BP Canada Energy Company
Innovative Methods for Reducing Greenhouse Gas - Low Emissions Wellsite

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Agenda

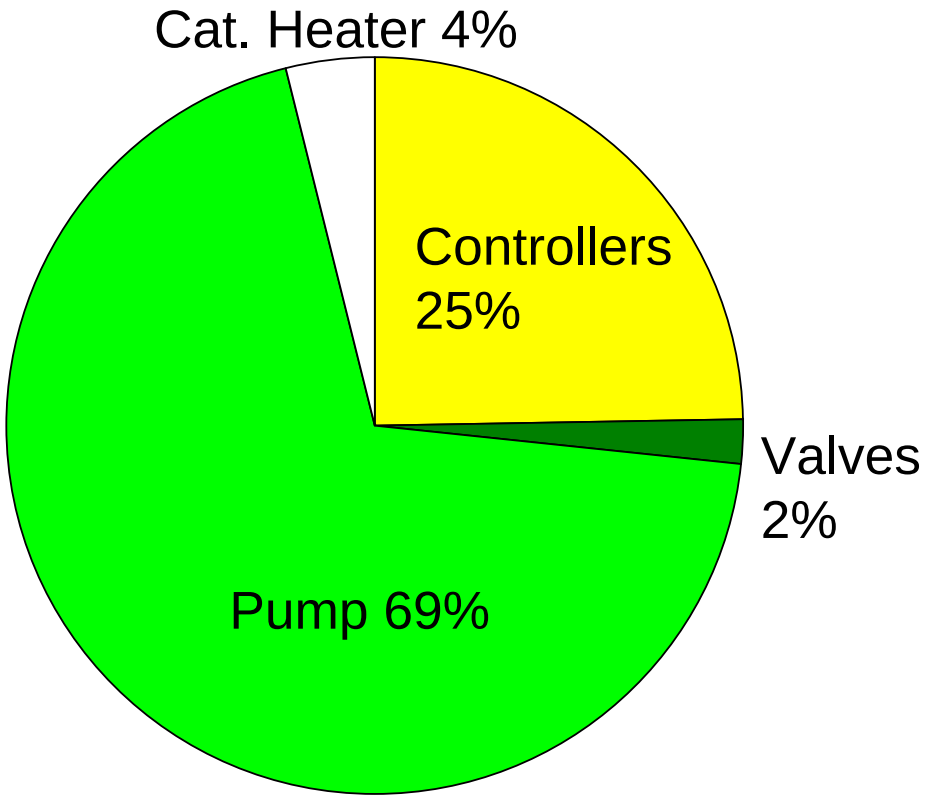
- Opportunity
- Scope
- Energy Consumption Profile
- Cost
- Concerns
- Going Forward

Low Emission Wellsite - The Opportunity

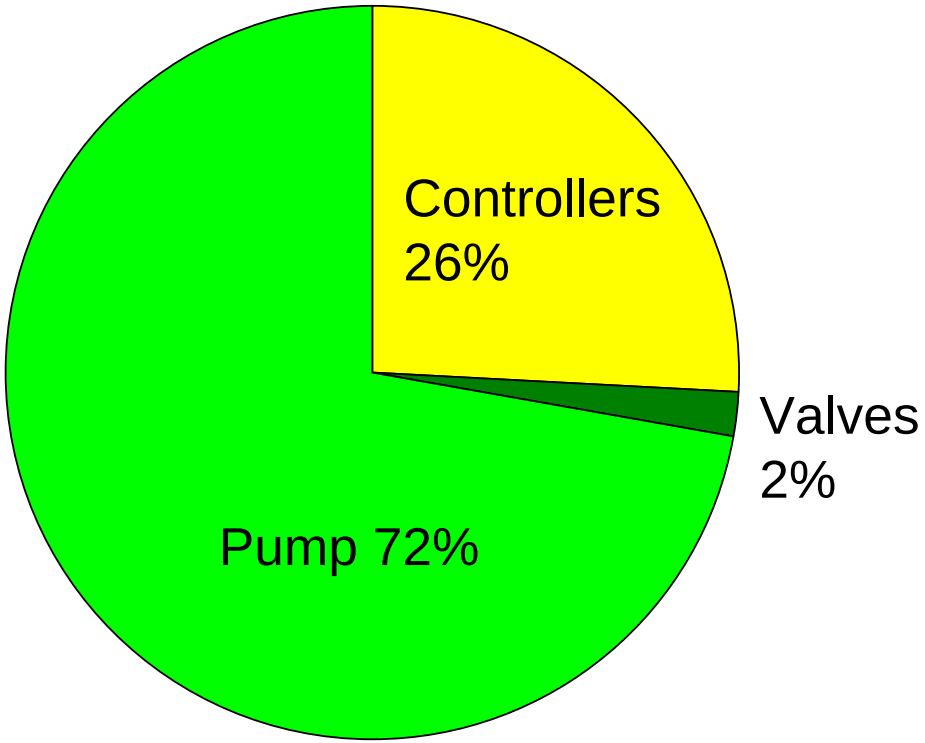
- Currently, all remote well sites use pressurized natural gas generated from the sites to operate the instrumentation and equipment.
  - Phase Separation
  - Chemical Injection
  - Metering
- Pneumatic instrumentation and equipment continuously vent methane to the atmosphere.
  - Loss of Saleable Product
  - Greenhouse Gas Emissions

Fuel Gas Users

Fuel Gas Consumption with Catadyne Heater



Fuel Gas Consumption without Catadyne Heater



The Test Site

- Two wells
- Two 3 Phase Separators
- Two Chemical Pumps
- Associated Instrumentation and Controls
- Two Catadyne Heaters

Current Estimate Fuel Consumption (excluding heaters)

5.5 MMscf/Year

$27,500/Year at $5.00/Mscf

- Determine most effective design to replace fuel gas pneumatics with electrical devices and/or instrument air.
- Combine solar/wind/pressure energy to power devices directly and power a small air compressor to indirectly power devices with instrument air.
  - Understand how, where and when energy is consumed.

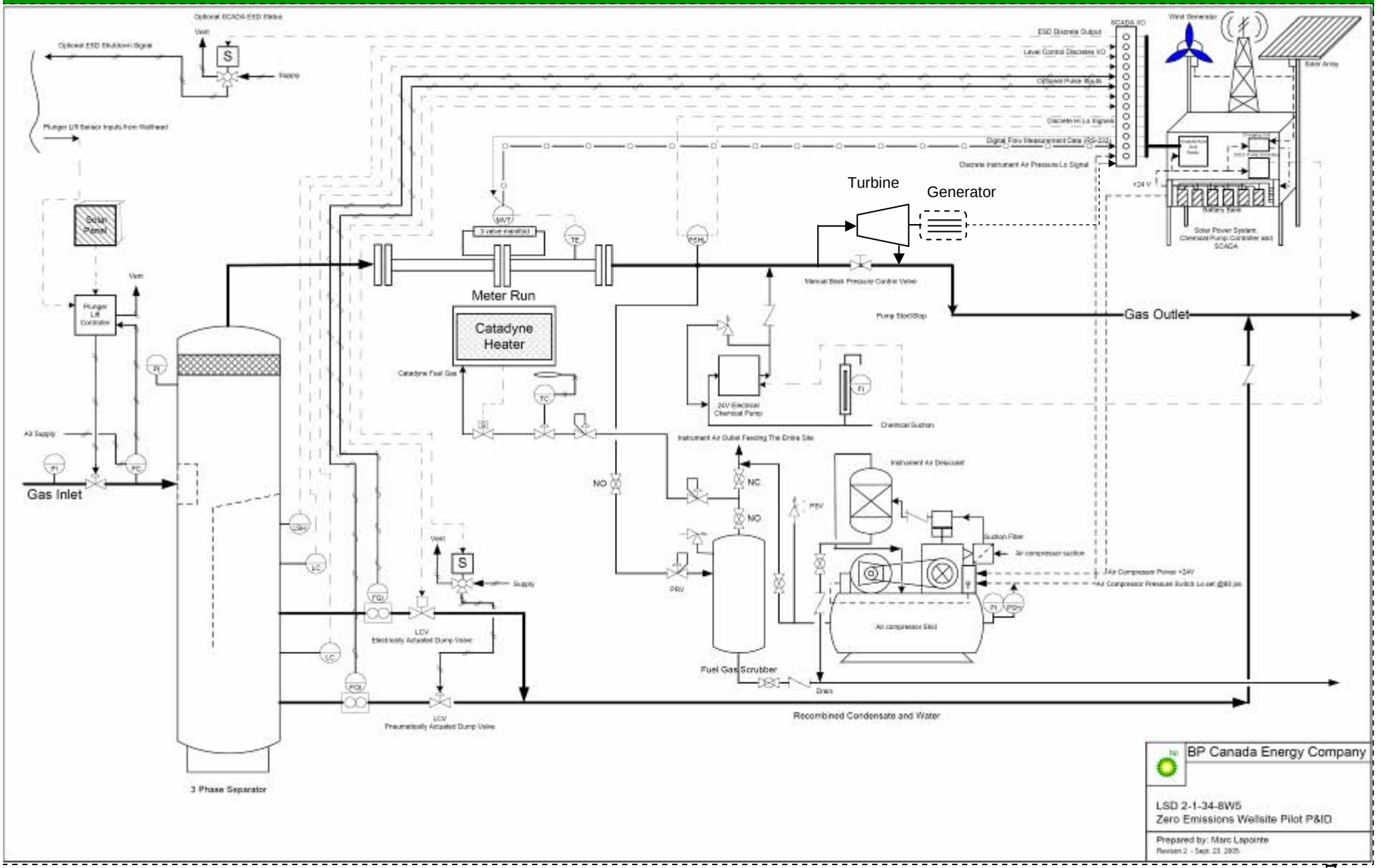
The Project Scope

- Install
  - Solar Panel Array
  - Wind Turbine and Mast
  - Pressure Turbine and Generator (future)
  - Anemometer and Communication Tower
  - Batteries
  - RTU
  - Air Compressor
  - Instrumentation

Electricity is then used to power electrical equipment or pneumatic equipment via an air compressor

Solar, pressure and wind energy are captured and converted into electricity, which is stored in a bank of batteries.

Concept


Turbine
Generator
Meter Run
Catadyne Heater
Gas Outlet
Gas Inlet
Fuel Gas Scrubber
3 Phase Separator
Recombined Condensate and Water
BP Canada Energy Company
LSD 2-1-34-8W5
Zero Emissions Wellsite Pilot P&ID
Prepared by: Marc Lapointe

Total Consumers For Both Sites

Consumption

Load	Est. Avg. Hourly Load
RTU	28.7 W
IA Compressor	38.0 W
Flow Meter x 2	0.8 W
Dump Valve	3.2 W
Solenoid	0.1 W
Solar Pump x 2	9.8 W
ESD	3.6 W
Losses (13%)	12.6 W
Total	**96.8 W**

Power Generation

Solar Generation:
9 – 150 W 24 VDC Panels (during daylight hours)

Pressure Differential Turbine Generation:
100 W 24 VDC (while there is gas flow)
Note: this technology is yet to be installed.

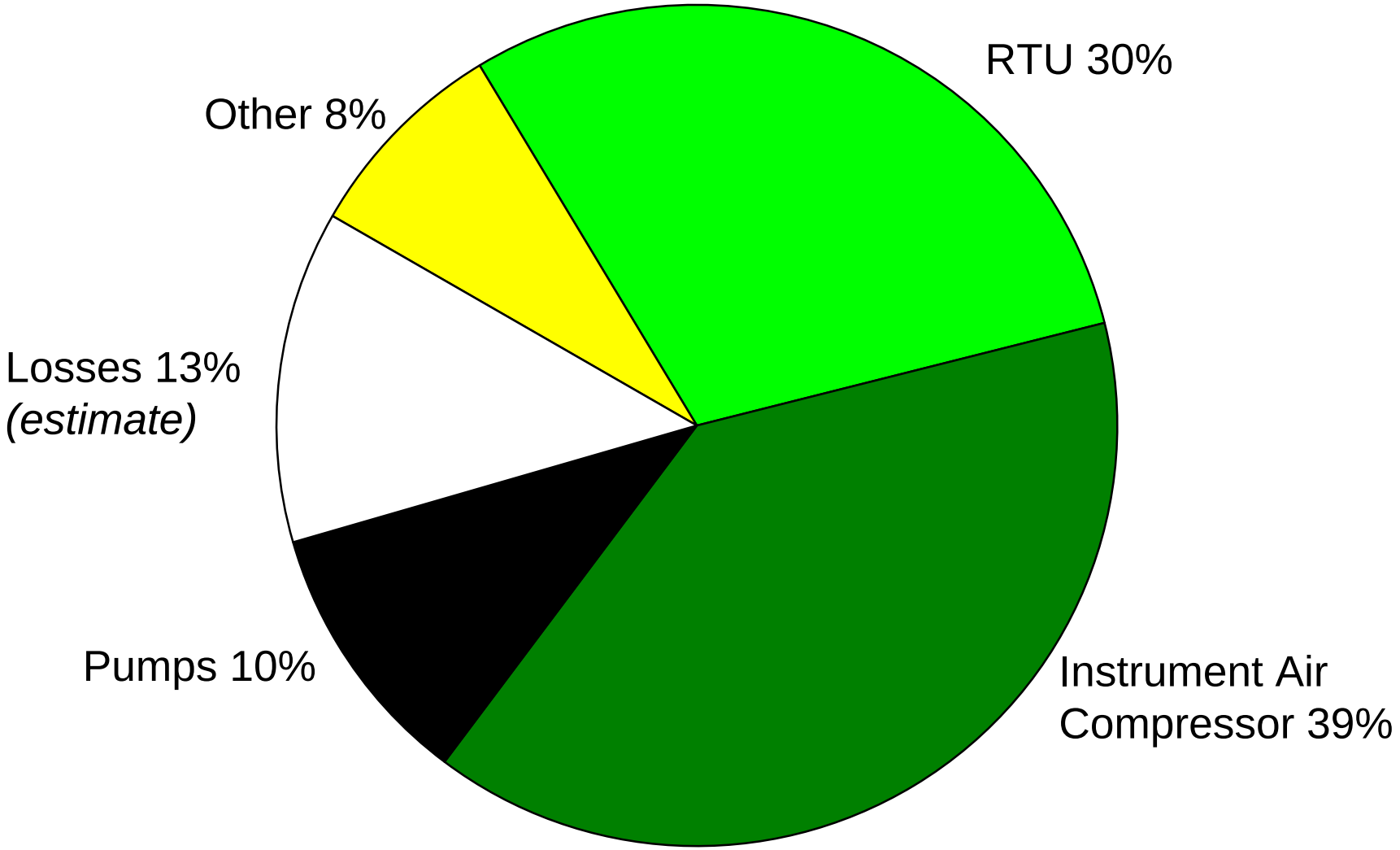
Wind Generation:
400 W 24 VDC (while there is sufficient wind)
Note: minimum wind speed is not achieved at site.

Energy Storage

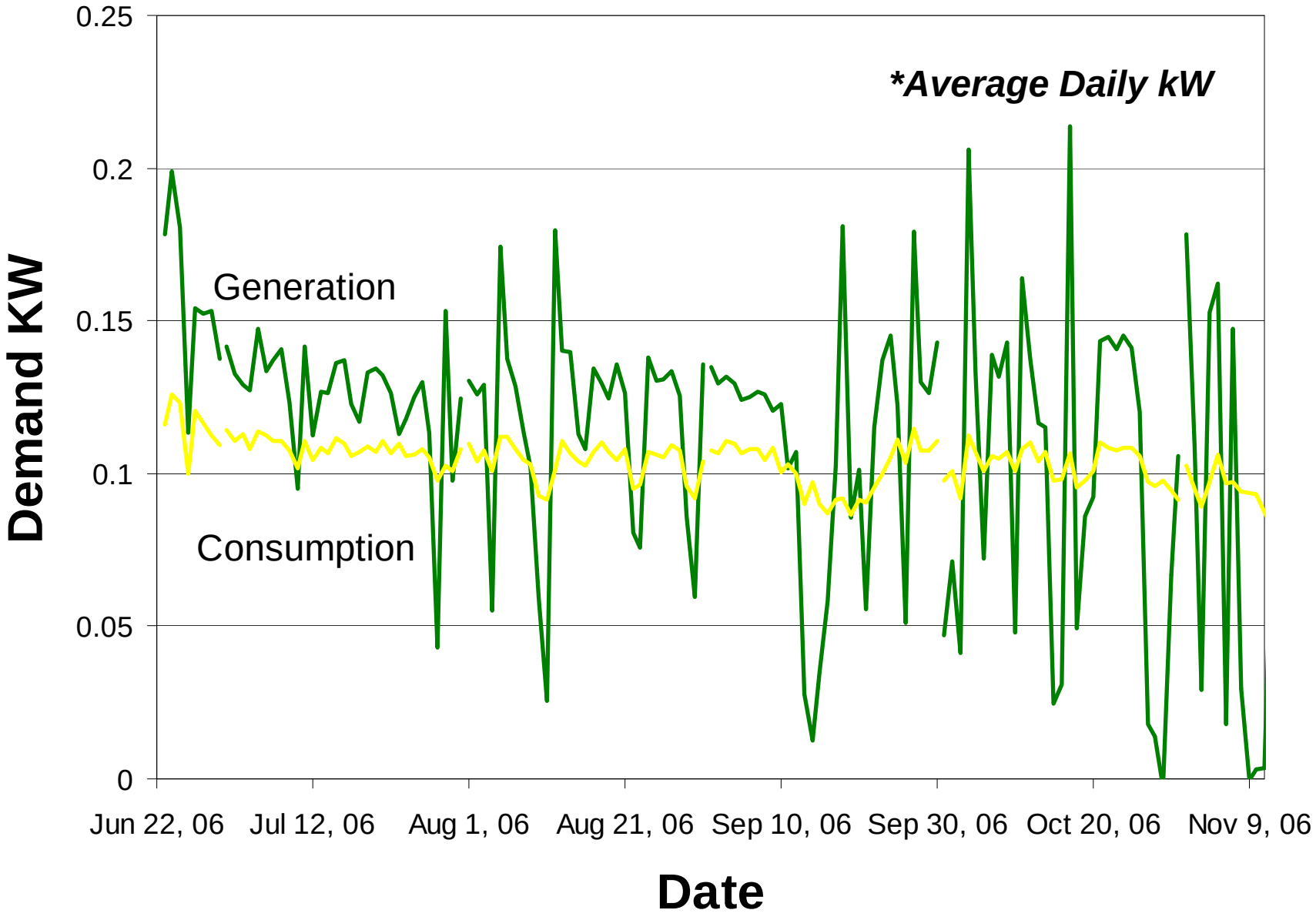
Battery Bank:

16 – 140A-hr 12VDC Batteries
(50% Capacity at low temp.)

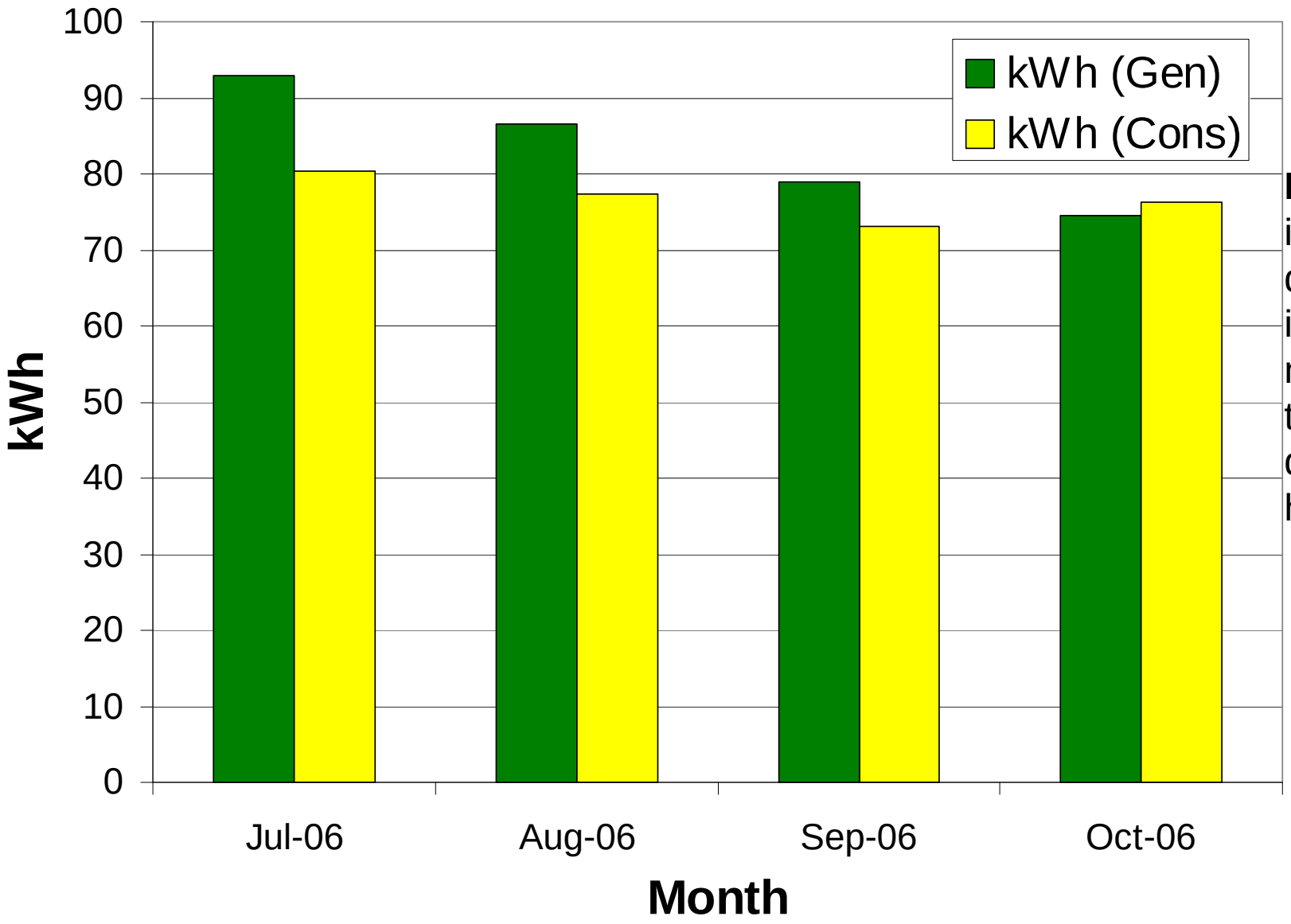
Electrical Consumer Breakdown



Daily Demand Profile (kW)



Monthly Energy Consumption (kWh)



Note: There is a energy deficiency in the colder months due to less daylight hours.

Emission Tech vs. Low Emission Tech

Old Pneumatic Package

- Cost Effective
- Pneumatic Controllers
  - Release of saleable Product
  - Polluting (GHG, CAC's)
- No need for power supply.
  - Reliable

New Low Emission Package

- Cost is estimated at $10-$15K greater then 'old' package. Still to be standardized.
- Electric or IA Pneumatic Controllers
- Power Supply
  - Still to be optimized.
- Savings in lost product and elimination of GHG, CAC to offset the additional cost.
  - Magnitude is dependant on venting volumes.

Capital Cost

Summary for Major Equipment

Unit	Cost/Unit
Wind (400 W)	$6,000 - $7,000
Solar Panel (150 W)	$1,000/Panel
Solar Stand	$1,000
Turbine (100W)	TBD (Pilot)
Battery Box	$450/box
Battery (140 A-hr, 12V)	$320/battery
IA Compressor + Control Panel	$11,000
Pump (Electric vs. Pneumatic)	Similar Price
Valve (Electric vs. Pneumatic)	Electric 100-150% Greater

For a new install the package is estimated at $10-15k greater.

For a retrofit with an IA compressor the package is estimated at $24-30k.

Cost will vary amongst different vendors.

Concerns

- Reliability of Power Source
  - Power Source Capacity
  - Temperature Effects (affects on battery from low temperature)
  - Solar - Daylight Issue (effects of overcast or days of low daylight hours)
  - Turbine - Pressure Drop Concerns (depleting reservoir pressure)
  - Wind – Requires Sufficient Wind Speeds
- Cost
  - Currently a retrofit has a 4 yr payback (no GHG credits), 2 yr payback with GHG credits.
  - New installations $10-15k greater in cost.

Going Forward

- Installing the Electrical Actuators
- Standardizing the Package
  - Electrical vs. Instrument Air Pneumatic
  - Retrofit and New Install
- Installing turbine and switching power source.
- Observation over the darkness cycle (winter).

Conclusion

BP hopes to continue with this program and standardize the package to eventually install all new facilities with this new low emissions design.