Managing Energy Use and Cost with Integrated Metering

Regional Municipality of Durham

October 29, 2015

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Overview

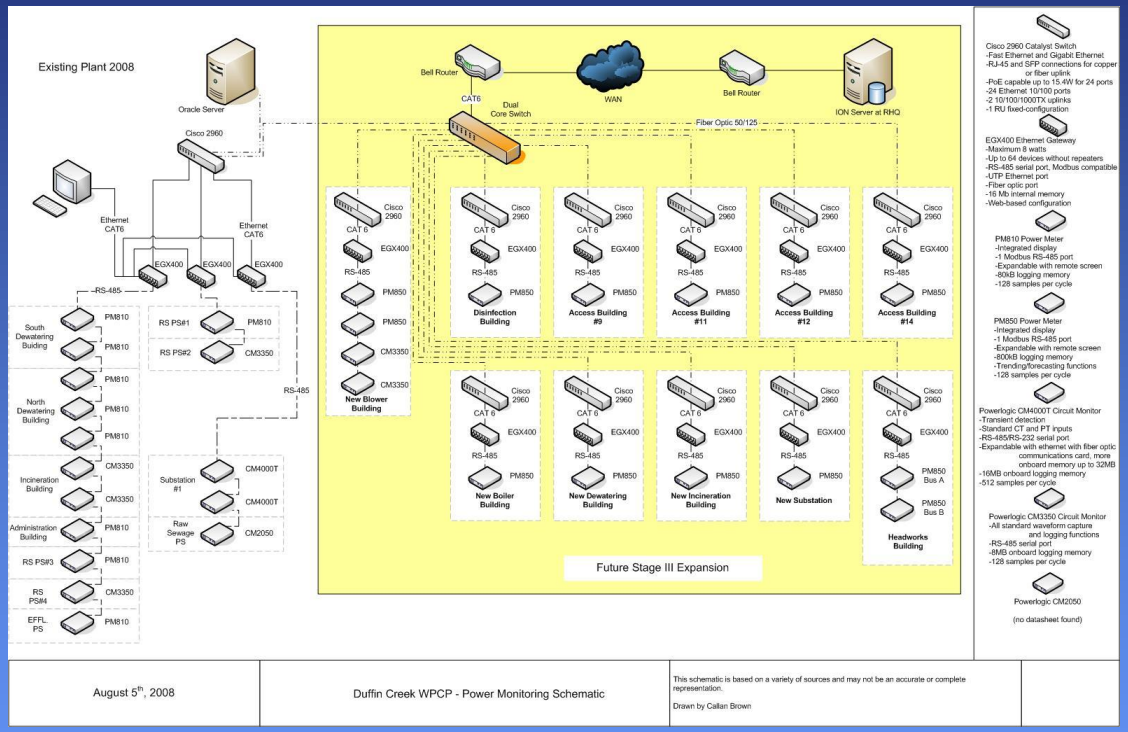
- Duffin Creek WPCP
  - Jointly owned by York and Durham Regions
- Capacity of 600,000 m3/day
- Built in 3 stages 1979, 1990, 2011
- Refurbishment and expansion projects on-going

Electrical Summary

- Two substations, two bills – combined demand of 7-10 MW
- Total 2014 electricity use – 65 million kWh
- Sub 1- Class A
- Sub 2 – Class B
- Supplied by Veridian

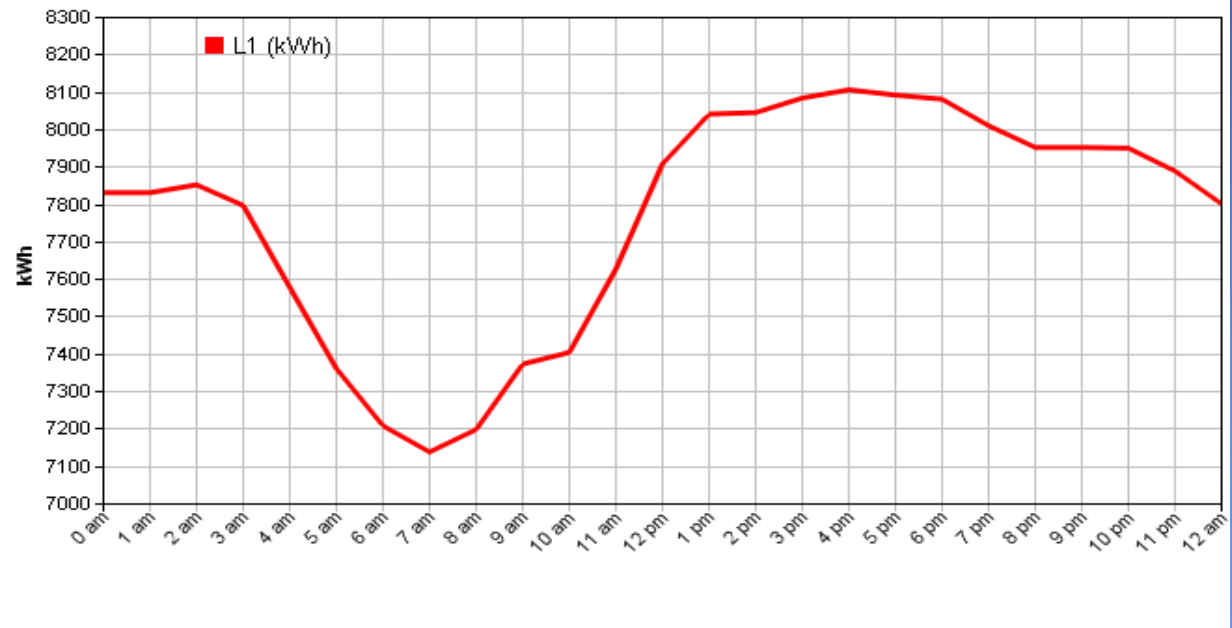
Power Monitoring

- ION 6.0 system
- Over 90 meters installed
- Budgeted for upgrade to PME in 2016



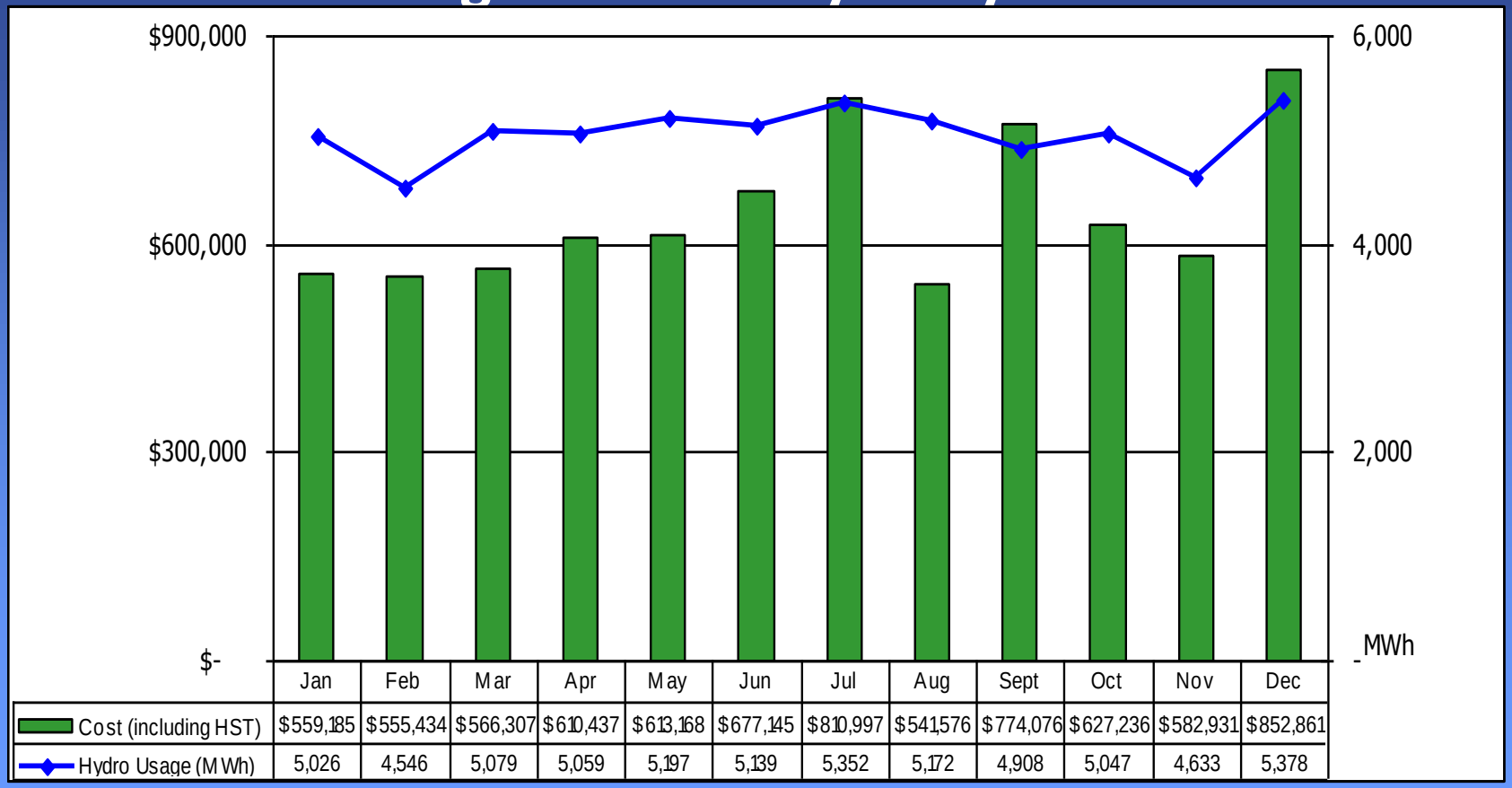
Daily Consumption

- Typical profile – about 1 MW difference from peak to trough. Follows wastewater flow pattern



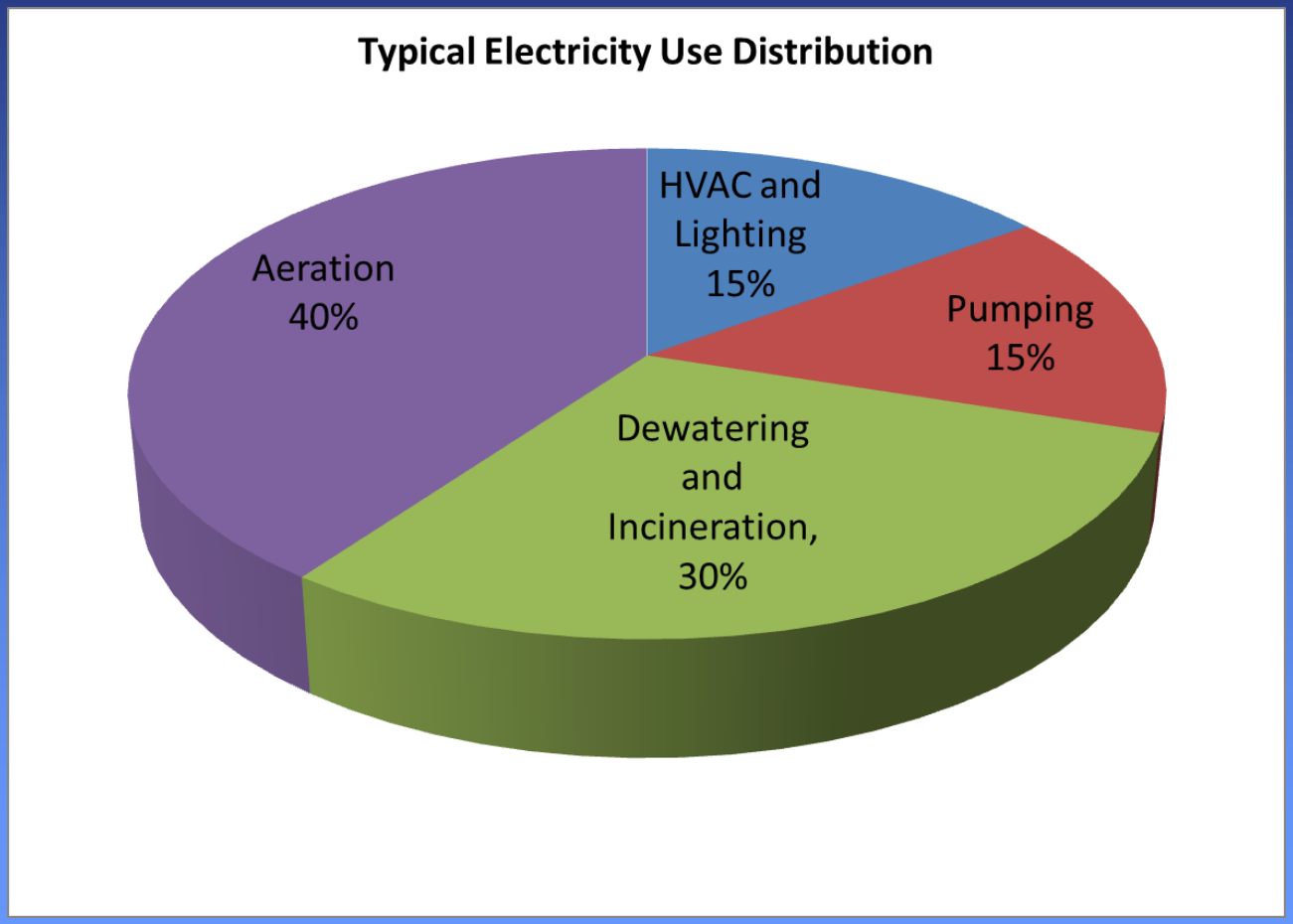
Monthly Consumption

- Seasonal loading? – not really. Very consistent overall



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Cost (including HST)	$559,185	$555,434	$566,307	$610,437	$613,168	$677,145	$810,997	$541,576	$774,076	$627,236	$582,931	$852,861
Hydro Usage (MWh)	5,026	4,546	5,079	5,059	5,197	5,139	5,352	5,172	4,908	5,047	4,633	5,378

How Do We Use It?



Energy Management Plan

- EMP Objectives
  - Determine current performance benchmarks
  - Identify short and long term opportunities in each area
  - Quantify savings opportunities and costs/paybacks
- EMP examples:
  - Process optimization
    - Aeration, influent pumping/effluent pumping/RAS/WAS/Dewat, etc
    - Power monitoring system upgrades
  - Lighting –LED retrofits, automatic controls
  - HVAC – Auditing and optimizing building HVAC

Value Added by Power Monitoring system

1. Determine current performance benchmarks for both energy and demand, provides excellent usage data to help quantify opportunities for energy efficiency measures (EEMs)
2. Provides real time feedback to Operations related to energy use
3. Simplifies measurement and verification (M&V) process for both incented and non-incented EEMs
4. Can be used as a tool for troubleshooting power quality or equipment reliability issues

Value Added by Power Monitoring system

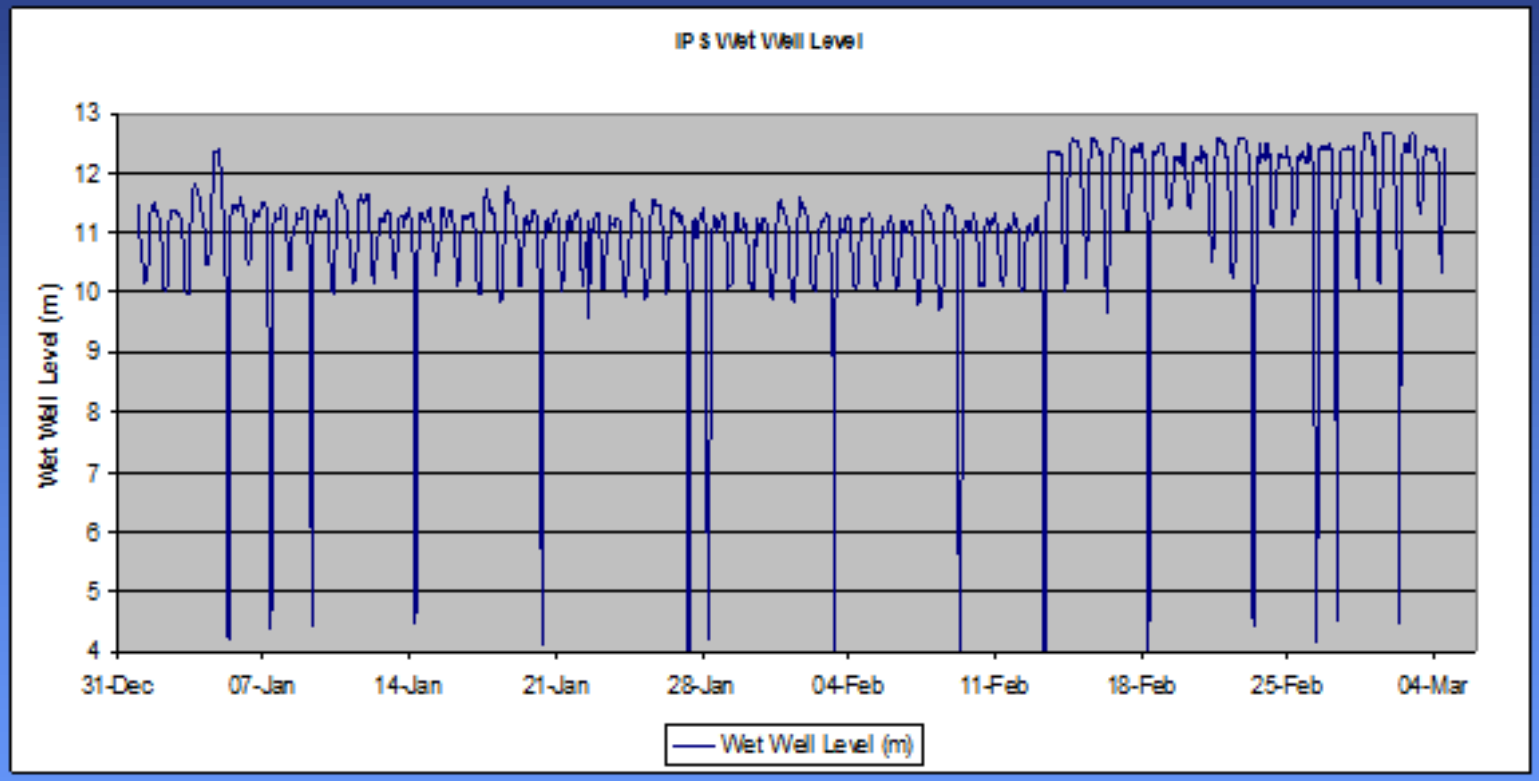
5. Provides real time load data which can be used for peak load and coincident peak management
6. Allows for energy cost analysis by unit process. This facilitates cost splitting with partners
7. Helps to fulfill reporting requirements
   a) Municipalities have certain requirements under 397/11 Green Energy Act
   b) Requires accurate reporting of energy use and GHG emissions

M&V Example

- As part of the facility Energy Management Plan, the performance of one of the pump stations was evaluated. Avg demand of 400-800 kW.
- Using the energy data collected by the energy monitoring system, testing was done to determine the effect of set point changes on energy use
- Statistical analysis of energy use data before and after the changes was used to normalize consumption to account for daily flow fluctuations using RETScreen
- This analysis was used to confirm test results, and also build business case for further study and optimization. Significant incentive funding was secured from IESO for a detailed engineering study
- Study has now been completed, and EEM's identified and now under implementation to avoid approx 1,700 MWh per year in energy

M&V Example

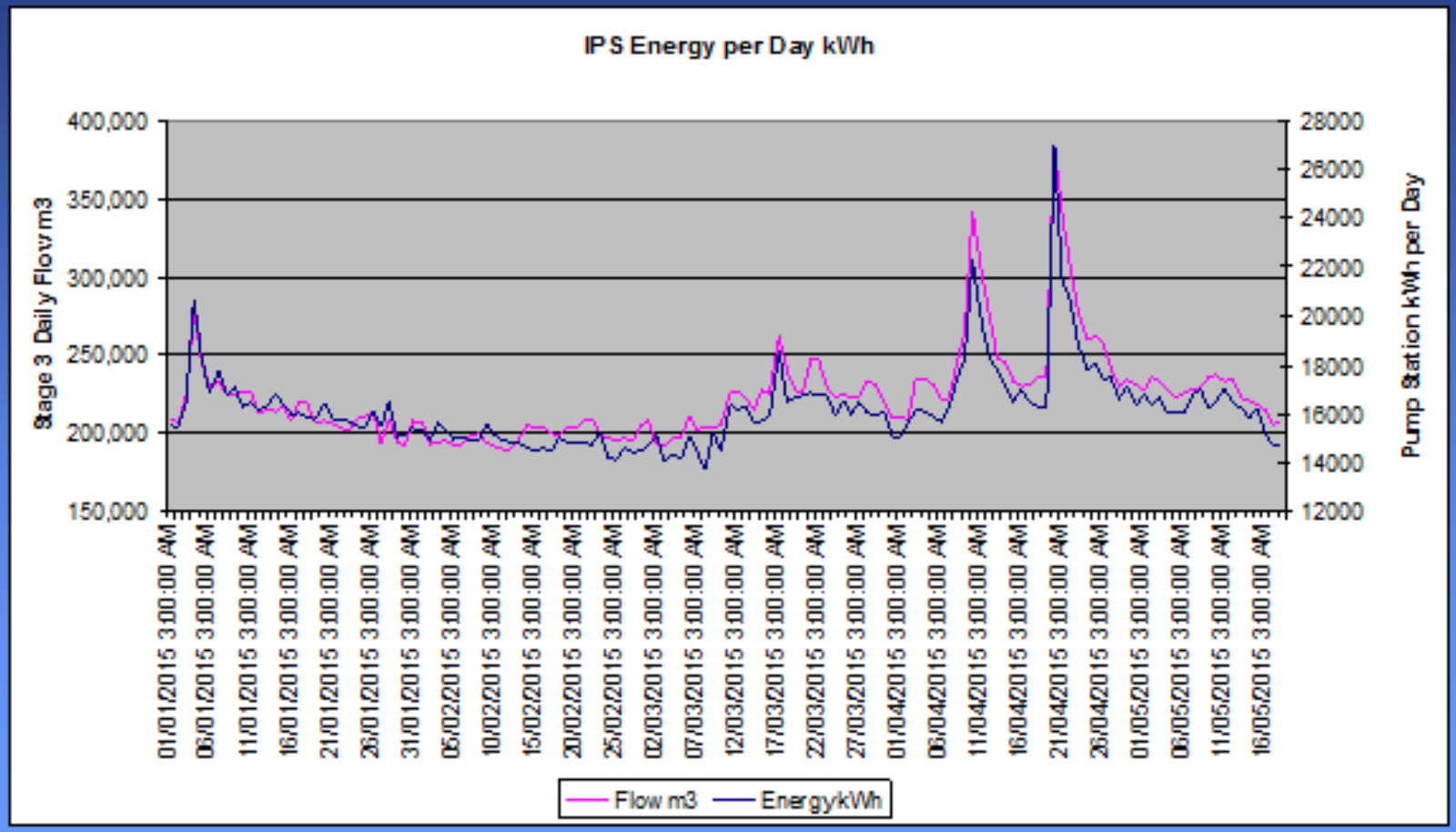
Feb 13th Set points changed to move typical operating level up 1m



Daily kWh and Flow

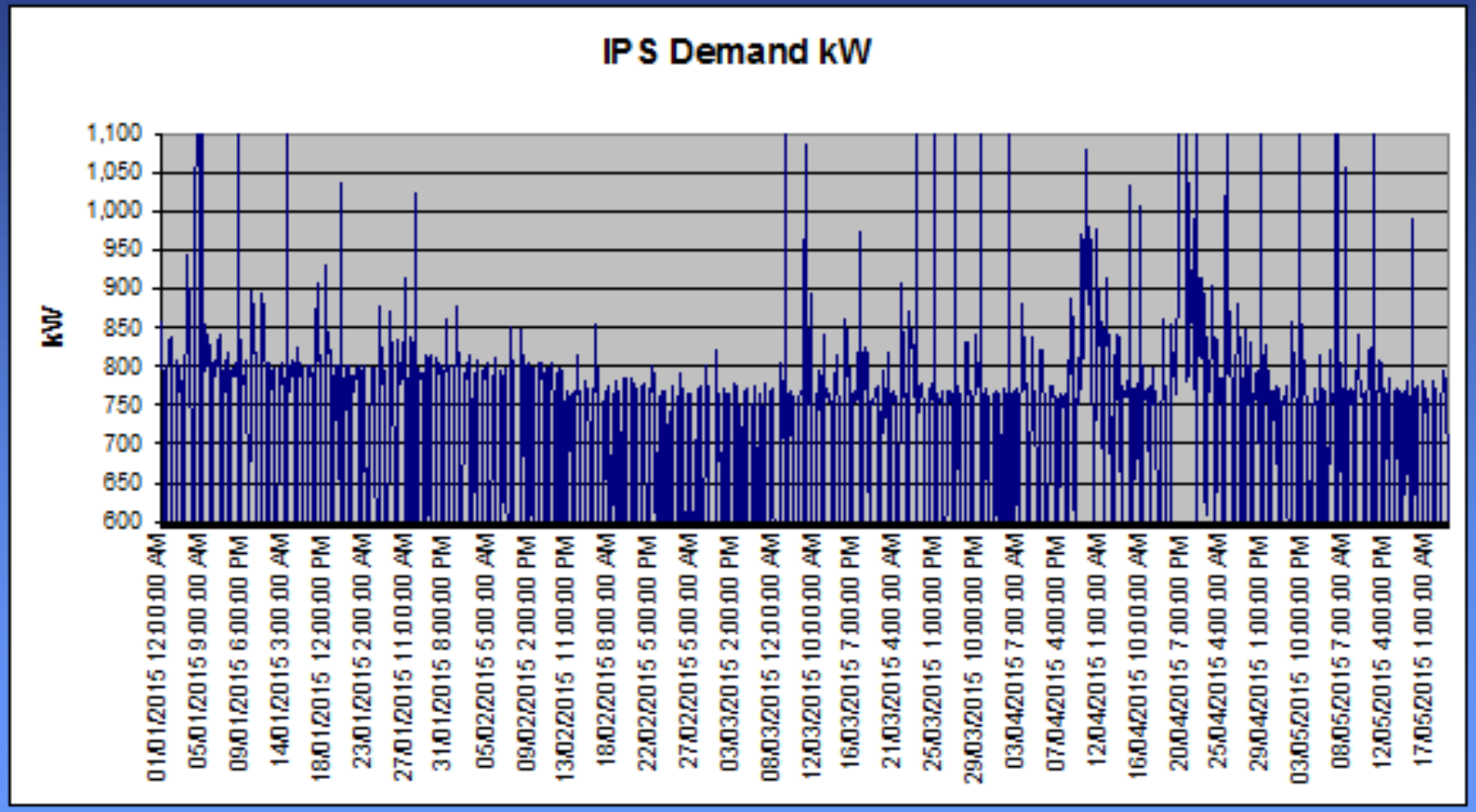
SP changed Feb 13th

Energy use reduction is not really obvious



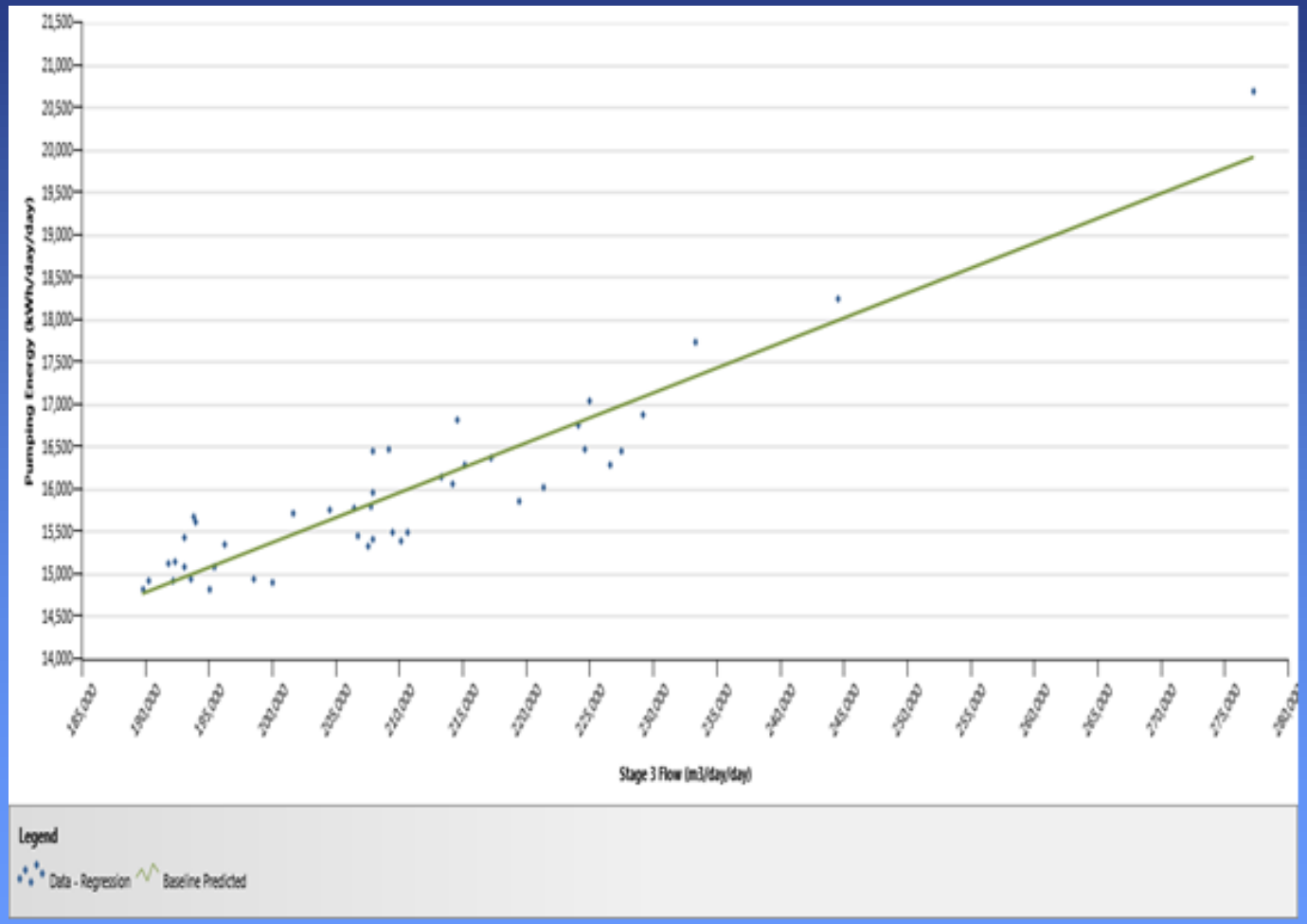
Demand kW

Set point Changed Feb 13th, noticeable change in demand, but difficult to quantify

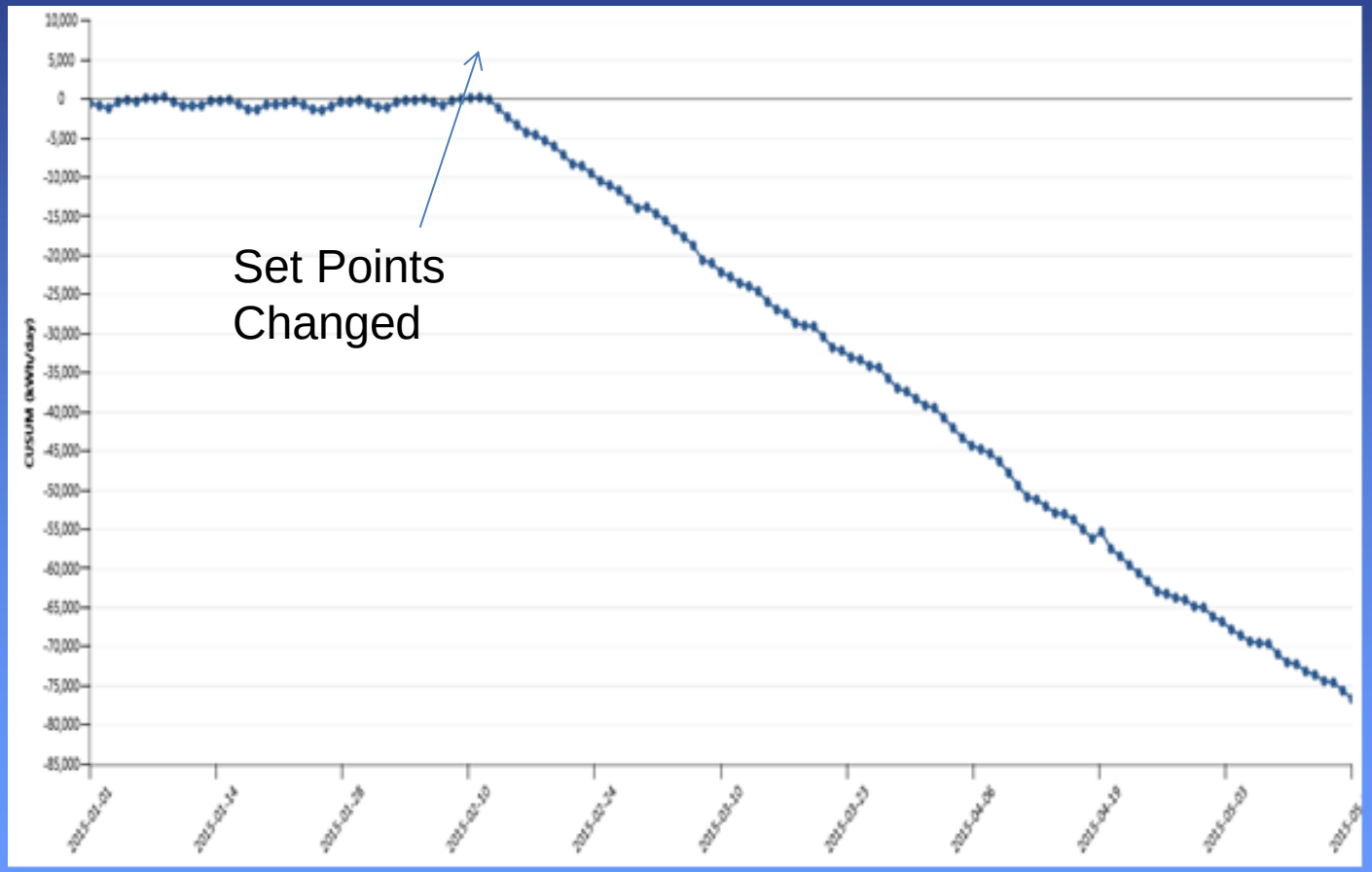


Energy vs Flow

Regression analysis performed on baseline data

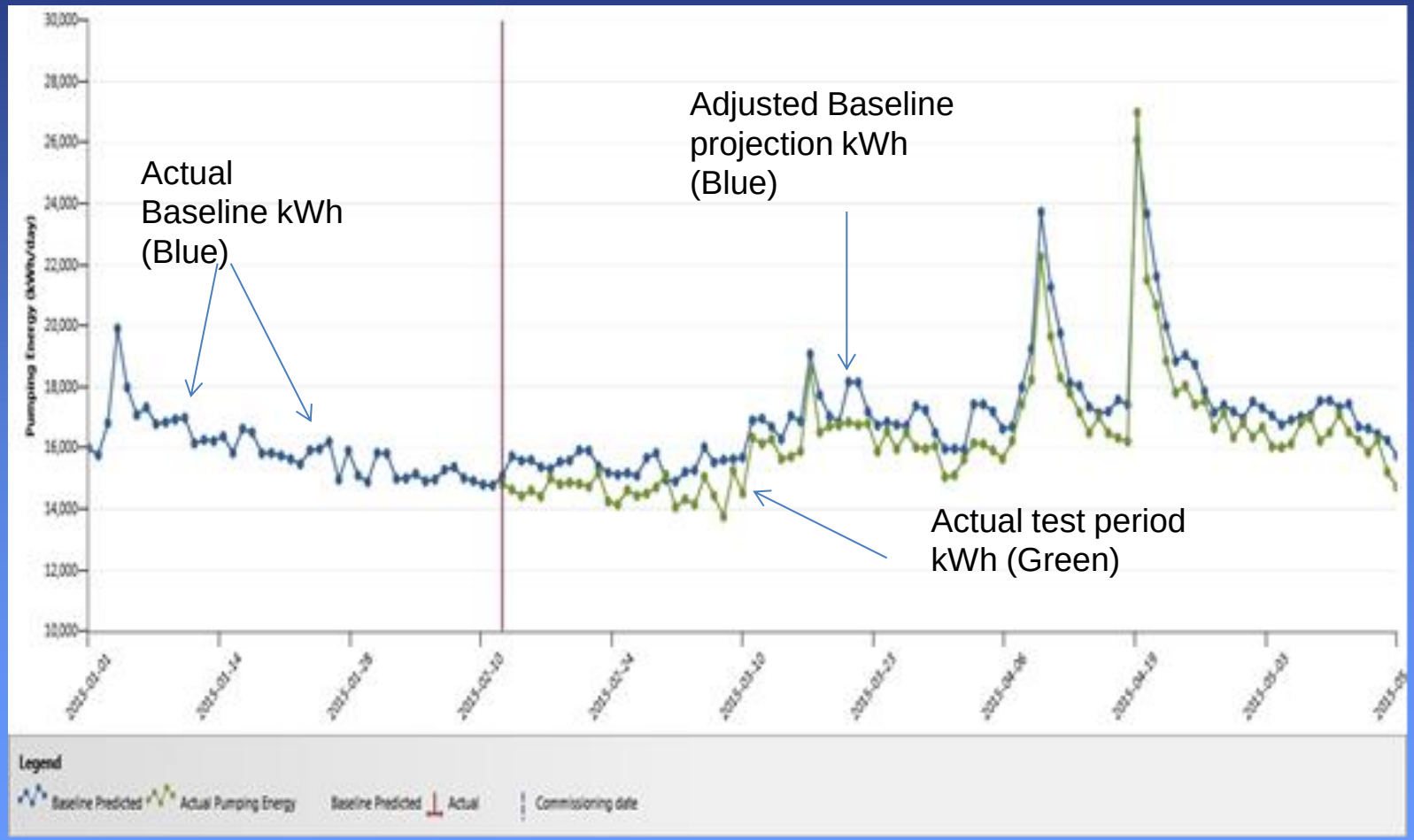


RETScreen CUSUM savings



RETScreen M&V

Adjusted baseline projection created to quantify avoided savings



Summary

M&V with Metering

- The use of high frequency interval energy and demand data from our sub-metering allowed us to verify energy savings from subtle operating changes.
- We were then able to leverage these findings to secure substantial incentives for a detailed study which yielded significant energy savings.

Summary

Peak Load Management

- Facility has implemented load shifting program to reduce Global Adjustment charges on Class A account
- Facility was able to predict and curtail load during all 5 coincident peaks during the summer of 2015
- The power monitoring system provided real time feedback on substation load which was used to optimize the facility response
- Facility realized over 1.4 MW average load reduction during each peak. Global Adjustment savings estimated at $400K-$600K for 2016-2017 period.

Questions?

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