	180.16	-6.32	-1.23	3.86	
SYS2: 30W	5	2300	2674	0.563	61.73	56.81	189.87	-5.51	-0.14	5.23	
SYS2:PV	6	2800	2758	0.593	63.53	58.36	195.04	-9.51	-3.62	1.92	
SYS2B:30W	7	2100	3142	0.630	70.08	65.33	217.70	-1.03	5.28	11.58	
SYS2B:PV	8	2600	3227	0.660	71.90	66.90	222.90	-4.67	1.81	8.28	
SYS3: 30W	9	3500	3260	0.563	74.12	67.64	225.82	-11.94	-5.40	1.14	
SYS3:PV	10	4000	3340	0.593	75.84	69.11	230.69	-15.61	-8.91	-2.21	
SYS3B:30W	11	3200	3735	0.630	82.46	76.30	254.13	-6.59	0.91	8.40	
SYS3B:PV	12	3700	3816	0.660	84.21	77.80	259.09	-10.25	-2.60	5.06	

Table D.4: Monthly Customer Bill Impacts (Sensitivity Analysis)

Postive Impacts = Bill Savings (Reduction), Negative Impact = Bill Increase

Base Case (Default Values)= $i_{fuel}=3.0\%$, $d=5.5\%$, $n=15$ years, Rebates=\$0.0, $Cost_{elec}=\$0.08/kWh$

Monthly Bill Impacts (\$/mo.)		Fuel inflation			Discount Rate		Demand Rebate		Avoided Gen.
		1.00	5.00	8.00	3.00	8.00	73.00	100.00	Rebate (G)
System	#	%	%	%	%	%	\$/kW-yr	\$/kW-yr	\$/yr
SYS1: 30W	1	-4.97	-1.60	1.76	-0.60	-6.45	-0.02	1.25	1.38
SYS1:Pv	2	-8.37	-4.78	-1.20	-3.23	-10.48	-3.10	-1.75	-1.77
SYS1B:30W	3	0.22	4.61	8.99	4.84	-0.56	6.46	8.03	7.90
SYS1B:Pv	4	-3.33	1.24	5.79	2.04	-4.75	3.21	4.86	4.61
SYS2: 30W	5	-2.37	2.48	7.31	3.15	-3.67	3.98	5.51	6.05
SYS2:Pv	6	-5.92	-0.90	4.10	0.34	-7.88	0.73	2.33	2.76
SYS2B:30W	7	2.61	8.42	14.21	8.35	1.98	9.89	11.60	12.31
SYS2B:Pv	8	-0.94	5.04	11.01	5.55	-2.21	6.64	8.43	9.03
SYS3: 30W	9	-8.18	-2.13	3.90	-0.46	-10.71	-1.28	0.25	2.04
SYS3:Pv	10	-11.76	-5.55	0.65	-3.30	-14.95	-4.57	-2.96	-1.30
SYS3B:30W	11	-2.32	4.70	11.71	5.50	-4.03	5.52	7.23	9.18
SYS3B:Pv	12	-5.90	1.29	8.46	2.67	-8.25	2.24	4.03	5.85

Table D.5: Monthly Customer Bill Impacts (Sensitivity Analysis)

Postive Impacts = Bill Savings (Reduction), Negative Impact = Bill Increase

Base Case (Default Values)= $i_{\text{fuel}}=3.0\%$, $d=5.5\%$, $n=15$ years, Rebates=\$0.0, $\text{Cost}_{\text{elec}}=\$0.08/\text{kWh}$

Monthly Bill Impacts (\$/month)		Emission Credit		System Cost		All Rebates		
		PSCW (E1)	High (E2)	(-20%)	(+20%)	D+G	D+G+E1	D+G+E2
System	#	\$/yr	\$/yr	\$/yr	\$/yr	\$/yr	\$/yr	\$/yr
SYS1: 30W	1	0.95	11.18	-0.10	-6.74	4.79	9.16	19.39
SYS1:Pv	2	-2.17	8.50	-2.57	-10.87	1.85	6.41	17.07
SYS1B:30W	3	7.51	19.79	5.23	-0.75	12.12	17.39	29.67
SYS1B:Pv	4	4.20	16.85	2.59	-5.05	9.05	14.48	27.13
SYS2: 30W	5	5.56	18.91	3.68	-3.96	10.18	15.88	29.23
SYS2:Pv	6	2.24	15.95	1.03	-8.27	7.10	12.96	26.67
SYS2B:30W	7	11.83	27.12	8.76	1.79	16.92	23.48	38.76
SYS2B:Pv	8	8.52	24.17	6.13	-2.51	13.86	20.57	36.22
SYS3: 30W	9	1.39	17.26	0.41	-11.21	6.16	12.95	28.82
SYS3:Pv	10	-1.97	14.24	-2.27	-15.55	3.04	9.98	26.19
SYS3B:30W	11	8.56	26.40	6.22	-4.41	13.04	21.45	39.29
SYS3B:Pv	12	5.21	23.40	3.55	-8.74	10.68	18.48	36.67