Pump Station Optimization - The Portland Water Bureau's Approach to Energy Management

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May 6, 2011

PORTLAND WATER BUREAU

FROM FOREST TO FAUCET

Presentation Outline

- Framework
- System Overview
- Historical Power Use
- Pump Station Optimization
- Other Strategies

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Framework

- Water & Wastewater Utilities Consume 3% of Energy in US
- 90 – 95% of Energy Consumed by Water Utilities is used by pumps
  - Raw Water Intake
  - Wells
  - Treatment Plants
  - Booster Pump Station

Portland Water Bureau
Energy Management Charter, February 2010

VISION

The Portland Water Bureau provides excellent service to our customers and acts as the steward of the critical infrastructure and fiscal and natural resources entrusted to our care. We strive to purchase and generate electricity from renewable sources and are an energy efficiency leader among service agencies across the country.

GOALS

- To develop an organizational culture of energy (electricity and natural gas) awareness that seeks continuous efficiency improvements.
- To educate and empower energy efficiency and environmental responsibility in a manner which promotes quality and safety.
- To explore and promote the development of renewable energy projects where practical.
- To contribute to advancing goals in the City of Portland and Multnomah County Climate Action Plan.

OBJECTIVES

Using a variety of methods the Portland Water Bureau shall work to accomplish the following objectives:

- Establish a bureau-wide energy use and generation baseline.
- Track and evaluate energy use in facilities including, but not limited to treatment facilities, pump stations, tanks and buildings.
- Update facilities, where appropriate, using the most current equipment and modifying operating procedures to make them as efficient as possible.
- Educate employees about the current status of energy use and future potential energy savings and generation.

We believe our goals can be obtained by implementing the above mentioned objectives. Thank you for your participation and contributions to make this a success.

David Shaff, Administrator

Edward Campbell, Director, Resource Protection and Planning

David Hasson, Director, Finance and Support

Kathy Koch, Director, Customer Service

Kelly Mulholland, Director, Maintenance and Construction

Michael Stuhr, Director, Engineering

Chris Wanner, Director, Operations

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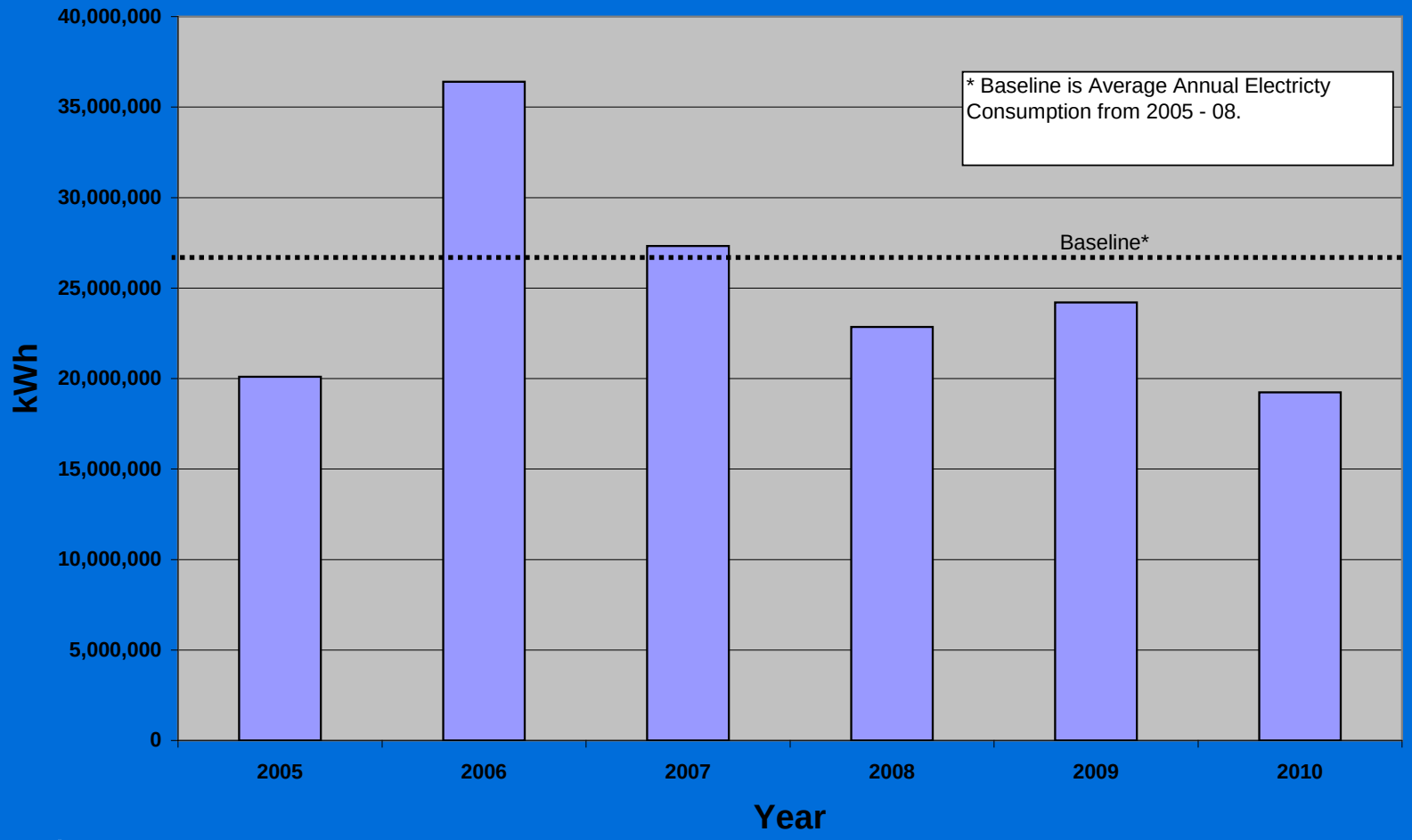
Total Annual Water Bureau Electricty Use for All Facilities



- $1.7 – 2.6M per year (4% of base budget)
- Electricity = 83% of PWB Measured Carbon Footprint

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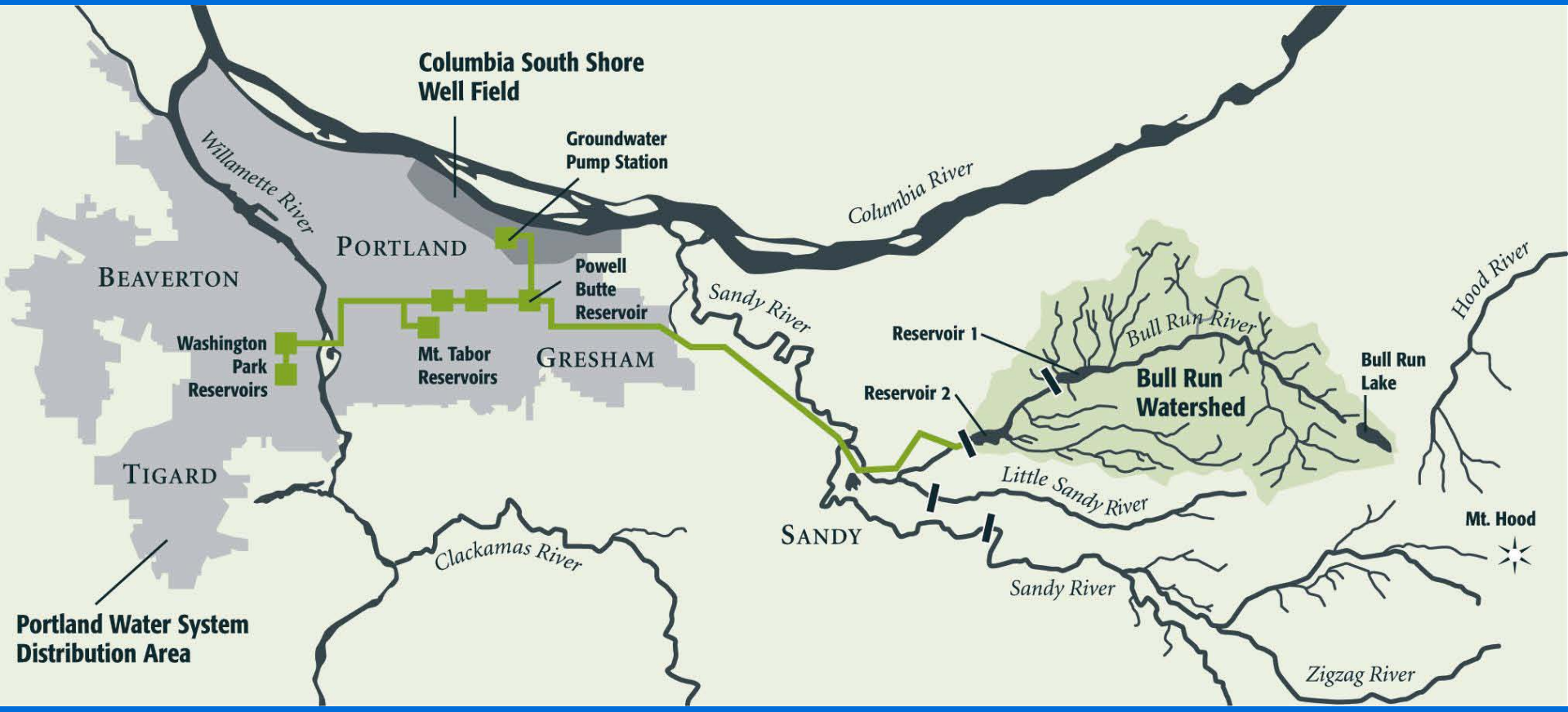

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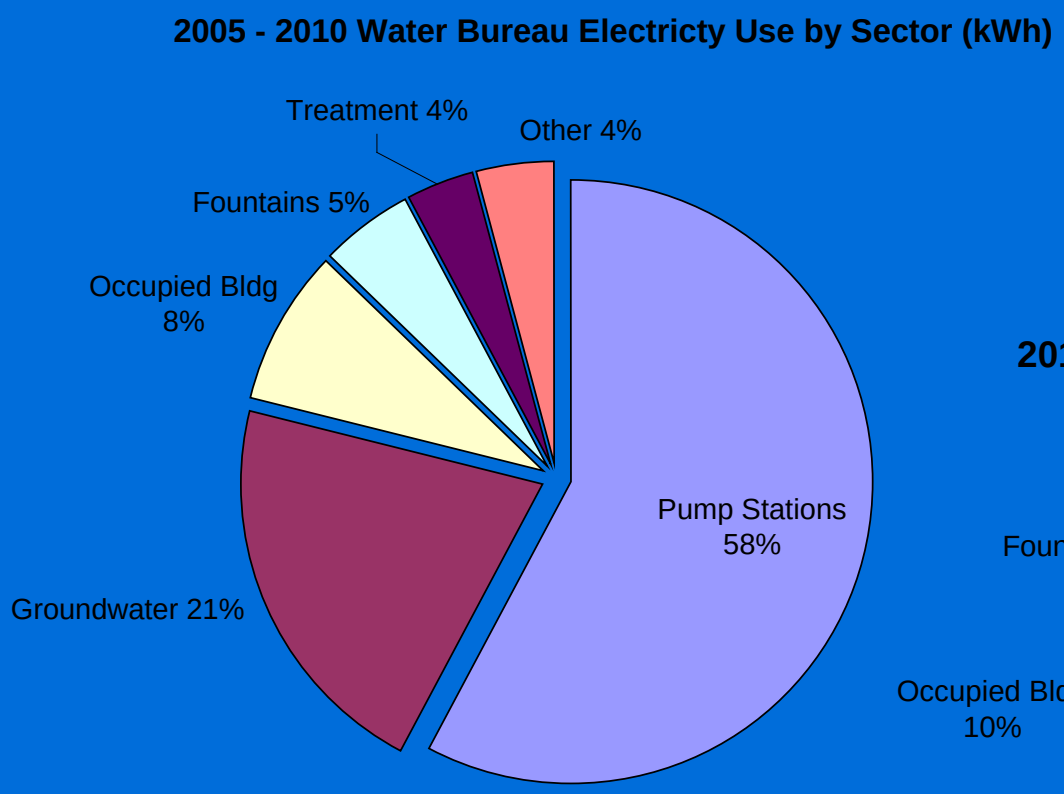
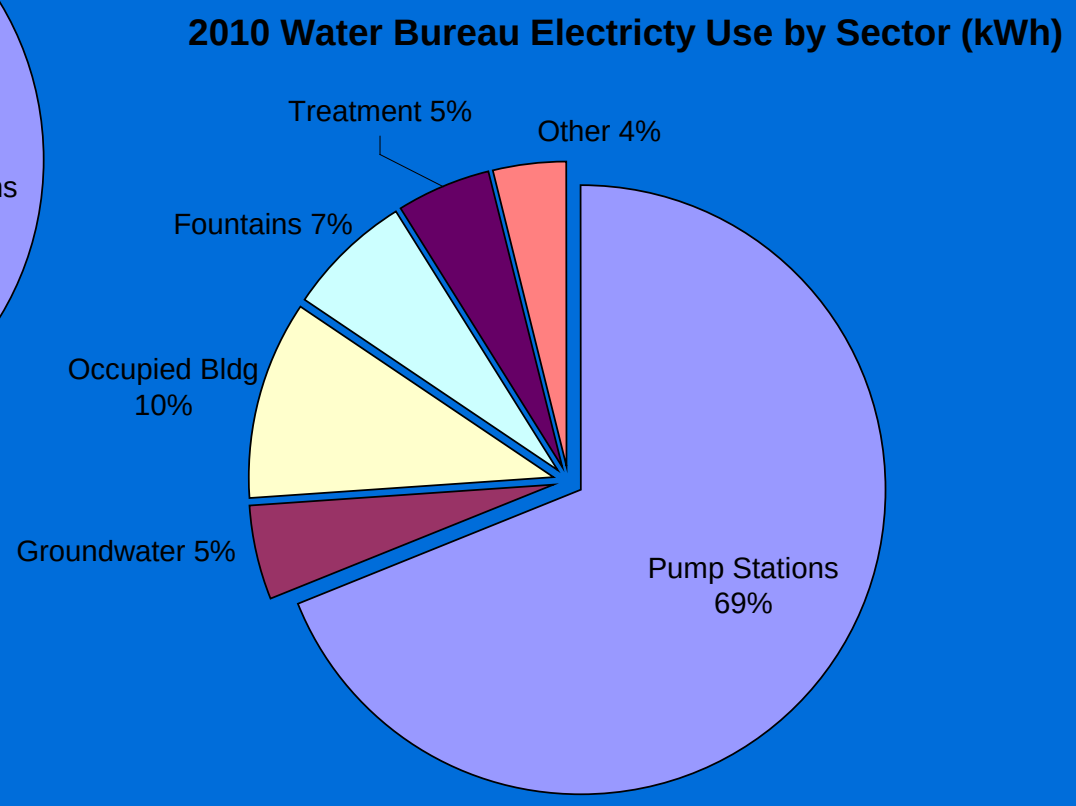
Electricity Consumption





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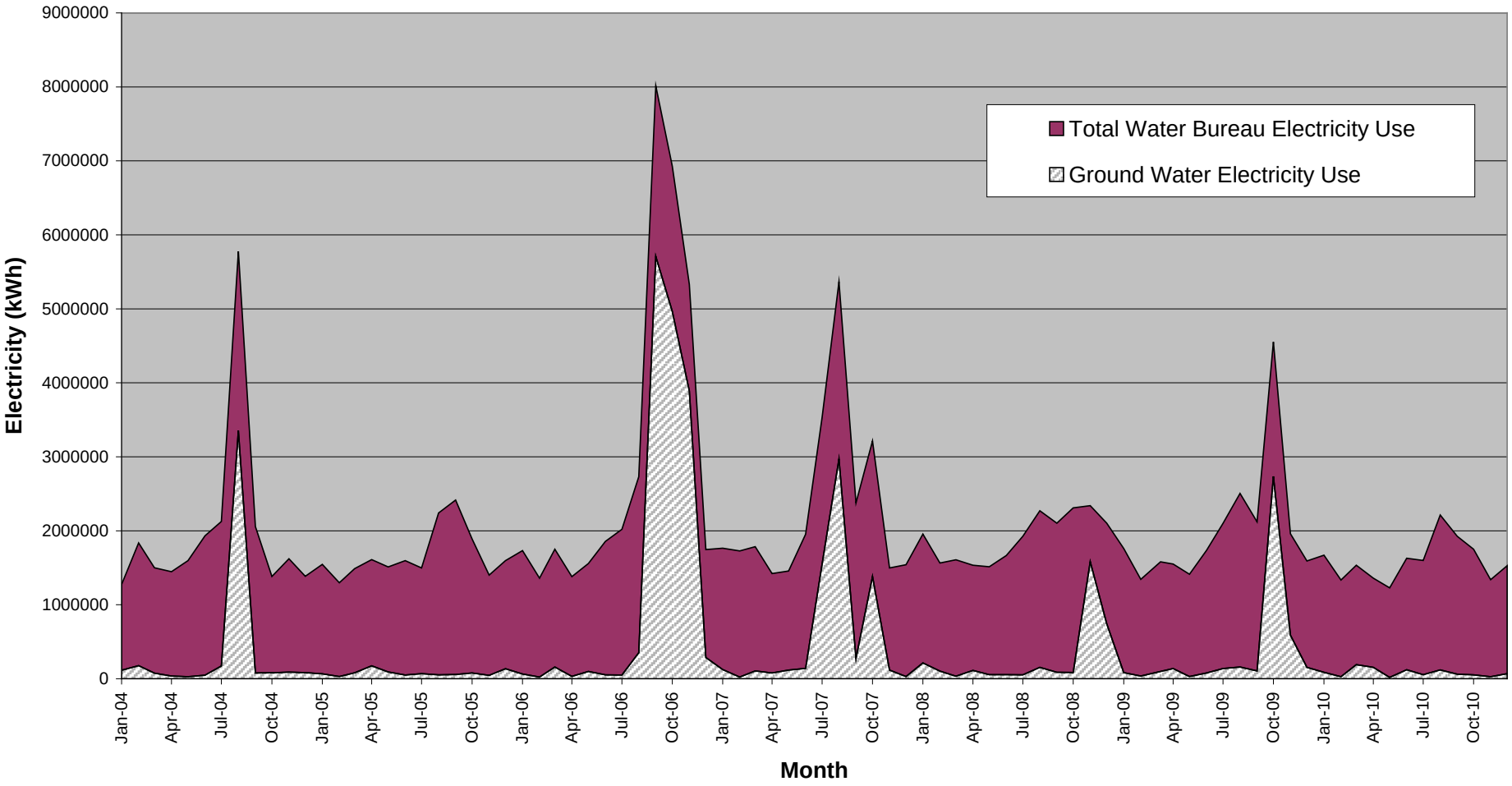
Monthly Electricity Use for Water Bureau Facilities



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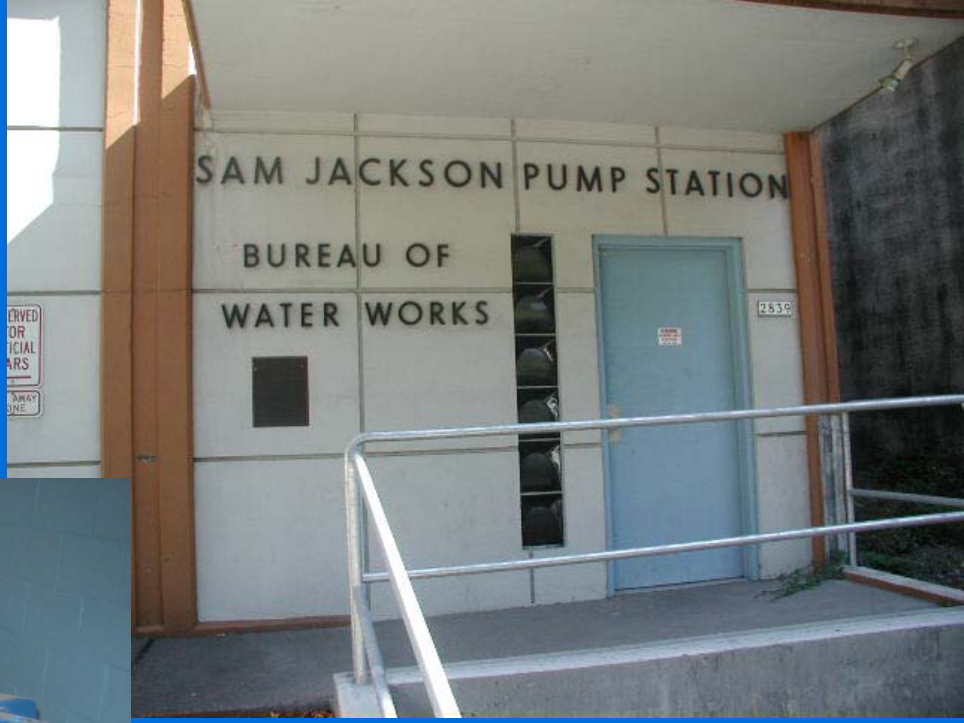
Pump Stations



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PWB Strategy

- Focus on top 7 Pump Station
- Electricity = 12.3M kWh/year Pump 5.3 BGal/year
- PS Improvements
  - Pumping Efficiency Optimization
  - Pump/Motor Replacement
  - Weatherization

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Pumping Efficiency Optimization

Pump Efficiency Test Locator by Site

ID 105

Select Site:

Sam Jackson

Close Form
Print Screen
Add Tests
Requery

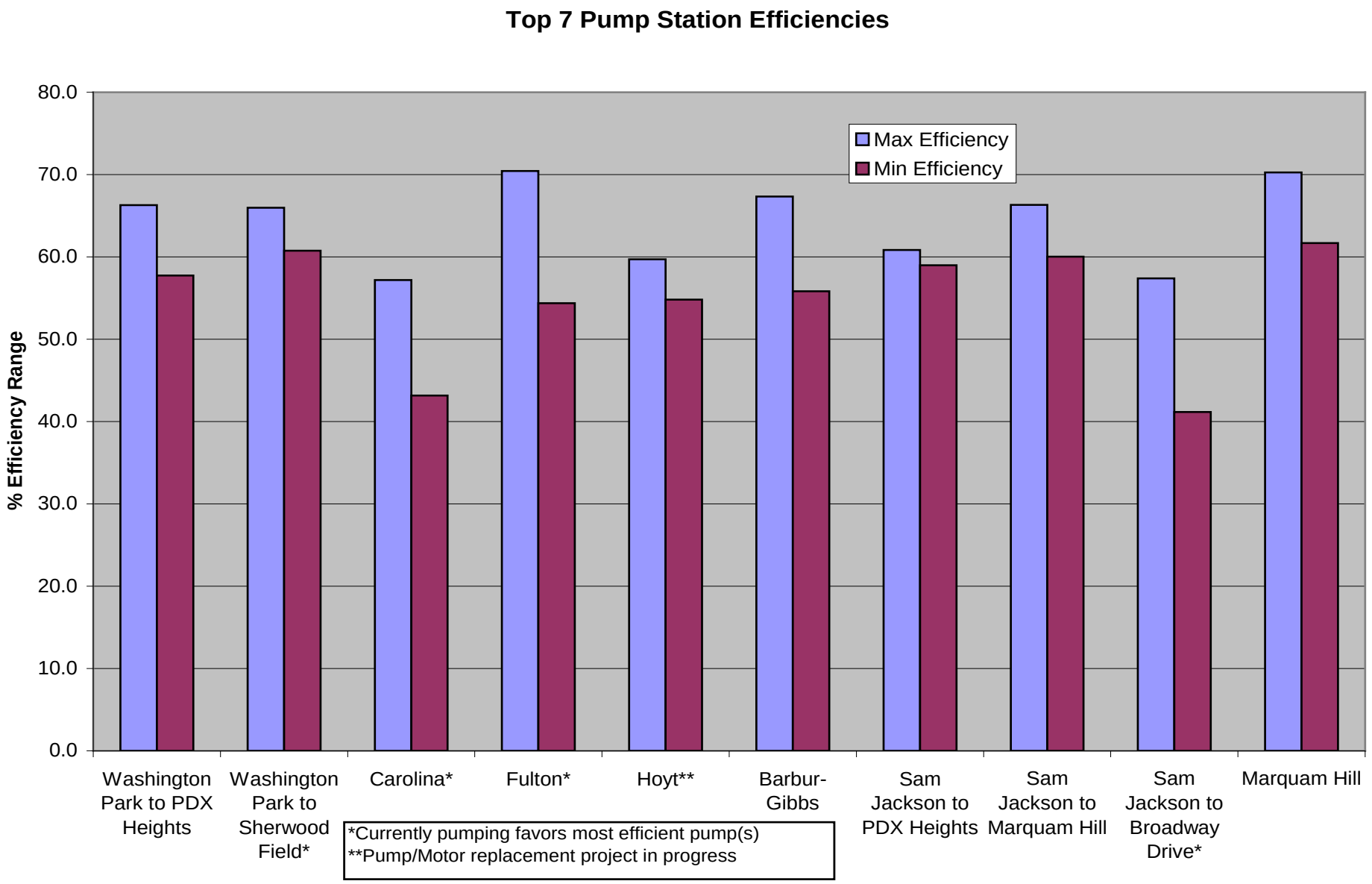
View Old Form (All Tests by Pump)

Pump Efficiency Tests

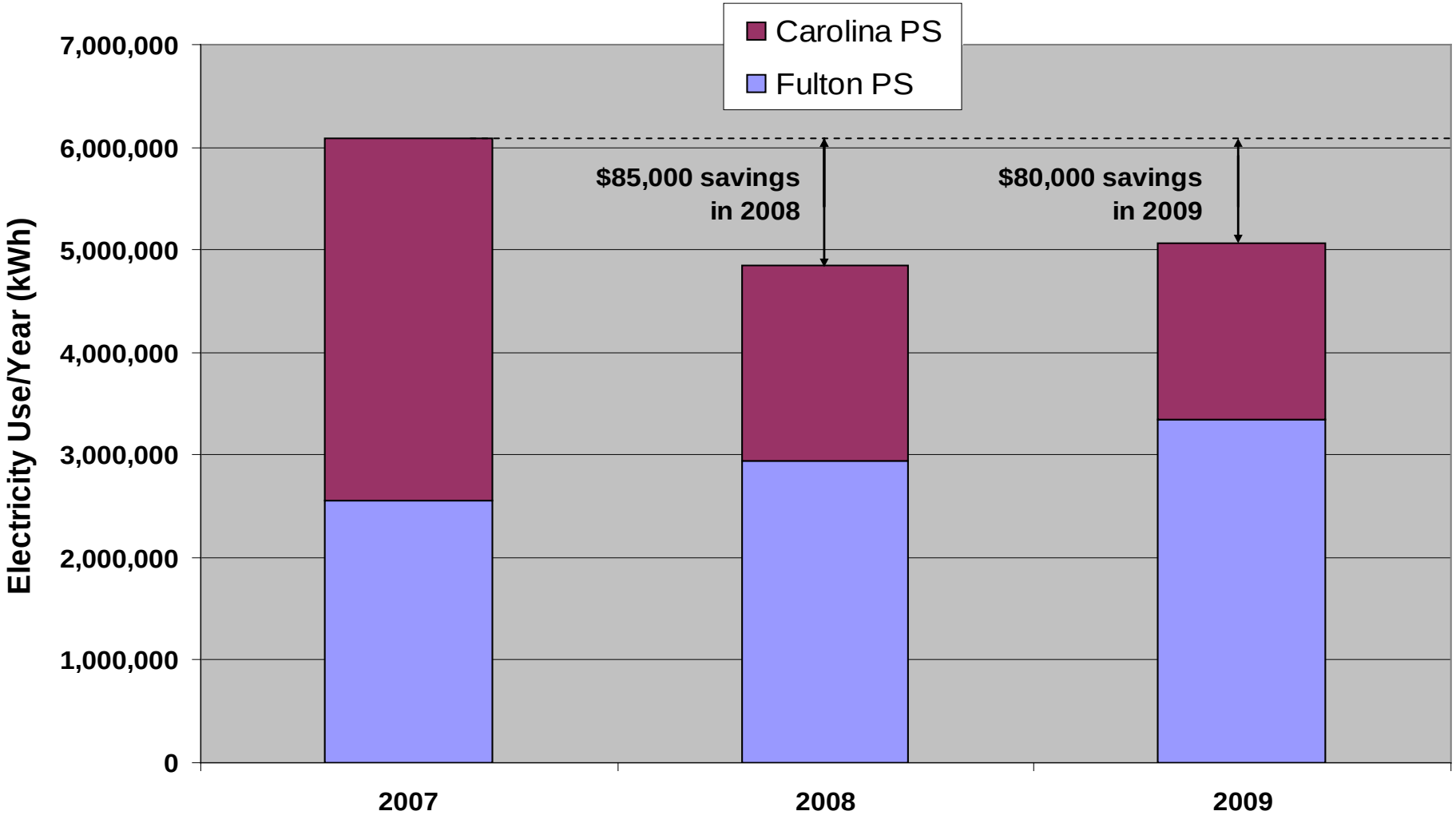
Date Observed	Pump List	Calculated Efficiency (g/kWh)	Test #	Bad Test?	
5/11/2009	Pump(s): 206	945	397	☐	View/Edit
5/11/2009	Pump(s): 206	951	396	☐	View/Edit
5/11/2009	Pump(s): 206	947	395	☐	View/Edit
5/7/2009	Pump(s): 205	675	401	☐	View/Edit
5/7/2009	Pump(s): 205	678	400	☐	View/Edit
5/7/2009	Pump(s): 205	682	399	☐	View/Edit
5/7/2009	Pump(s): 205	688	398	☐	View/Edit
5/5/2009	Pump(s): 205	684	404	☐	View/Edit
5/5/2009	Pump(s): 205	690	403	☐	View/Edit
5/5/2009	Pump(s): 205	700	402	☐	View/Edit
5/5/2009	Pump(s): 205	680	405	☐	View/Edit
4/29/2009	Pump(s): 206	886	391	☐	View/Edit
4/29/2009	Pump(s): 206	888	390	☐	View/Edit
4/29/2009	Pump(s): 206	890	389	☐	View/Edit
4/25/2009	Pump(s): 206	877	394	☐	View/Edit

Operational Notes | Set Points

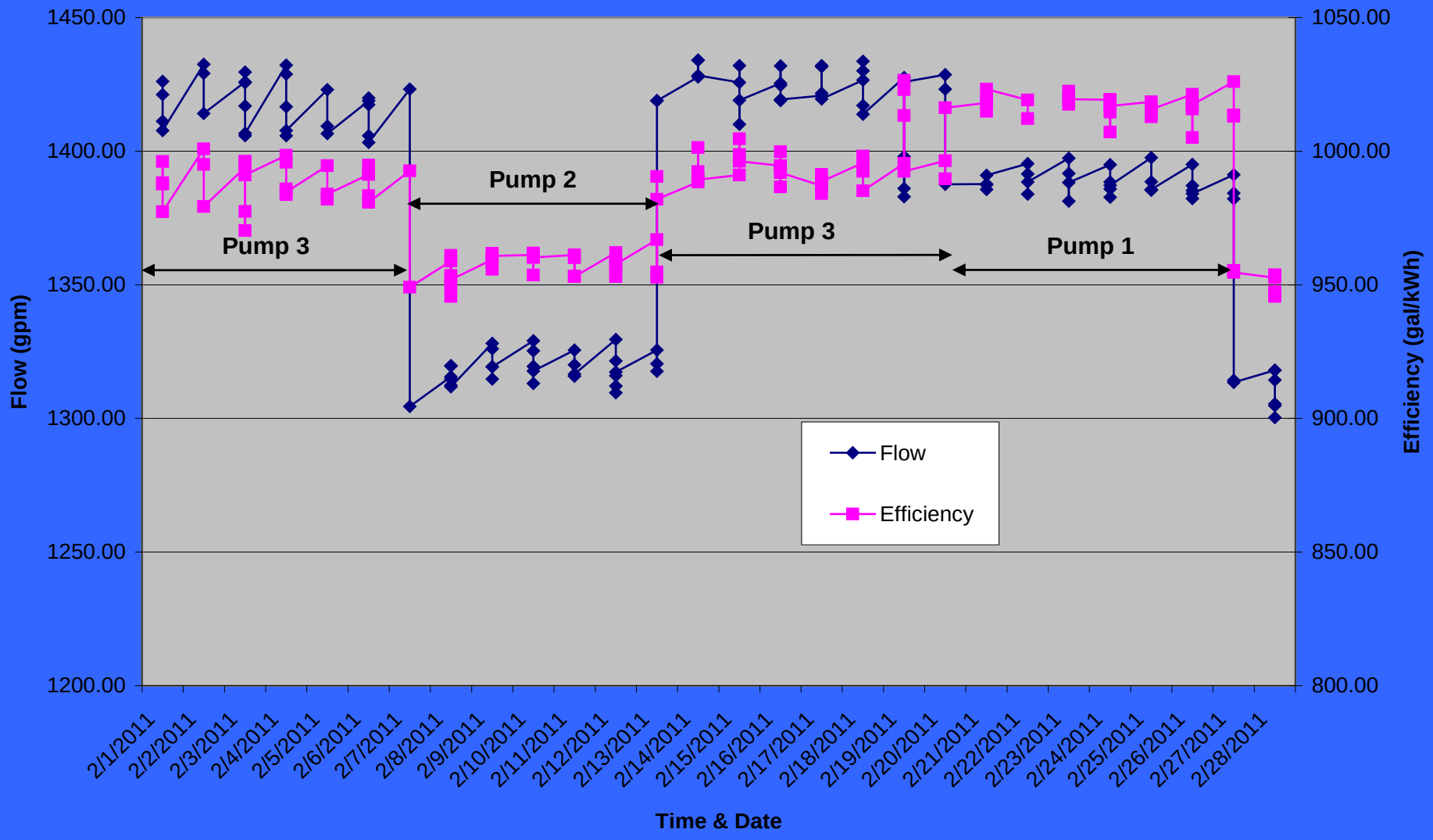
Pump / Motor Replacement



Energy savings by favoring more efficient Pump / Pump Station



Hoyt PS Flow & Efficiency



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Hoyt Pump Replacement

Form 420C
Incentive Offer - Custom
Business Energy Solutions—Production Efficiency

EnergyTrust of Oregon

Program Use Only			
Project ID	PE3519	FastTrack ID	
Currently Self-Directing	No		
Eligible to Self-Direct	No		

Participant Information

Participant Name	City of Portland						
Contact Name	Peter Nierengarten	Title	Engineer				
Mailing Address	1120 SW 5th Ave #609	City	Portland	State	OR	Zip	97204
Telephone	(503) 823-7507	Cell Phone		Fax	(503) 823-6015		
Email	peter.nierengarten@portlandoregon.gov	Website					

Project and Facility Information

Project Name	Hoyt Pump Station Improvement	Facility County	Multnomah				
Site Address	4025 SW Fairview Blvd	City	Portland	State	OR	Zip	97221

Section 1: Measure Summary and Incentive Offer *(to be completed by PMC)*

A technical analysis study, incorporated and made a part of this agreement by this reference, was performed for Participant's site by **Portland Water Bureau**, and is dated **10/1/2010**. Based on our review of this information, we have identified the following energy efficiency measures (Measures) as potentially eligible to receive Energy Trust incentive funds.

Measure	Estimated Gas Savings	Estimated Electric Savings	Estimated Cost of Measure	Estimated Incentive Amount
New 100 HP Pump	0	75,229 kWh	$ 41,448	$ 20,724
Totals	Therms	75,229 kWh	$ 41,448	$ 20,724

Estimated incentives have been calculated in accordance with current program requirements and incentive levels. The actual incentive amount paid to Participant may be different than the estimated amounts listed in this application depending on the actual Measures installed and final costs; however, the maximum amount Energy Trust will ever be required to pay under this agreement is limited to the estimated amounts as set forth above.

DEADLINE FOR PARTICIPANT TO ACCEPT THIS OFFER. Details of this program, including incentive levels and availability, are subject to change. Unless Energy Trust receives this completed and signed ***Form 420C: Incentive Application and Agreement*** from Participant by **11/30/2010**, Energy Trust's offer to reserve the estimated incentive amounts above for the Measures will expire and shall be void. Applications will be processed on a first-come, first-served basis.

Reviewed by	Walt Mintkeski *Production Efficiency Technical Manager*	Signature	Walt C. Mintkeski, PE	Date	10/20/10

- 61% to 79% efficient
- Project cost = $41,500
- ETO incentive = ½ capital cost
- 4.1 yr payback

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PS Weatherization

- Poor Insulation
- Air Leaks
- Electric Resistant Heat = up to 5,000kWh/month
- Goal
  - Prevent freezing
  - Reduce humidity
  - Comfortable work zone?
- Strategies
  - Reduced temperature (freeze protection)
  - Programmable thermostats
  - Weather-stripping
  - Winterize/Summerize Checklist

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Winterize Facility Checklist

When performing your Winterize work order for a remote facility place check mark in box next to each item to confirm that it was completed. If an item does not apply to a particular site please make note next to that item. Add other any appropriate checklist items in blank lines below.

- ❑ Close manual louvers
- ❑ Place covers over louvers
- ❑ Set heater thermostat to 55 deg
- ❑ Close ceiling vents
- ❑ Clean photocells on exterior lighting

Summerize Facility Checklist

(Place check mark in box next to each item to confirm that it was completed. If an item does not apply to a particular site please make note next to that item. Add other any appropriate checklist items in blank lines below.)

- ❑ Open manual louvers
- ❑ Remove covers over louvers
- ❑ Turn off Heaters
- ❑ Open ceiling vents

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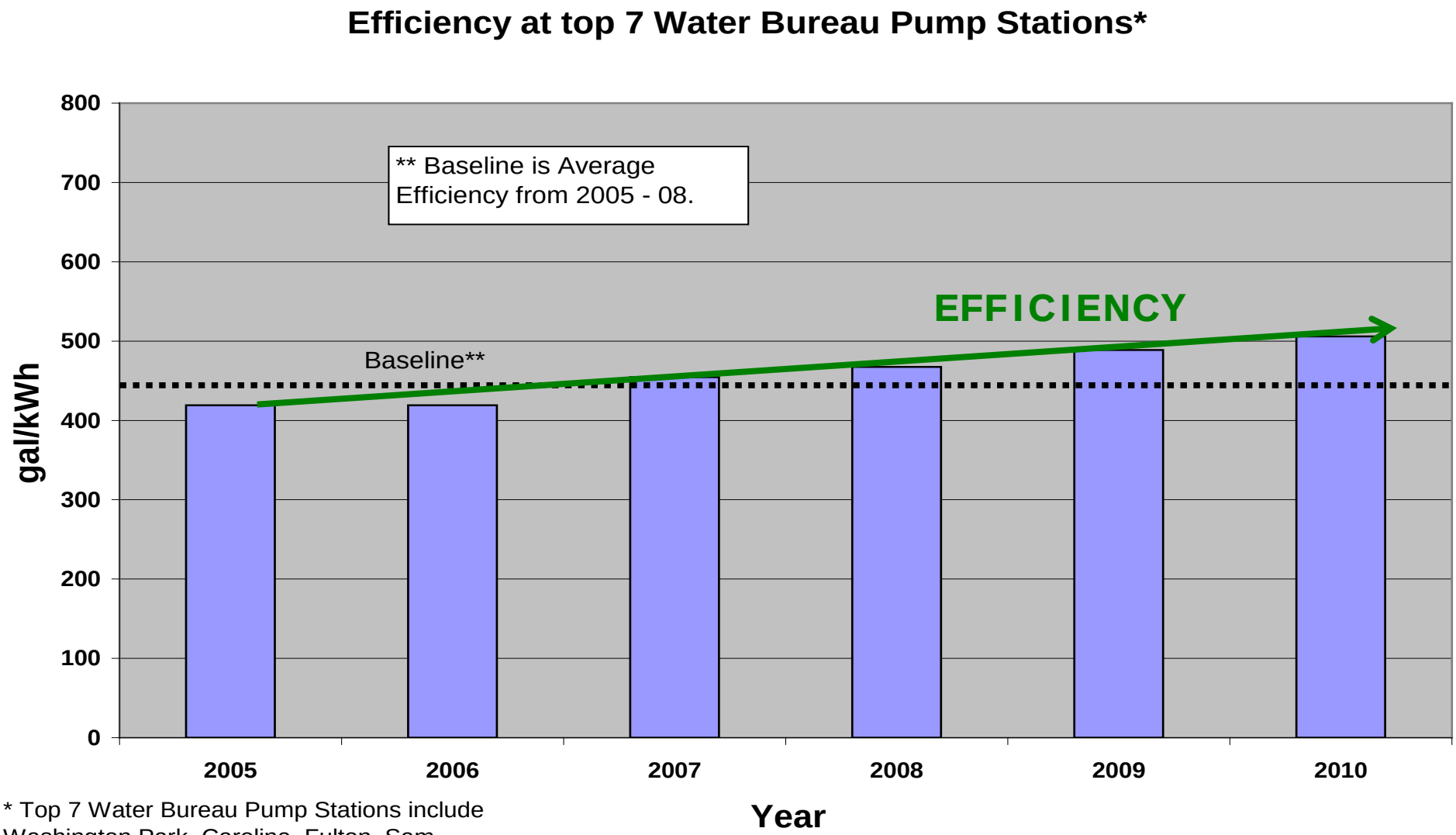
Results

- 2010 was a good year
- Very little operation of GW System
- Efficiency Gains contributed

Type of Facility	2005 - 08 Baseline	2010
Pump Stations	14,844,882	13,240,241
Groundwater	6,537,153	972,971
Occupied Bldg	2,159,840	2,006,680
Fountains	1,218,799	1,285,600
Treatment	896,601	993,520
Other	1,147,076	737,320
Total (kWh)	**26,804,350**	**19,236,332**

Energy Use by Sector



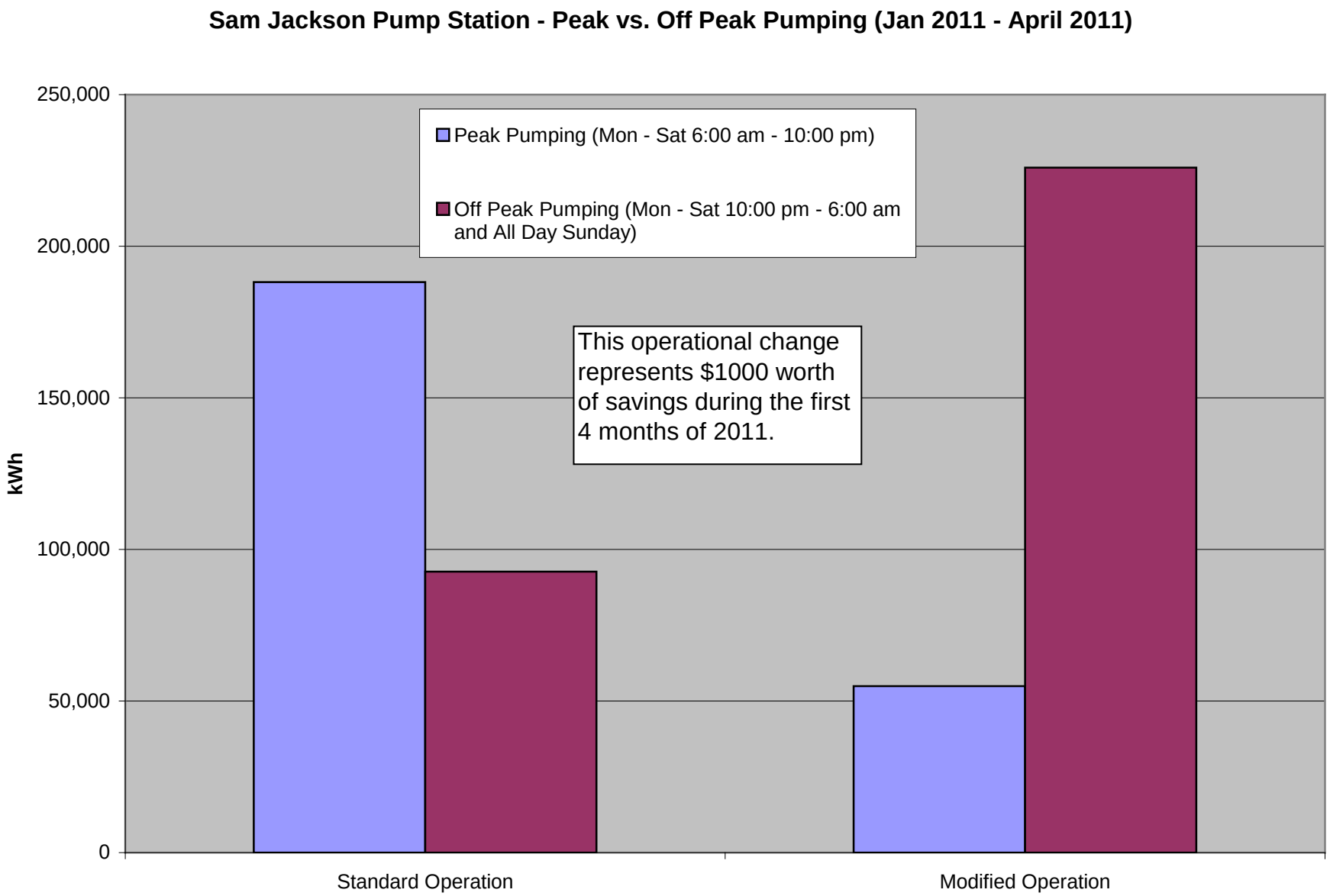
* Top 7 Water Bureau Pump Stations include Washington Park, Carolina, Fulton, Sam Jackson, Barbur-Gibbs, Hoyt & Calvary

- 1.5 Million kWh/yr saved
- 691 Tons of Carbon Dioxide

Other Strategies

- Lighting Upgrades
  - T-12 to T-8
  - High Pressure Sodium to Induction Arc - GWPS
  - 77,000 kWh saved/year
- Employee Outreach
  - 27 Motion Sensors
  - Night Audits
  - Water Control Center – Operators Energy Efficiency Guidance Document
  - Website
- Demand Shift
  - Increased pumping during off-peak period
  - Take advantage of Time of Use Energy Charges

Demand Shift



Renewable Energy

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Solar on the Slough

Meter Shop Solar

Vernon-Micro Hydro Generator

Groundwater Treatment Bldg Solar

Questions?

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503-823-7507

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