Metering for ESPC Measurement & Verification

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IPMVP & FEMP Option - A

- **Properly defined baseline conditions**
- **Savings are predicted using engineering or statistical methods**
  - **Using historical data for *operational* factors (occupancy schedule etc.)**
  - **May use spot or short-term but no long-term measured data to estimate *performance* factors**
- **Option A includes primarily verification activities such as physical assessment of equipment changes**

IPMVP & FEMP Option - B

- **Properly defined baseline conditions**
- **Projects where actual savings (energy and cost) during contract need to be determined, based on end-use**
- **Involves long-term measurements for both *Performance* and *Operational* factors**
- **M&V can be performed at the equipment or system level and goes on for the term of the project**
- **Same procedures as Option A plus measurement of pre- and post-installation energy use**

IPMVP & FEMP Option - C

- Properly defined baseline conditions
- Projects where actual savings (energy and cost) during contract need to be determined, based on end-use
- Utility whole-facility meter analysis and/or computer simulation calibrated with utility billing data
- Savings are determined by “whole facility”
- Same procedures as Option A plus measurement of pre- and post-installation energy use

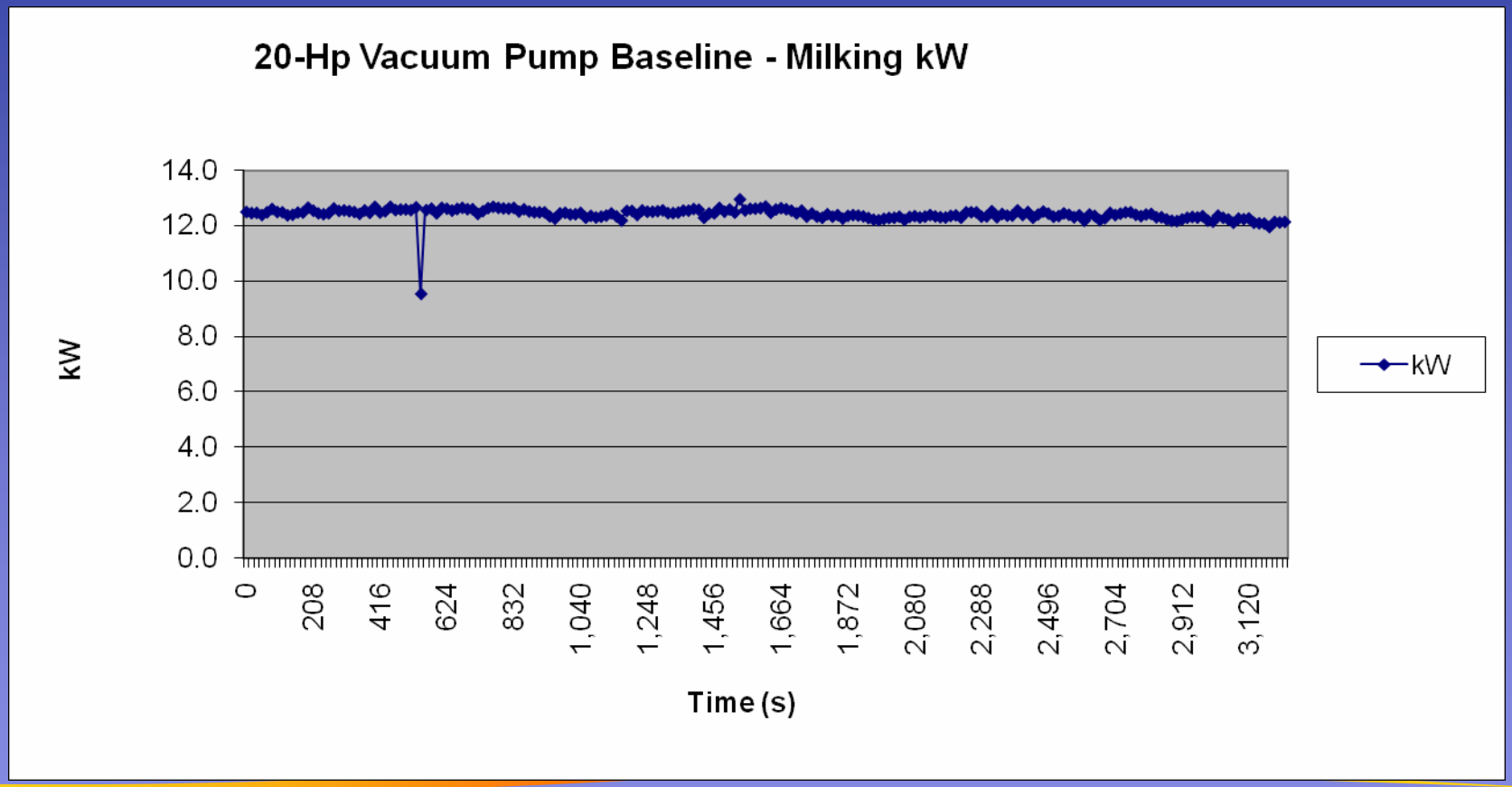
IPMVP & FEMP Option - D

- Use of a calibrated simulation tool to estimate “before” and “after” energy use
- Simulation of whole building or just end use
- Building simulation model (e.g. DOE-2), or a spreadsheet, or VSD estimating program, etc.
- Calibration is done by:
  - Linking simulation inputs to actual operating data, and
  - Comparing the results with end-use or whole building data
- Used for new buildings and complex existing building systems

Option B – Baseline - VFD

- Baseline: 20-Hp Vacuum Pumps to service 32 milking stations. Operating hours are 8,760 hours per year that includes wash up cycle. Average Milking kW 12.4 kW Estimated Annual Energy Consumption 108,833 kWh Annual Energy Costs (kWh only) $3,113 per year ($0.0286/kWh, $9.898/kW)

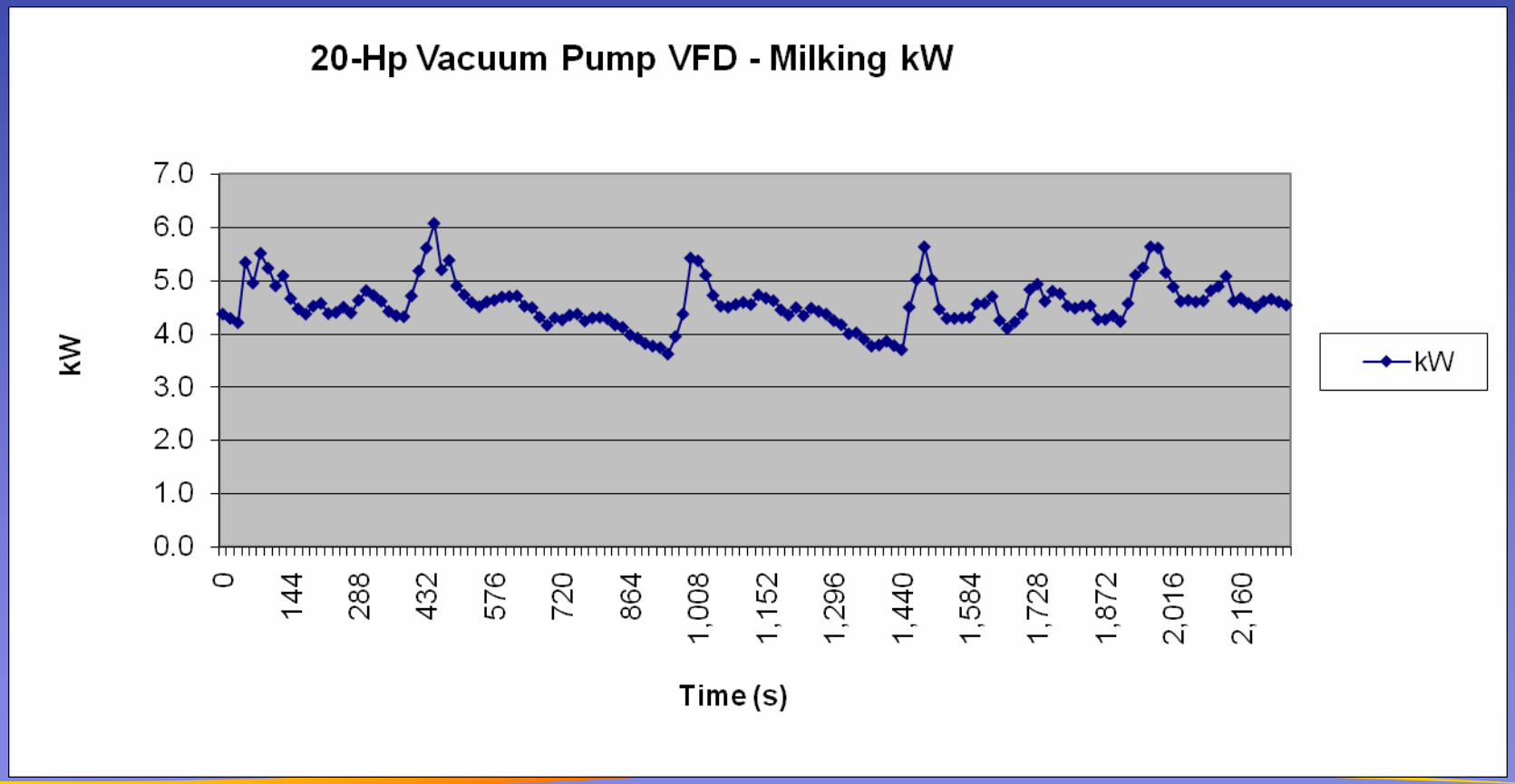
Option B - Baseline



Option B - Proposed

- Propose: Equip Vacuum Pump with VFD and Controls & Transfer Switch
- Average Milking kW 4.6 kW Estimated Annual Energy Consumption 39,906 kWh
- Annual Energy Costs (kWh only) $1,141 per year ($0.0286/kWh, $9.898/kW)

Option B – As Found



Option B - Results

- Annual Energy Savings: 68,927 kWh per year Annual Energy Cost Savings: $1,971 per year Utility Incentives: $8,271
- Equipment Costs: $5,703
- Incentives $2,851
- Customer Investment $2,851
- Simple Payback 1.4

Option D - Example

- School – GSHP – Energy Model
- Energy use without tuning: 405,600 kWh/yr.
- Energy use with tuning: 342,370 kWh/yr.
- 15.6% difference in annual energy use between the tuned and un-tuned model.
- Results in a $3,000/yr margin to savings and may reduce a 16 yr term project to 13 yrs.

Metering Recommendations

- Do Choose metering wisely
- Do Calibrate metering
- Do Centralize data monitoring & analysis
- Do Use EMS to monitor systems performance
- Do calibrate models

Metering Recommendations

- Don’t use defaults in simulation models
- Don’t use proprietary models
- Don’t use undocumented assumptions
- Don’t guess at parameters

For More Information

- Would you like to know more about this session?
- Steve Dunnivant
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Don’t forget to fill out and drop off your session evaluations!

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