

Low and No Cost Operational Measures

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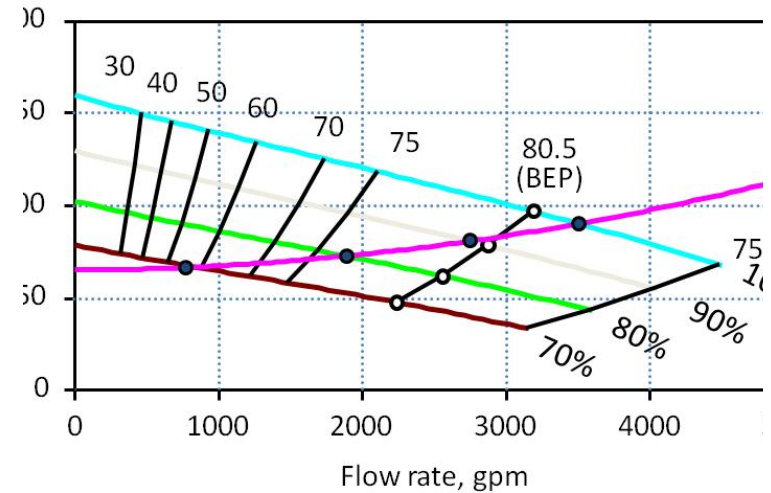
What is an Energy Evaluation?

- Evaluate equipment and process efficiency
- Evaluate building systems
- Identify energy conservation measures
- Identify low cost operational measures
- Can reveal issues with equipment commissioning

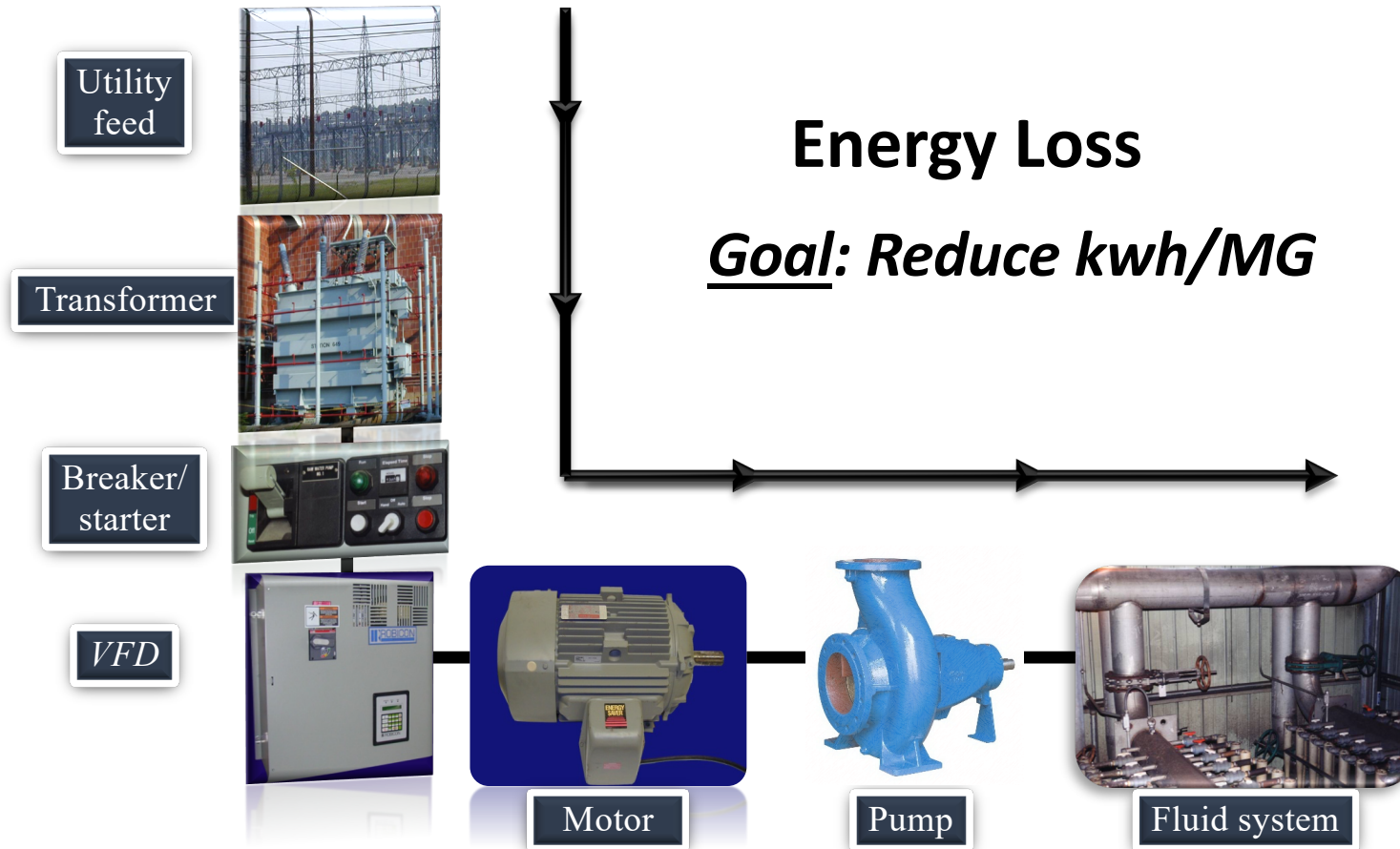


Long Term Impacts

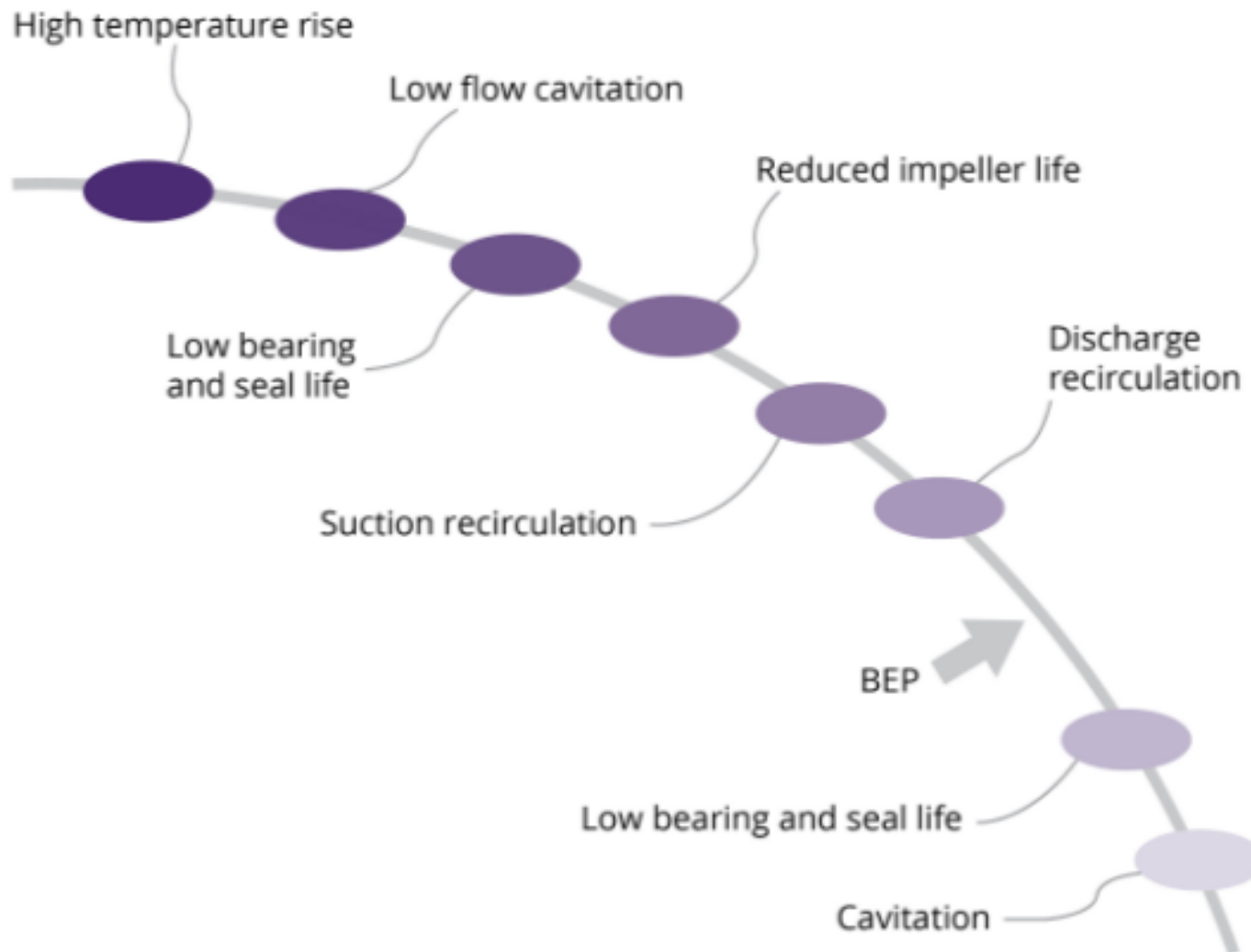
- SCADA instrumentation and automated control
- Pump operating points
- HVAC, ventilation rates, temperature control



Pump System Efficiency



Long Term Maintenance Costs



What Affects Pump Efficiency?

- 
- Wear
 - Bearings
 - Seals
 - Clearances
 - Surface roughness
 - Vibration/misalignment
 - Impeller modifications
 - Cavitation



Wire to Water Testing

- Pump testing using portable or installed instrumentation
 - Flow
 - Pressure
 - Power
 - May require data loggers or trending

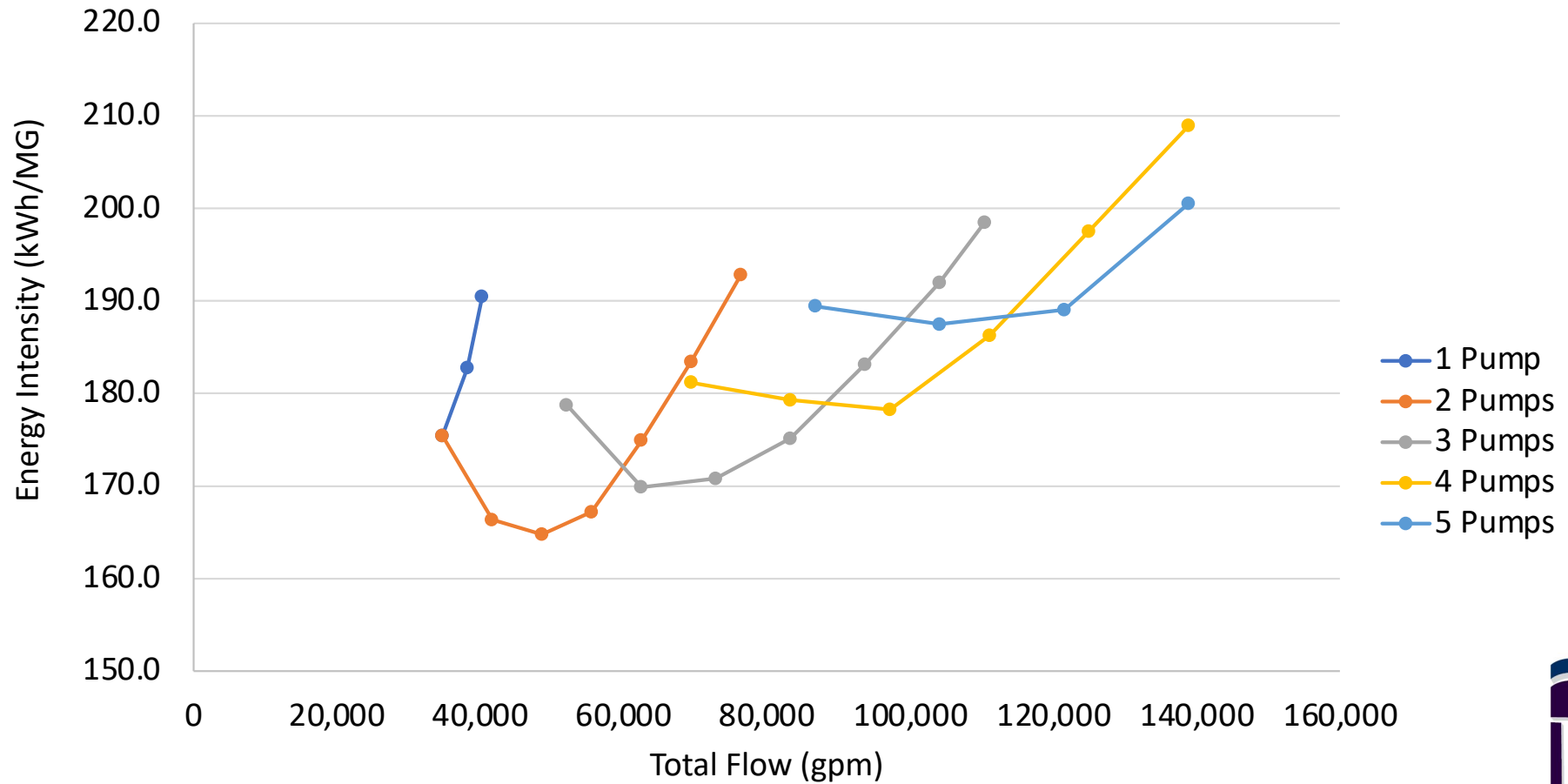


How Important is Wet Well Level?

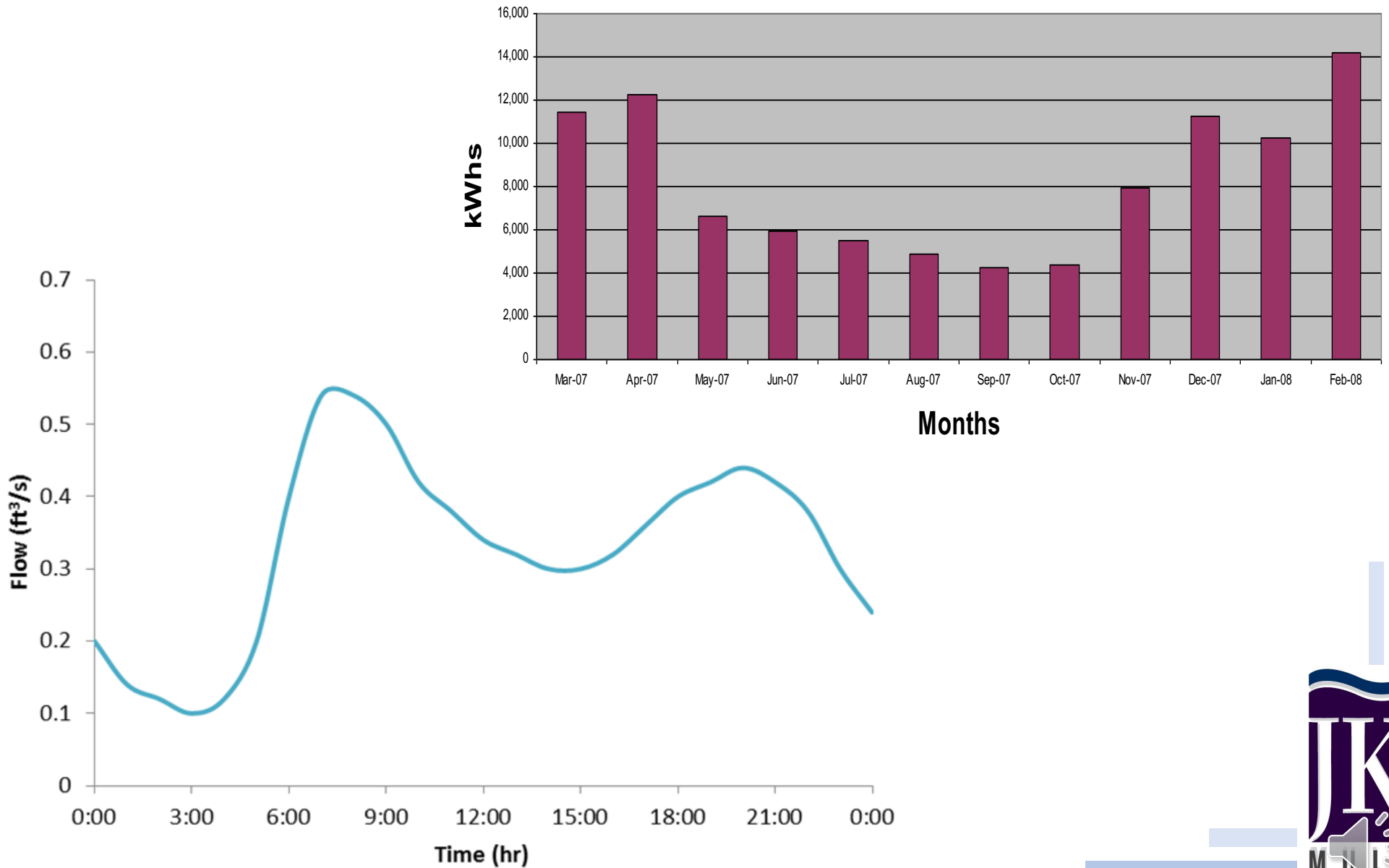


- Pump station with 5,900 HP pumps
- Potential Annual Savings:
 - 590,000 kWh/ft
 - \$40,000/ft

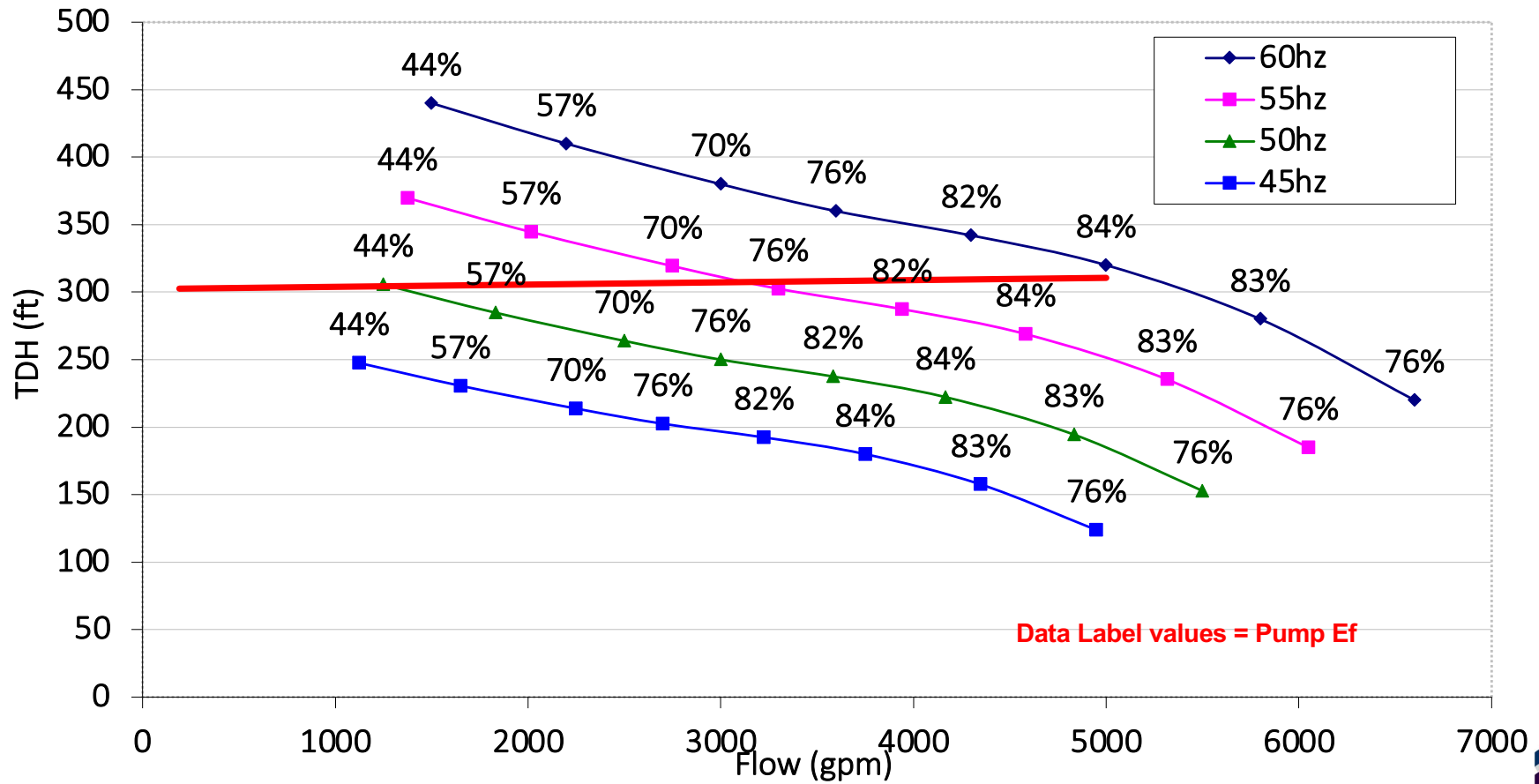
Energy Intensity Analysis



Diurnal Flow & Varying Monthly Flow

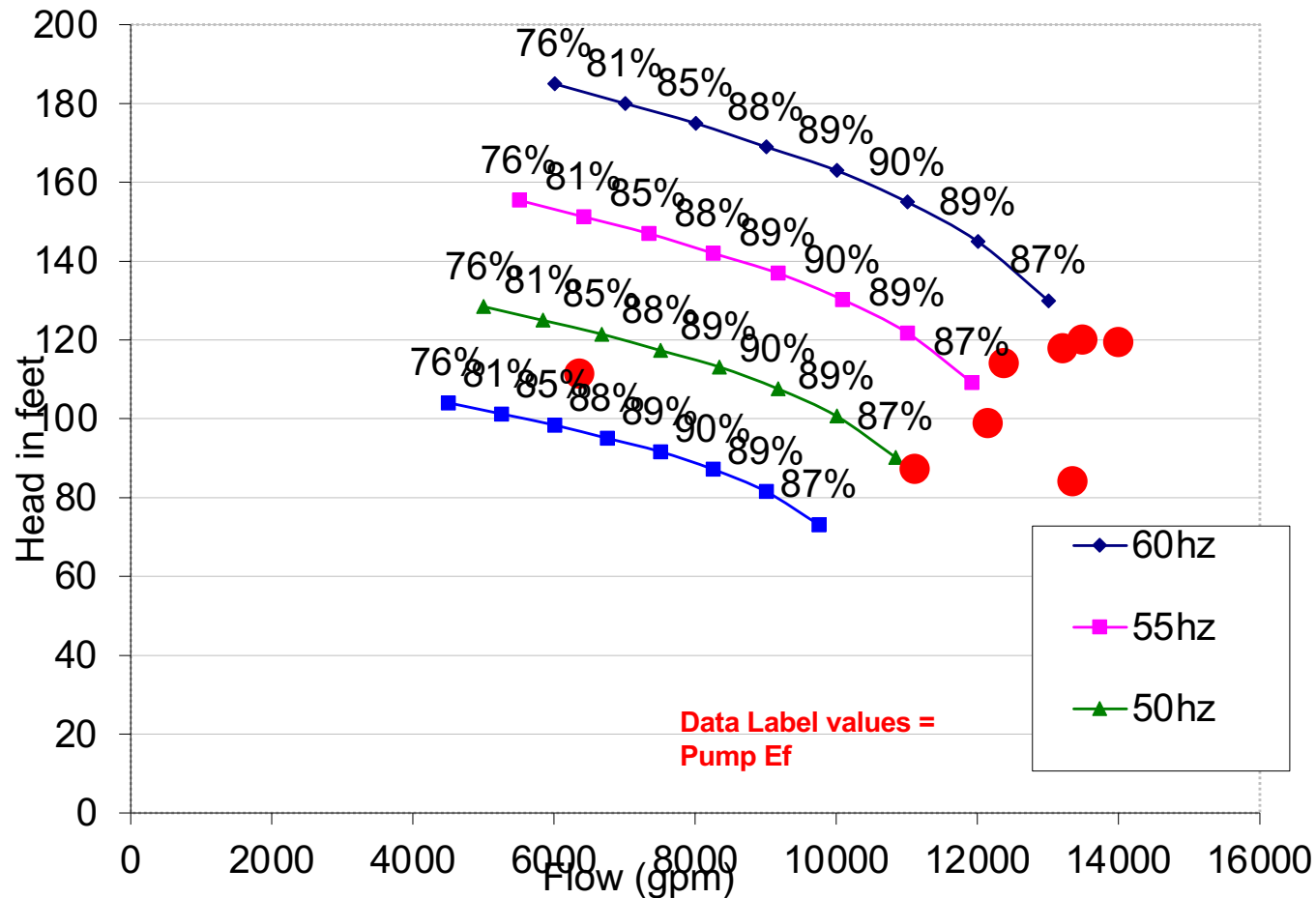


Is a VFD the Right Solution?



Data Label values = Pump Ef

Pumps in Run Out Example

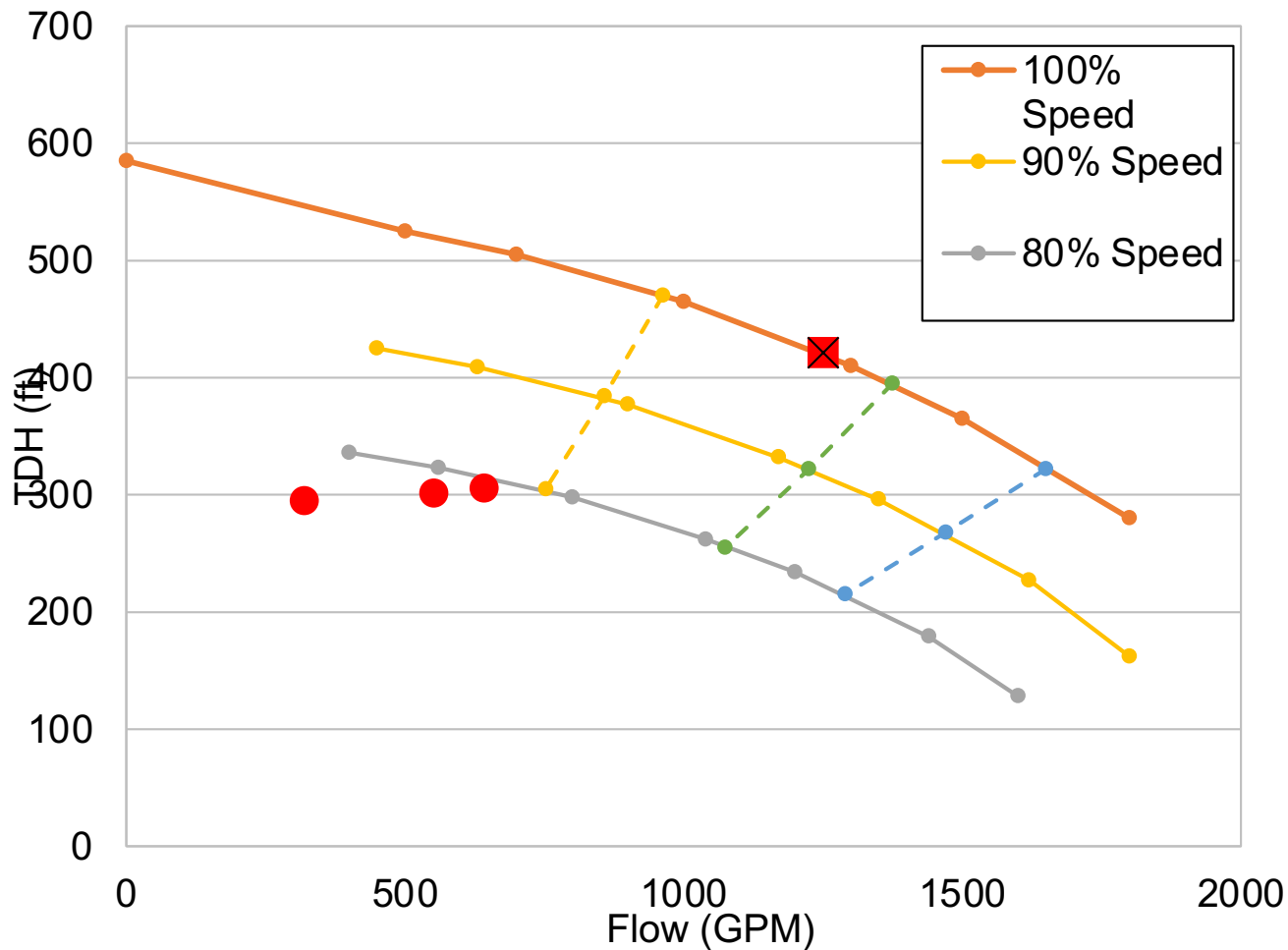


Operating the pumps at reduced speeds would increase the efficiency of the pumps

Operate two pumps at reduced speeds to meet the same flow



Preferred Operating Range (POR) Example



Creating minimum speed setpoints and cycling the pumps would result in energy savings

Blower Control/Aeration Control

Blower	Blower Efficiency
1	58%
2	71%
3	66%

- Operate all 3 blowers year-round = 10,000,000 kWh/year
- Only operate blowers 2 and 3 = 9,500,000 kWh/year
- 500,000 kWh/year = \$90,000 in savings annually

Understanding How You're Billed

DETAIL OF CURRENT CHARGES

Delivery Services

	Energy-kWh	Demand-kW	Demand-kVA
Metered Usage	406990 kWh		
Peak	141865 kWh	824.0 kW	860.0 kVA
Off Peak	265125 kWh	852.0 kW	
Billed Usage	406990 kWh	824.0 kW	860.0 kVA
Customer Charge			223.00
Dist Chg On Peak	0.01617199 x 141865 kWh		2,294.23
Dist Chg Off Peak	0.00864199 x 265125 kWh		2,291.22
Transition Charge	0.00034205 x 406990 kWh		139.21
Transmission Charge	0.02111136 x 406990 kWh		8,592.11
Distribution Demand Chg	5.76 x 824 kW/kVA		4,746.24
High Voltage Discount	-0.52 x 824 kW		-428.48
Energy Efficiency Chg	0.00957 x 406990 kWh		3,894.90
Renewable Energy Chg	0.0005 x 406990 kWh		203.50
High Voltage Metering	-1.0 % x \$ 22384.41		-223.84
Total Delivery Services			\$ 21,732.09

On Peak and Off Peak Hours

Peak charge is 2X more expensive

Demand Charge

Demand charge is 22% of the total cost



Electric Billing – Time of Day Use

- WTP Pump Station
- Connecticut
- Eversource Rate Structure 027

EVERSOURCE

Demand is based on:

- Greatest **30-minute average peak** during on-peak hours
- **On-peak hours** are from M-F: 12PM-8PM EST
- **Off-peak hours** are from M-F: 8PM-12PM & Weekends
- Demand Charge (over 2kW) = **\$17.64/kW**



Time of Day Use Example

Total Charges for Electricity

Supplier

DIRECT ENERGY BUSINESS

Service Reference: 783981002

Generation Srvc Chrg** 16535.00kWh X \$0.07370 \$1,218.63

**Annual Savings:
\$16,404**

Trans Chrg per kWh Off-Pk	16086.00kWh X \$0.00571	\$91.85
Distr Cust Srvc Chrg		\$44.00
Distribution Dmd Chrg	0.90KW X \$13.30000	\$11.97
Electric Sys Improvements***	0.90KW X \$0.32000	\$0.29
Revenue Adj Mech On-Pk	449.00kWh X \$0.00181	\$0.81
Revenue Adj Mech Off-Pk	16086.00kWh X \$0.00181	\$29.12
CTA Demand Chrg	0.90KW X \$-0.18000	-\$0.16
FMCC Delivery Chrg On-Pk	449.00kWh X \$0.01925	\$8.64
FMCC Delivery Chrg Off-Pk	16086.00kWh X \$0.00429	\$69.01
Comb Public Benefit Chrg*	16535.00kWh X \$0.00754	\$124.67

Demand = 1% of Bill

Operations and Maintenance: *Operational Measures*

- Equipment timer installation
- Up to 50% reduction potential



Additional Opportunities



Plant water pump
pressure reduction



Odor Control



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