Remote Monitoring of a Microturbine CHP System in Canada's Northwest Territories

Myra J. Berrub
Northwest Territories Power Corporation

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NORTHWEST TERRITORIES
POWER
CORPORATION

Background

- 2 x 30 kW Capstone Microturbines with Heat Recovery
- Installed in a recreation complex with pool in Inuvik, Northwest Territories (3,300 km from Edmonton by road)
- System Commissioned September 2002
- Funding Assistance from NRCan

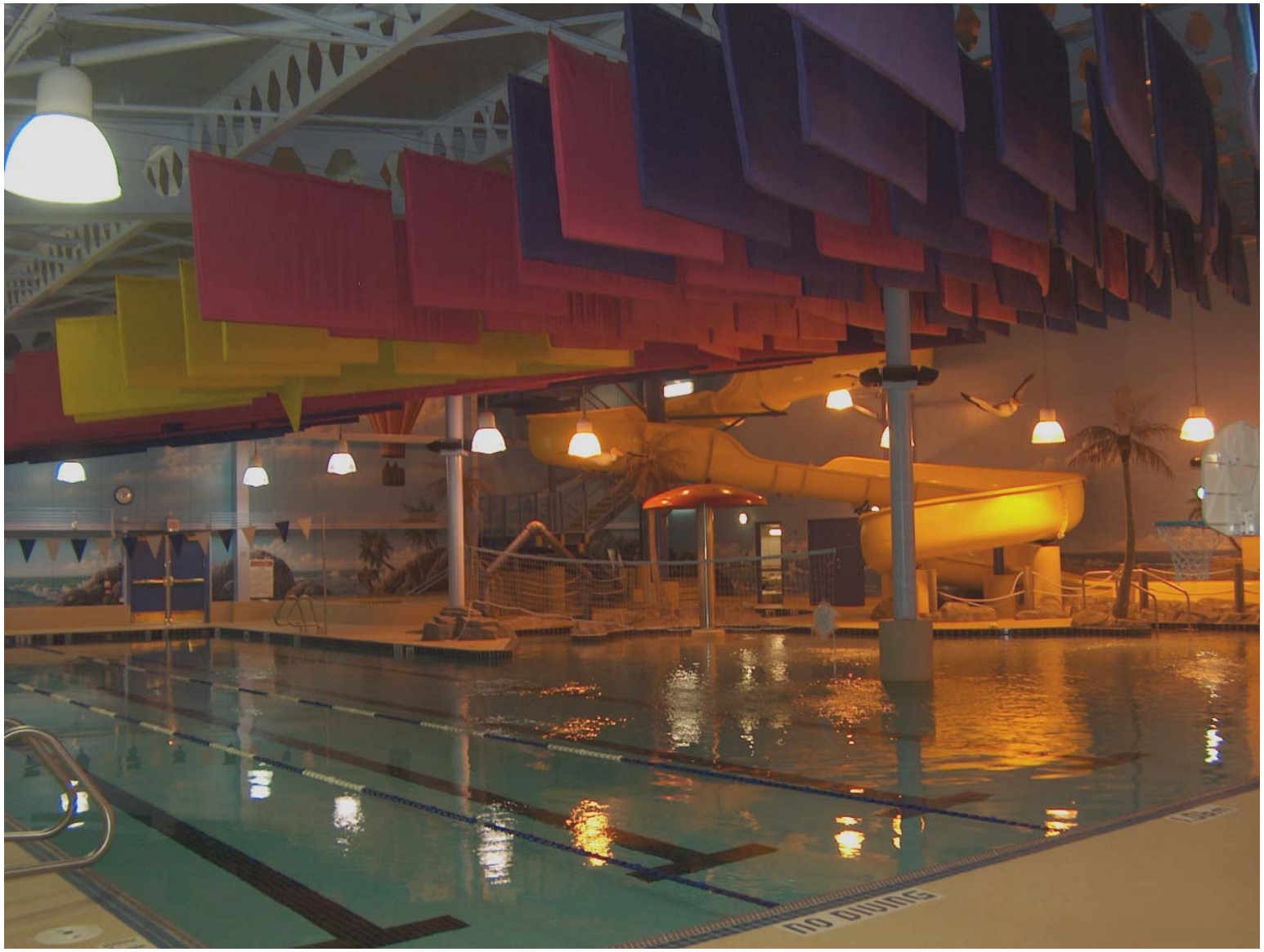

Figure 1: New Pool Addition (to Existing Community Arena)

Upgrades Undertaken in 2005

- Training of local staff
  - Major barrier: O&M can be very costly for remote applications
  - Locally trained staff can avoid some of these costs
- Subscription to UGS Profiler, remote monitoring system
  - See later slides
- Rerouting of plumbing into primary heating loop
  - Plumbing originally fed a secondary loop

General Experience

- Year 1
  - Unit not available for 4 ½ months due to fire
- Year 2
  - Unit not available for 3 months due to parts delay
- Year 3
  - Trouble free

- Outages generally due to system disturbances

UGS Profiler

- Pro's
  - Easy to use
- Con's
  - Costs focused on consumer-owned equipment, not utility-owned
  - BUT have been working with UGS to incorporate utility-focused reports

CUSTOMER INFORMATION

Please choose a selection from the list below.

- Price Information
- Energy Report
  - Daily Energy Report
  - Monthly Energy Report
  - Annual Energy Report
- Bill Information
- Performance Report
  - Performance Measures
  - Budget Assistant
- DG Report
  - DG Daily Report
  - DG Monthly Report
  - DG Inputs
- UPDATE PRICE ALARM INFORMATION
- UPDATE KW & PF ALARM INFORMATION

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Daily Energy Report

msnorth

January 2006

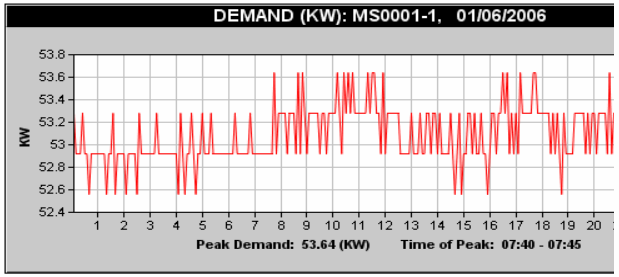
Sun	Mon	Tue	Wed	Thu	Fri	Sat
25	26	27	28	29	30	31
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	1	2	3	4

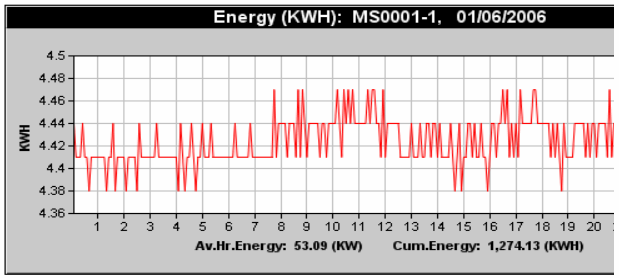
Meter ID: MS0001-1 -- GKWH, Electricity Meter

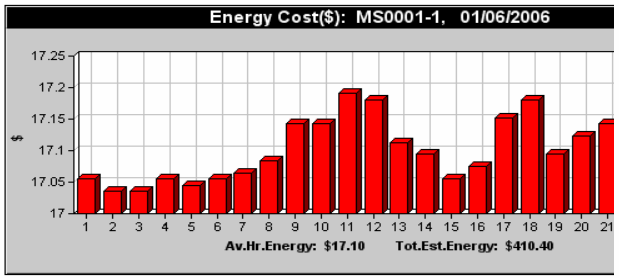
Utility: Electricity

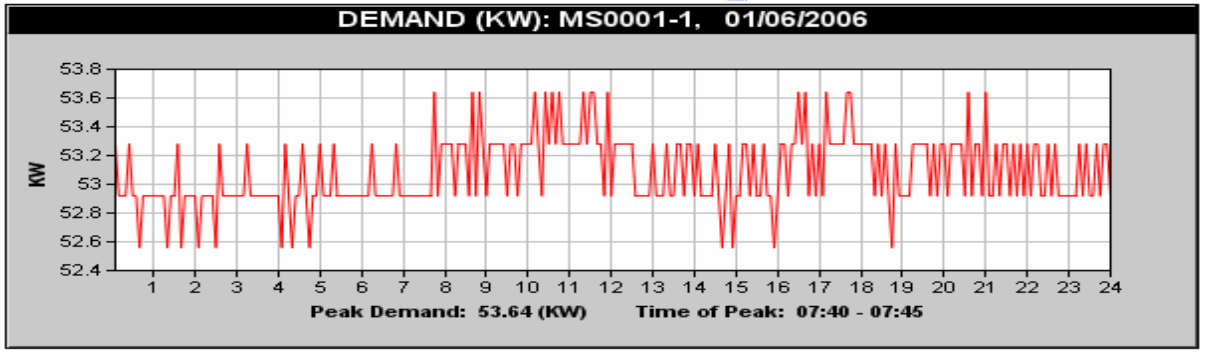
Interval: 5 Minutes

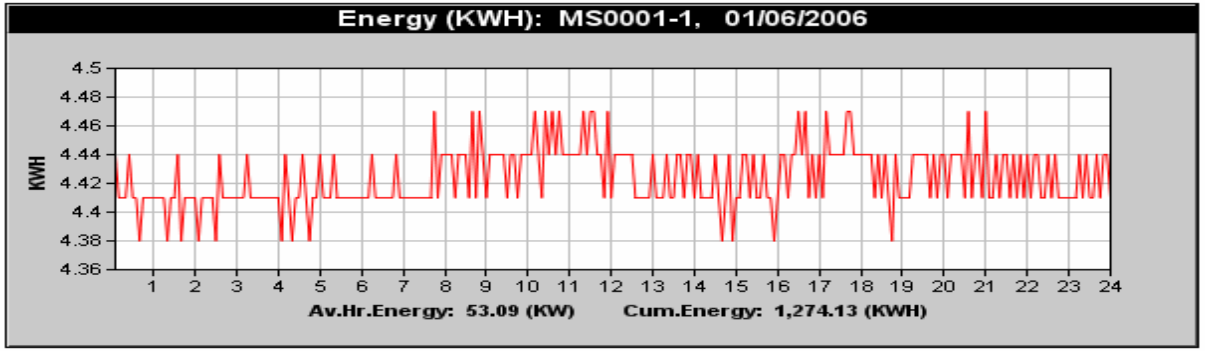
Calendar: Jan / 2006

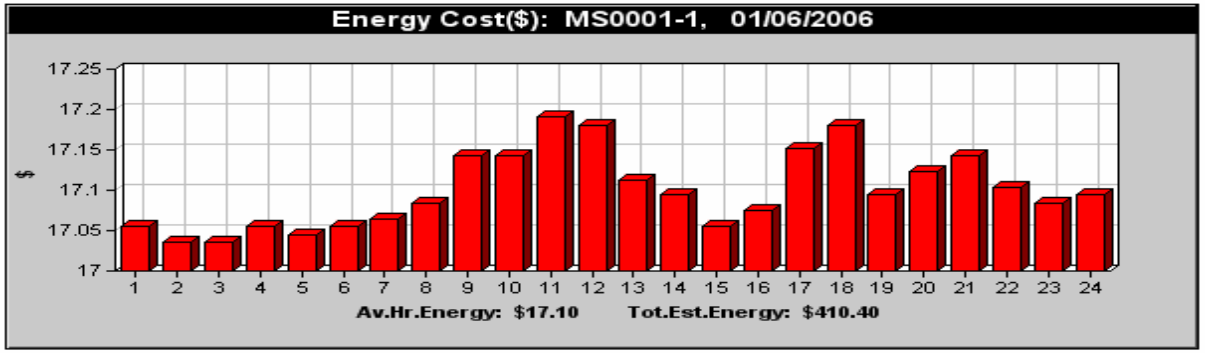












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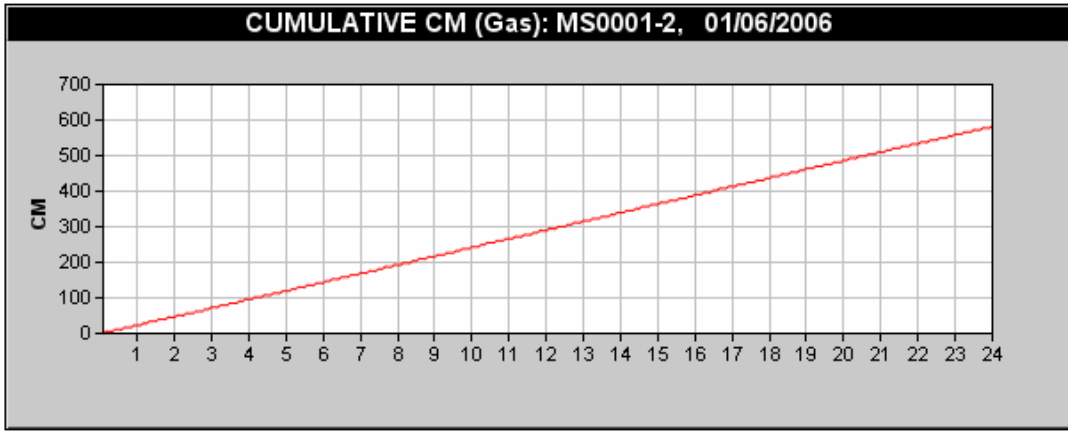
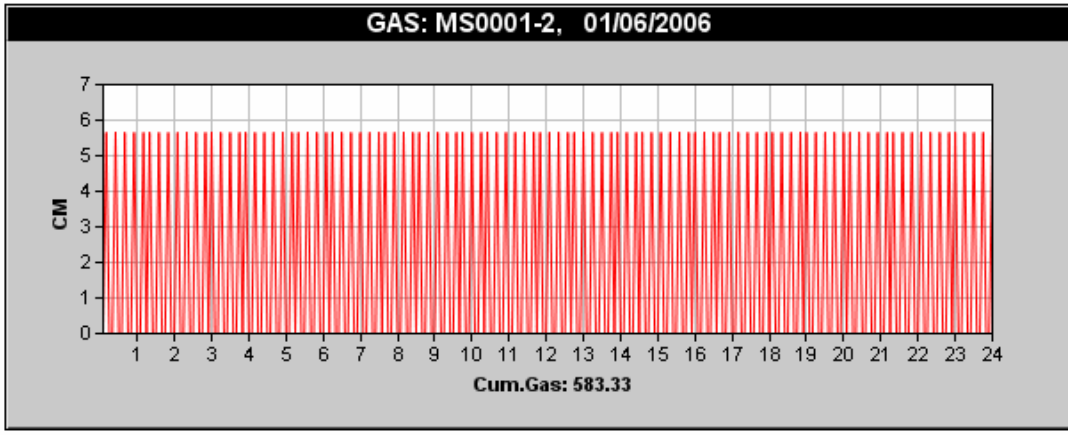
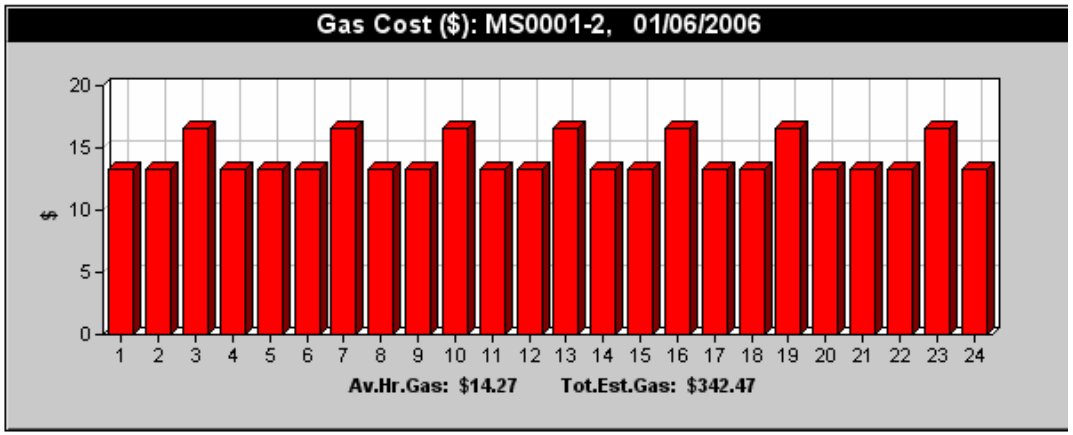
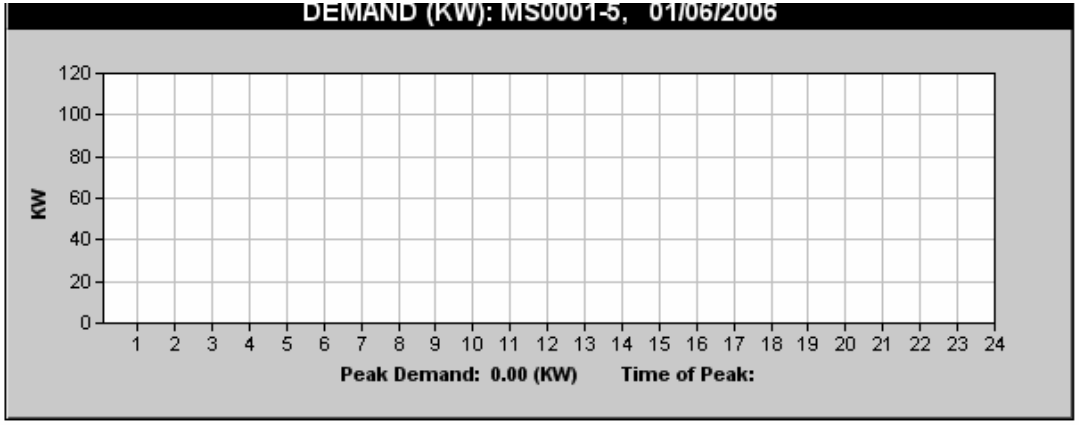
Gas

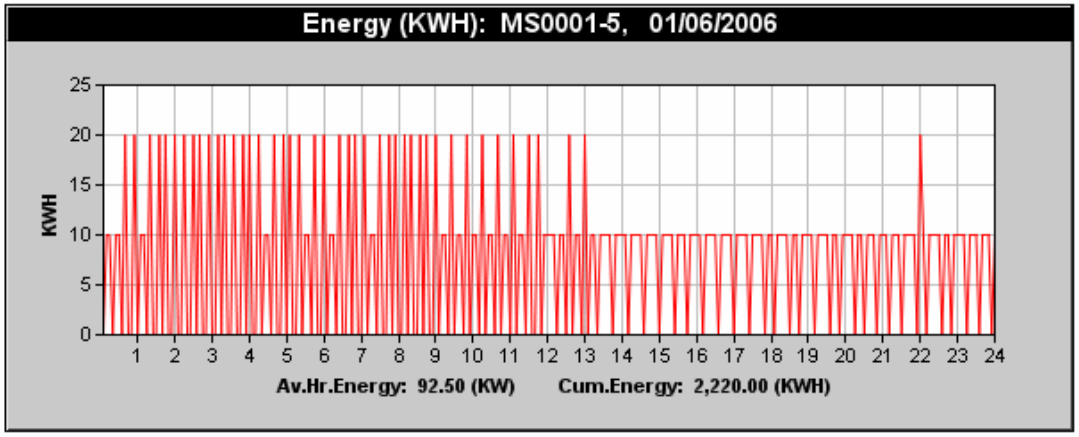

CUMULATIVE CM (Gas): MS0001-2, 01/06/2006
CM
700
600
500
400
300
200
100
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

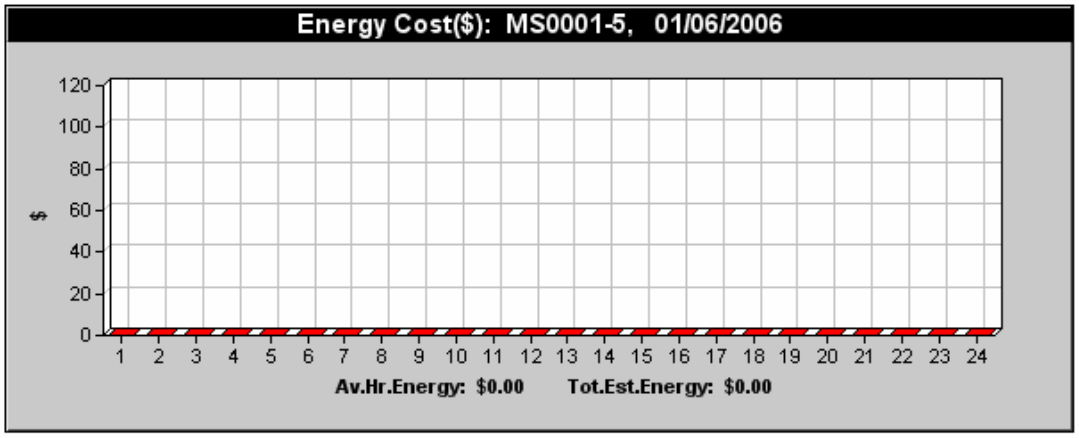

GAS: MS0001-2, 01/06/2006
CM
7
6
5
4
3
2
1
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Cum.Gas: 583.33


Gas Cost ($): MS0001-2, 01/06/2006
$
20
15
10
5
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Av.Hr.Gas: $14.27
Tot.Est.Gas: $342.47

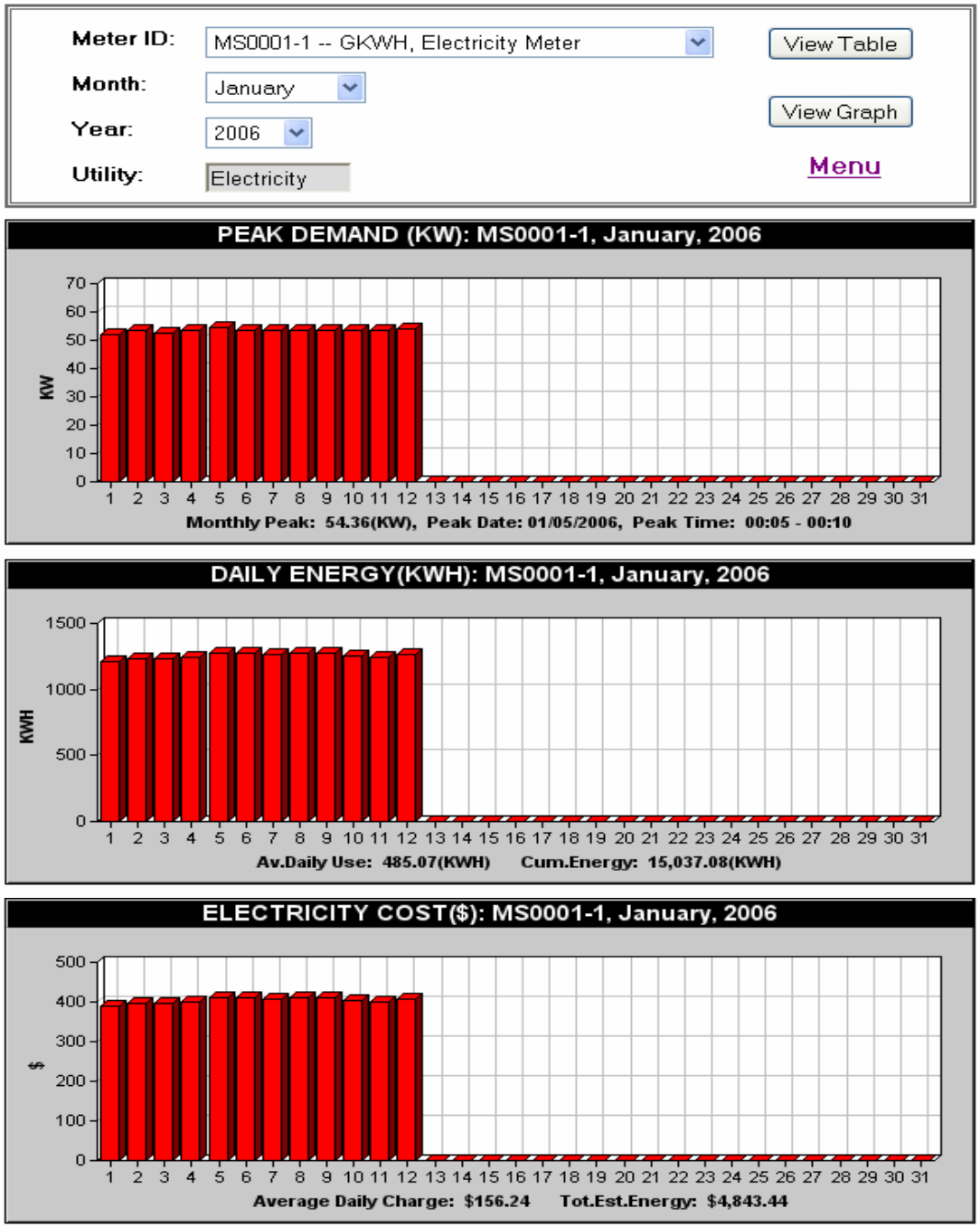
Thermal


DEMAND (KW): MS0001-5, 01/06/2006
KW
120
100
80
60
40
20
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Peak Demand: 0.00 (KW)
Time of Peak:

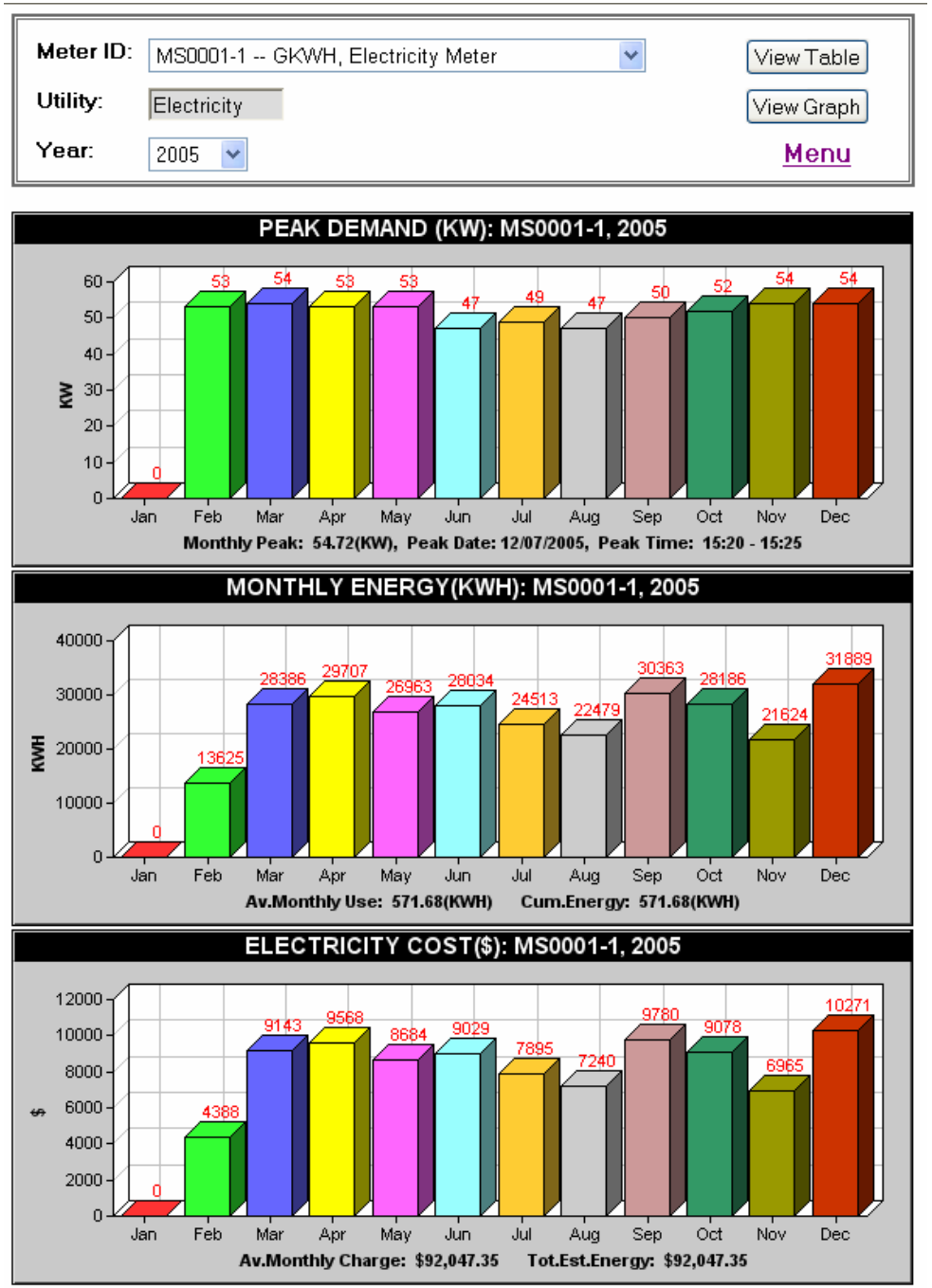

Energy (KWH): MS0001-5, 01/06/2006
KWH
25
20
15
10
5
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Av.Hr.Energy: 92.50 (KW)
Cum.Energy: 2,220.00 (KWH)


Energy Cost($): MS0001-5, 01/06/2006
$
120
100
80
60
40
20
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Av.Hr.Energy: $0.00
Tot.Est.Energy: $0.00

Monthly Energy Report



Annual Energy Report



DG Inputs

Capital	
Installed capital Cost ($)	418,000.0000
Economic Life (yrs)	10.00
Financing Cost	0.0962
Monthly Charge ($)	5,436.3185

Annual Maintenance & Labour	
Standby Charge ($)	0.0000
Annual Lube oil ($)	0.0000
Annual parts & labour ($)	10,000.0000
Operator ($)	0.0000
Total ($)	10,000.0000

Fuel Cost	
Gas Cost ($/M3)	0.5871

Operating Assumptions	
Building Peak Load (KW)	200.0000
Daily Operating Hours	24.00
DG Efficiency	0.2100
Boiler Efficiency	0.7000
Heat Available for Reclaim	0.4500
Net capacity Output (kw)	60.0000
Monthly Operating Hours	720.00
Operating Lifetime (Hrs)	86,400.00
Expected Monthly Output (kwh)	43,200.0000
Expected Lifetime Output (kwh)	5,184,000.0000

Cogen C&M Costs Per kwh	
Capital cost ($/kwh)	0.1258
Maint & Labour ($/kwh)	0.0193
Total cost ($/kwh)	0.1451

DG Daily Report

Date: 01/06/2006

Meter Data	
Electricity generated - kwh	1,274.1300
Gas used to generate electricity in (M3)	583.3302
DG Thermal meter - kwh	2,220.0000
DG Load (KW)	53.6400
Building Electrical Load (KW)	0.0000
Building Gas Load (M3/Hr)	0.0000

Energy Pricing Data	
kwh production commodity value	410.3973
Wholesale Charge $/kwh	0.0000
Debt Retirement $/kwh	0.0000
Distribution Charge $/kw	8.0000
Transformer Allowance $/kw	0.0000
Network Transmission Charge $/kw	0.0000
Network Connection Charge $/kw	0.0000
Transmission Loss Factor	1.0000
Average Gas Cost per /M3	0.5871

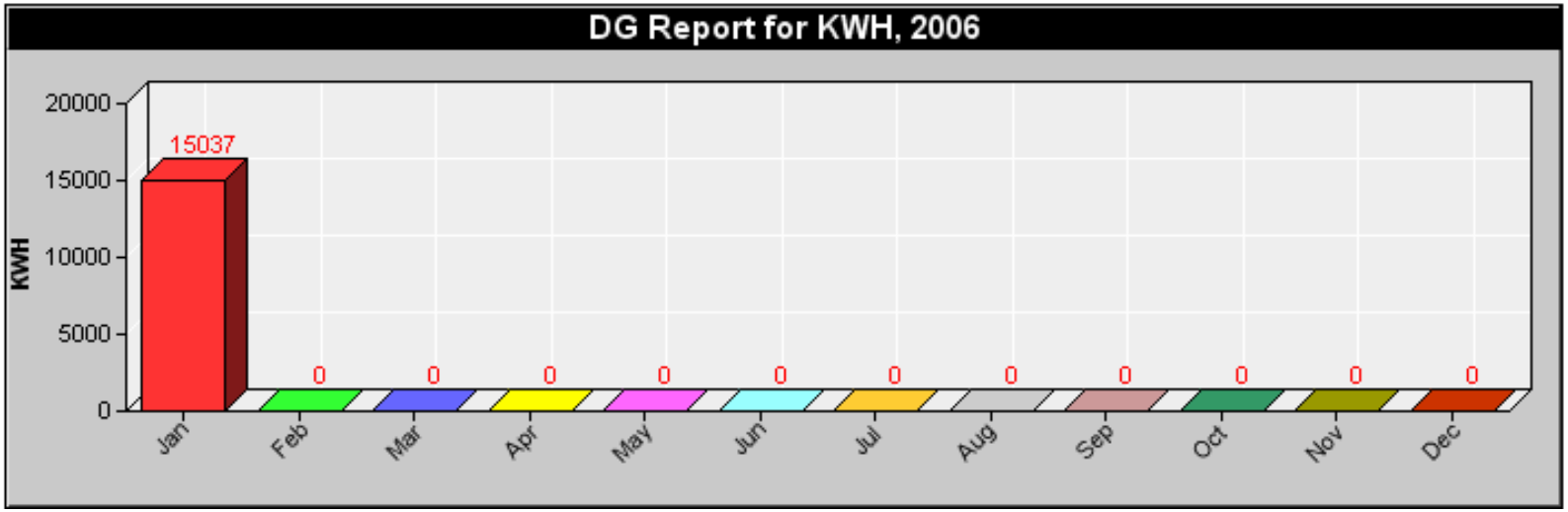
DG Operating Costs	
Gas meter M3 converted to kwh	6,079.4670
Thermal meter kwh converted to M3	213.0109
Value of electricity produced based on market rates $	424.2399
Cost of electricity production $	385.6662
Value of heat recovered	178.6553
Net benefit of running the generator	217.2290

DG Efficiencies	
Electrical Efficiency	0.2096
Thermal Efficiency	0.3652
Total Efficiency	0.5747

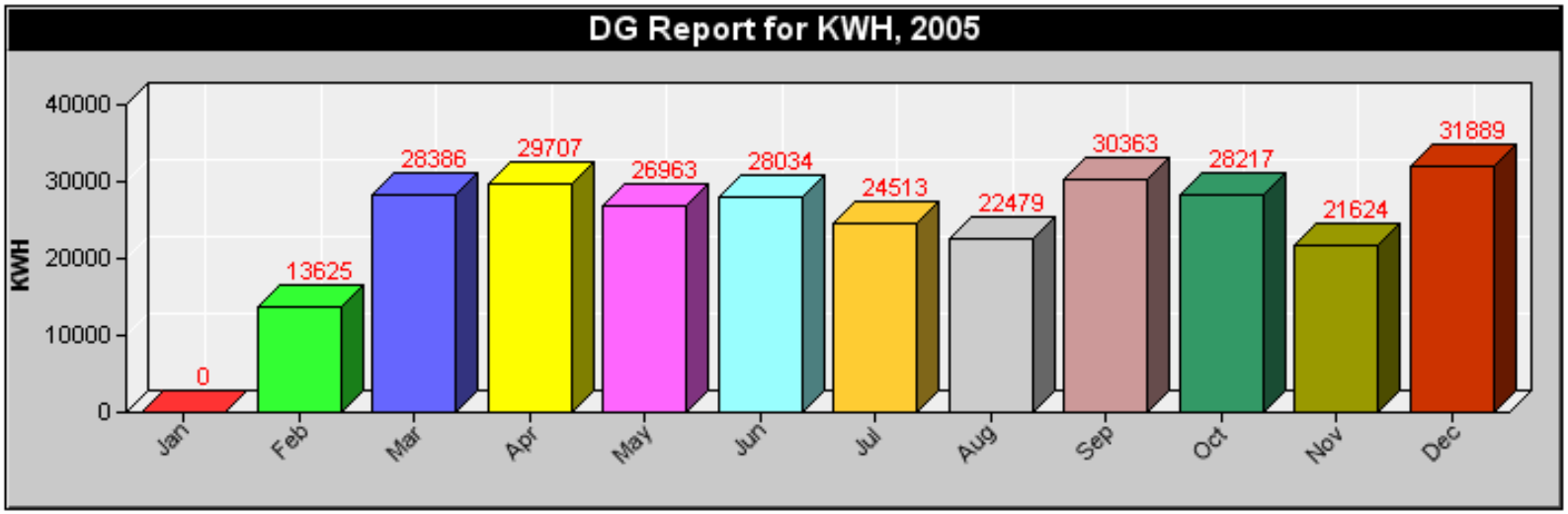
DG Monthly Report

Year: 2006 Graph: KWH

2006	Gas(Cum)	TKWH	KWh	Peak KW	NET Benefit	Electrical Eff	Thermal Eff	Total Eff
Jan	6,971.6460	27,009.8000	15,037.0800	54.3600	2,579.8110	0.2070	0.3718	0.5787
Feb	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mar	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Apr	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
May	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Jun	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Jul	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Aug	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sep	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Oct	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nov	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Dec	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000



DG Monthly Report

Year: 2005 Graph: KWH

2005	Gas(Cum)	TKWH	KWh	Peak KW	NET Benefit	Electrical Eff	Thermal Eff	Total Eff
Jan	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Feb	3,216.8110	357,710.0000	13,625.4900	53.6400	30,975.8100	0.4064	10.6705	11.0769
Mar	6,311.8590	698,160.0000	28,386.4200	54.0000	60,977.0400	0.4650	7.8963	8.3613
Apr	7,430.3820	857,500.0000	29,707.1100	53.6400	73,565.7300	0.3448	9.9686	10.3134
May	6,906.5170	848,870.0000	26,963.0400	53.2800	72,390.4500	0.3421	11.2550	11.5971
Jun	7,184.0230	848,100.0000	28,034.1000	47.8800	72,460.2200	0.3672	10.6414	11.0086
Jul	6,065.5030	715,560.0000	24,513.4500	49.3200	61,465.2200	0.3260	10.0661	10.3921
Aug	5,615.2610	681,920.0000	22,479.6000	47.1600	58,376.5700	0.3081	10.5668	10.8749
Sep	11,935.6200	443,784.2000	30,363.8100	50.7600	37,806.9300	0.2680	5.0411	5.3092
Oct	13,954.6200	56,068.7500	28,217.7300	52.9200	4,765.7400	0.1938	0.3897	0.5835
Nov	10,103.5000	83,490.0000	21,624.0600	54.3600	7,301.1360	0.1685	2.1135	2.2820
Dec	14,877.7500	61,090.0000	31,889.2800	54.7200	5,769.7220	0.1930	0.3692	0.5622