

NAVY FUEL CELL DEMONSTRATION SITES

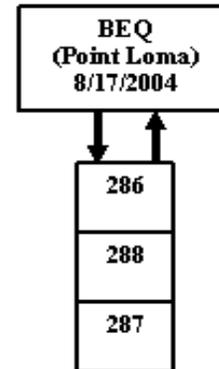
SITE: POINT LOMA SUB BASE
LOCATION: SAN DIEGO
BUILDING APPLICATION: 501 BEQ

Site Description

San Diego, CA was a chosen site for eight Plug Power GenSys™ 5CS- 5kW PEM fuel cells. They are distributed between two bases. Point Loma Sub Base has three of the eight units. These fuel cells reform natural gas into a hydrogen fuel source, CO2 and water vapor. The GenSys 5kW fuel cells offers uninterruptible power to a critical load in the event of grid disturbance, but in this demonstration project the critical load is not connected. They are only connected to the grid and set to allow 2.5kW output from the fuel cell. This allows for a capacity factor of about 50% due the fuel cell primarily operating at half of its rated capacity. These fuel cell installations also capitalize on a combined heat and power (CHP) utilizing the fuel cells waste heat to be recovered to supplement an existing hot water system. The sites were chosen based on their CHP utilization.

Fuel Cell Performance			
Cummulative Operating Hrs	11362.09 Hours	Capacity Factor	47.04%
Total Electric Output	28083.18 kWh	Availability	95.05%
Total Input Fuel	308.80 MMBTU	Electrical Efficiency	25.88%

Site Layout



Period Summary Statistics:

		Total	Unit # 286	Unit #287	Unit #288
Start Date		--	8/17/2004	8/17/2004	8/17/2004
Thru Date		--	8/31/2005	8/31/2005	8/31/2005
Hours of Operation	Hours	26439.3	8888	8957.3	8594
kWh Output	kWh	64573.4	21849.5	21875	20848.8
Input Fuel	MMBTU	881.4	299.2	301.1	281.2
Electric Efficiency	%	25.16%	25.09%	24.92%	25.47%
Availability	%	97.05%	97.80%	98.50%	94.80%
Capacity Factor	%	47.46%	48.07%	48.22%	46.09%

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Unit#1 (System Number#SU01B000000286)

Date	Oper. Hours	Total kWh	Avg. kW	Capacity Factor	Availability	Input Fuel (MMBTU)	Electric Eff.
4-Aug	336	814.3	2.42	48.47%	100%	10.48	26.52%
4-Sep	673.7	1642	2.44	45.61%	94%	21.21	26.43%
4-Oct	732	1772.9	2.42	47.66%	98%	23.09	26.22%
4-Nov	720	1765.7	2.45	49.05%	100%	23.17	26.01%
4-Dec	744	1823	2.45	49.01%	100%	24.18	25.74%
5-Jan	744	1827.1	2.46	44.25%	100%	24.4	25.56%
5-Feb	672	1648.8	2.45	49.12%	100%	22.65	24.84%
5-Mar	732	1798.1	2.46	49.07%	98.39%	25.1	24.44%
5-Apr	702	1729.9	2.46	48.34%	97.50%	25.48	23.17%
5-May	743.98	1874.3	2.52	50.38%	100%	30.42	21.02%
5-Jun	643.87	1587.56	2.47	44.10%	89.43%	21.1	25.66%
5-Jul	725	1787.12	2.46	48.04%	97.45%	23.7	25.76%
5-Aug	719.45	1771.24	2.46	47.61%	96.70%	24.4	24.81%

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Unit#2 (System Number#SU01B000000287)

Date	Oper. Hours	Total kWh	Avg. kW	Capacity Factor	Availability	Input Fuel (MMBTU)	Electric Eff.
4-Aug	336	860	2.56	51.19%	100%	11.01	26.67%
4-Sep	720	1790.5	2.49	49.74%	100%	23.19	26.36%
4-Oct	744	1825.8	2.45	49.08%	100%	24.28	25.67%
4-Nov	720	1795	2.49	49.86%	100%	24.62	24.89%
4-Dec	744	1857	2.5	49.92%	100%	25.75	24.62%
5-Jan	637.3	1589.7	2.49	42.73%	86%	22.1	24.59%
5-Feb	672	1693.5	2.52	50.40%	100%	22.7	25.49%
5-Mar	730.4	1817.5	2.49	48.86%	98.18%	25	24.81%
5-Apr	702	1746.98	2.49	48.53%	97.50%	25.1	23.71%
5-May	743.9	1858.95	2.5	49.97%	99.90%	28.7	22.11%
5-Jun	719.07	1701.08	2.36	47.27%	99.96%	23.4	24.87%
5-Jul	744	1703.7	2.29	45.80%	100%	23.3	24.96%
5-Aug	744	1646.15	2.21	44.25%	100%	22.3	25.19%

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Unit#3 (System Number#SU01B000000288)

Date	Oper. Hours	Total kWh	Avg. kW	Capacity Factor	Availability	Input Fuel (MMBTU)	Electric Eff.
4-Aug	336	847.7	2.52	50.46%	100%	10.57	27.39%
4-Sep	720	1793.5	2.49	49.82%	100%	23.23	26.36%
4-Oct	744	1827.6	2.46	49.13%	100%	24.6	25.37%
4-Nov	720	1782	2.48	49.50%	100%	24.42	24.92%
4-Dec	437.6	1098	2.51	29.52%	59%	15.01	24.97%
5-Jan	627	1552.5	2.47	41.73%	84%	20.3	26.06%
5-Feb	672	1688.2	2.51	50.24%	100%	22.2	25.95%
5-Mar	730	1816.3	2.49	48.83%	98.12%	24.7	25.10%
5-Apr	702	1762.8	2.49	48.97%	98.33%	24.7	24.39%
5-May	743	1854	2.49	49.84%	100%	27.5	22.97%
5-Jun	713.5	1707.1	2.39	47.42%	99.10%	23.1	25.21%
5-Jul	744	1622.97	2.18	43.63%	100%	20.9	26.39%
5-Aug	697.4	1498.69	2.15	40.29%	93.74%	19.6	26.02%

Average kW = kWh ÷ Operating Hours

Availability = Operating Hours ÷ Hours in Period

Capacity Factor = Total kW Hours ÷ [Total Period Hours * Fuel Cell Rated kW]

Electrical Efficiency = [kWh x 3413 Btu/kWh] ÷ [Input Fuel MMBTU x 1 million Btu/MMBTU]