



# Hawaii Energy

*Your Conservation and Efficiency Program*



## WATER SYSTEMS PROJECTS – EFFICIENCY FROM SOCKET TO FAUCET

Michael Chang  
Chief Innovation Architect

3<sup>rd</sup> Annual Joint Government Water Conference, Aug 6, 2015

# HAWAII CLEAN ENERGY INITIATIVE

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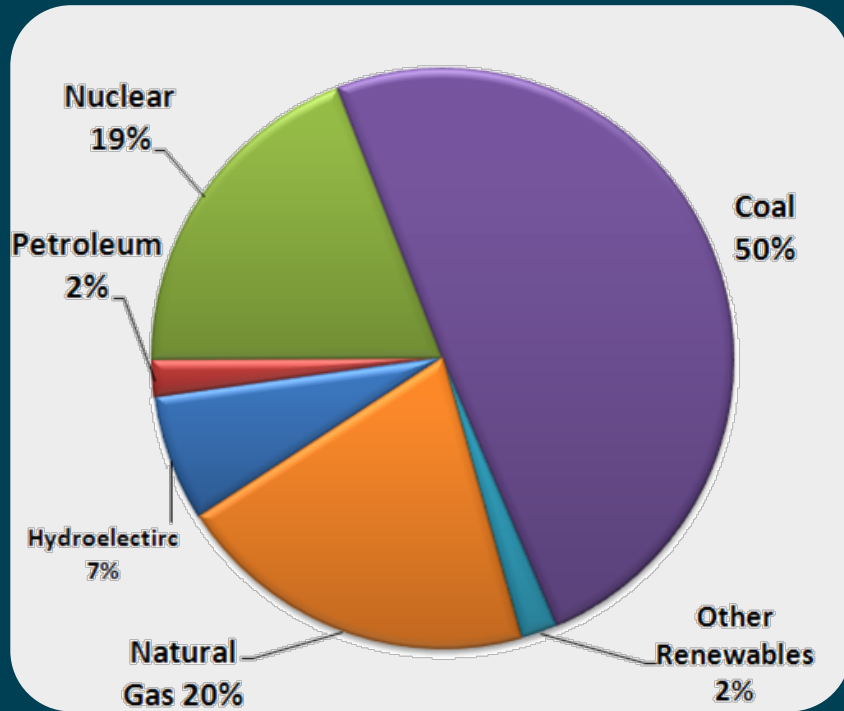
The State of Hawaii and the Department of Energy signed a historic memorandum agreeing to:



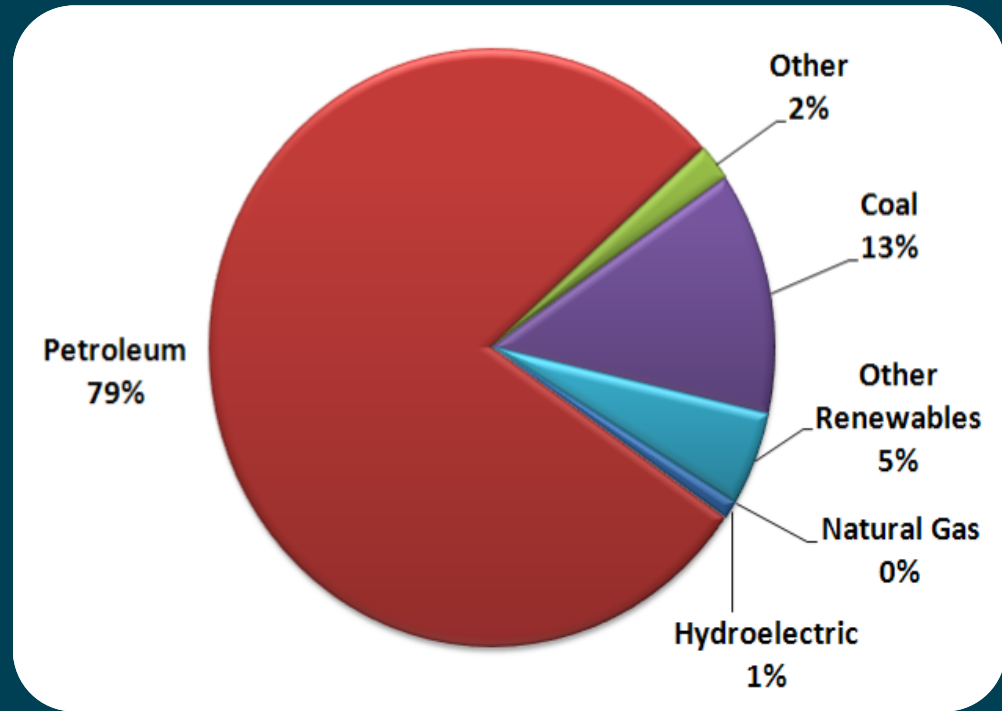
- Meet 70% of Hawaii's energy demand through conservation and clean-energy sources by 2030
- Make Hawai'i a national leader in smart energy use
- Create new jobs and a new, energy-based economy in Hawai'i

# HAWAII'S DEPENDENCY

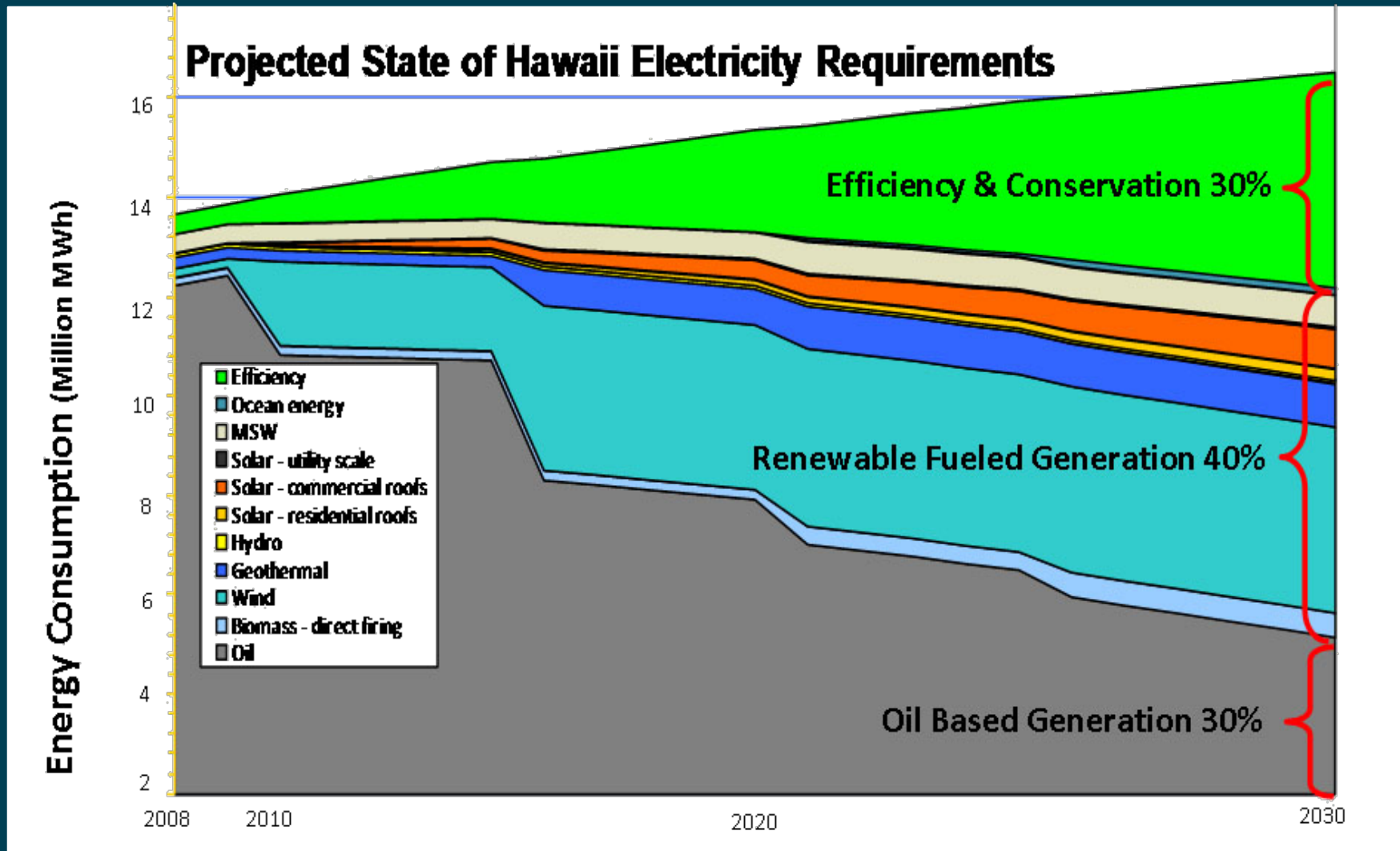
## U.S. Electricity Generation



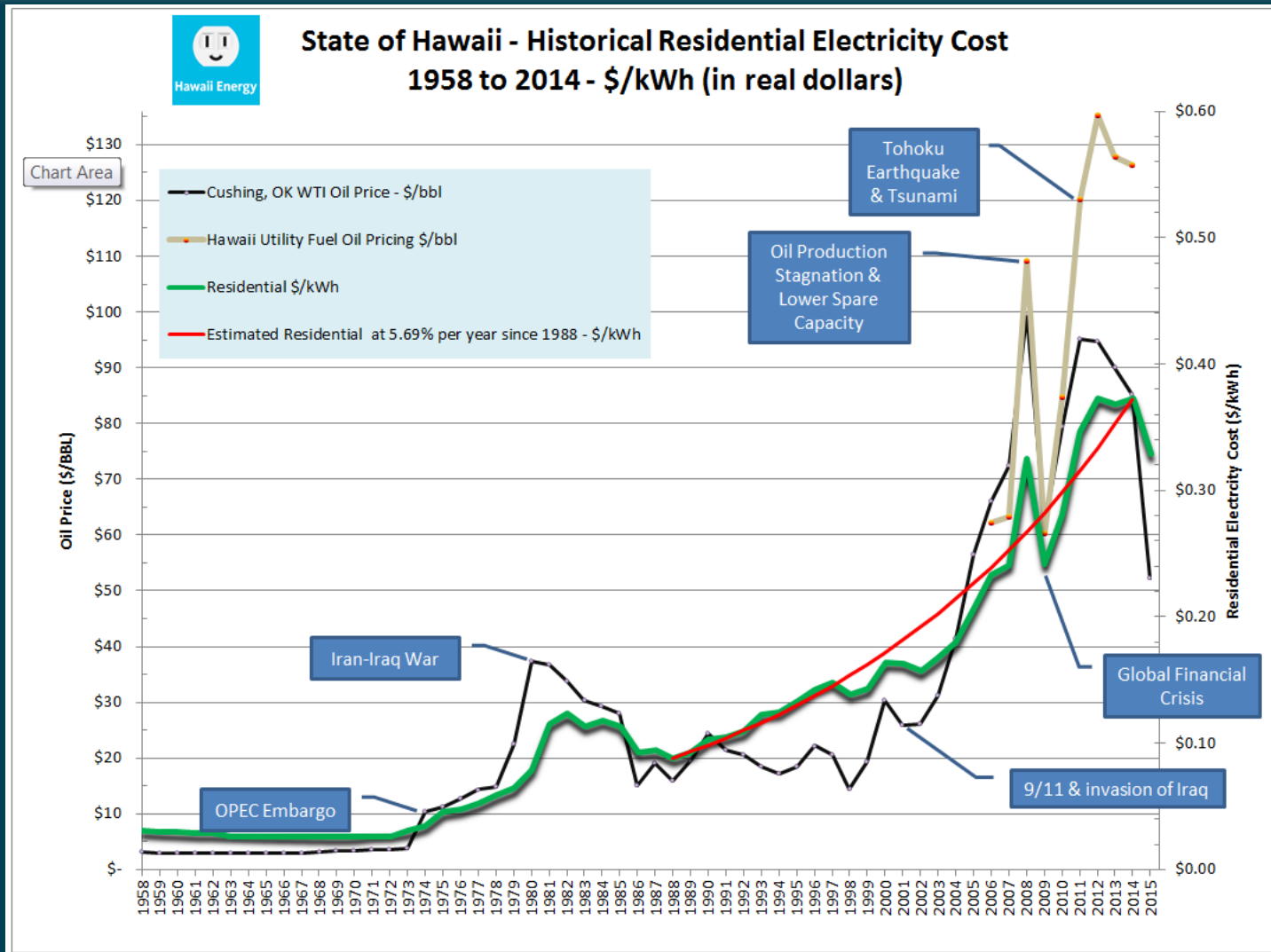
## Hawaii Electricity Generation



# THE COMPONENTS



# BUSINESS RISK TO BE MANAGED



# W&WW POTENTIAL (2014)

	Annual Cost	Energy (kWh/Year)	Demand (kW)
<b>Municipal Water &amp; Wastewater Sites 2014</b>	\$ 89,495,000	286,000,000	56,054
<b>Hawaii Electric Industries 2014</b>		8,976,200,000	1,554,000
<b>% of HECO</b>		3.2%	3.6%
<b>Potential Reductions for Municipal W&amp;WW:</b>			
10%	\$ 9,533,126	28,600,000	5,605
20%	\$ 19,066,253	1,795,240,000	310,800
<b>Simple Payback Est.</b>		15	
<b>Low Capital Cost Est.</b>	\$ 142,996,896		
<b>High Capital Cost Est.</b>	\$ 285,993,792		



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**“Wishes cost nothing  
unless you want them  
to come true.”**

**— *Frank Tyger***

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**How many  
energy efficiency experts  
does it take to change a  
light bulb?**



# DEPENDS ON THE SIZE OF BULB



# DEPENDS ON THE SIZE OF BULB



and...

Location,  
Funding Source,  
Procurement Method,  
Legal Review Requirements,  
Environmental Compliance,  
Generational Technology Compatibility,  
Training,  
Ongoing Maintenance...



# FROM FAUCET TO SOCKET

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- **Manage Resources and Production**
- **Optimize Distribution / Ops /Storage**
- **Consumer Awareness / Behavior**
- **Catch and Fix leaks**
- **Use Efficient Fixtures**
- **Minimize Landscaping Use**
- **Monitor Cooling Towers / Industrial Processes**
- **Optimize Collection**
- **Manage Processing / Reuse**
- **Start over**



# PILOT PROGRAM DEVELOPMENT

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- PUC ask to Review Opportunities for W / WW Sites
- Gain Market Knowledge and Understand Challenges
- Site Inspections / Interviews / Review Prior Studies
- Opportunities
  - Operational Optimization – Education, Tools and Methods
  - Design Standards and Simulations
  - Maximization of Current Capital Improvements

# PILOT PROGRAMS

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- **Utilize Present Incentives Available**
- **Assist with Project Financial Benefit reviews**
- **Submetering – Temporary and Permanent**
- **Hawaii Specific Benchmarking**
- **Demand Side Awareness and Action Efforts**
- **Participation in Industry Meetings**

# FREE EQUIPMENT PROVIDED

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- **Recipients: HBWS, HRWA, and RCAC**
  - Fluke 1735 power meters
  - Multimeters with pressure module
  - Ultrasonic flowmeter
  - HOB0 remote data logger



# GROUPS WE'RE SUPPORTING

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- **Hawaiian Beaches Water Company (Big Island)**
- **Hawaii Water Service Company (Big Island)**
- **Hana Water Company (Maui)**
- **Aqua Engineers**
- **Veolia Water (Oahu)**
- **Rural Community Assistance Corporation**
- **Hawaii Rural Water Association**
- **County of Maui DWS**
- **County of Hawaii DWS**
- **Honolulu BWS**
- **And more...**

# PRIVATE WASTEWATER FACILITY

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- Existing: large pumps with VFDs
- Pumps grossly oversized, not running efficiently
- “Right-sized” 2 of 3 pumps and upgraded VFDs
- **Estimated savings = 170,000 kWh (1<sup>st</sup> year)**
- Incentive amount = ~\$23,000 (20% of total project cost)



# LARGE MUNICIPAL WATER COMPANY

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- Has a known problem of water leaks
- Has a proven leak detection program, but needs to replace failed loggers
- Project has stalled from lack of funding
- Hawaii Energy provided \$135,000 for purchase of new loggers (about 200 loggers)
- **Estimated savings = 500-600 kWh/year per logger (total over 100,000 kwh, 1<sup>st</sup> year)**
- **FIRST LEAK DETECTED and Fixed!**



# COUNTY WASTEWATER FACILITY

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- UV upgrade project – 2015/2016
- Single channel test (6 channels total)
- \$5 million project cost
- Old: 2.8 kW per lamp, 338 lamps per channel
- New: 1.0 kW per lamp, 220 lamps per channel
- **Estimated savings = 7.6 million kWh per year!**
- Committed incentive = \$2.3 million
- Plans for expansion to additional channels

# WHY ROB A BANK?

That is where the money is!

	Efficiency Range	Low	Average	High
Motor	85-95	.85	.9	.95
Drive	20-98	.20	.6	.98
Pump	30-85	.30	.6	.85
System Efficiency		.05	.32	.80

System Efficiency

# PUMP ENERGY INEFFICIENCIES

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- Original Design Load vs. Existing Conditions
- Motors
- Gearsets
- Pumps
- Volume Control Method
- Wear/ Site Conditions



# PUMPING SYSTEM INFLUENCES

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- Flow Rate
- Head Differential
- Static
- Friction (dynamic)
- Equipment Efficiencies
- Water Main
- Material
- Size
- Wetted circumference
- Material being Pumped
- Code Requirements



# HAWAII BENCHMARKING

**Table 2** presents the average energy use rates for the various classes of drinking water utilities in Wisconsin<sup>45</sup>. It should be noted that one-fourth of Wisconsin's drinking water utilities use less than 1.0 kWh per 1000 gallons.

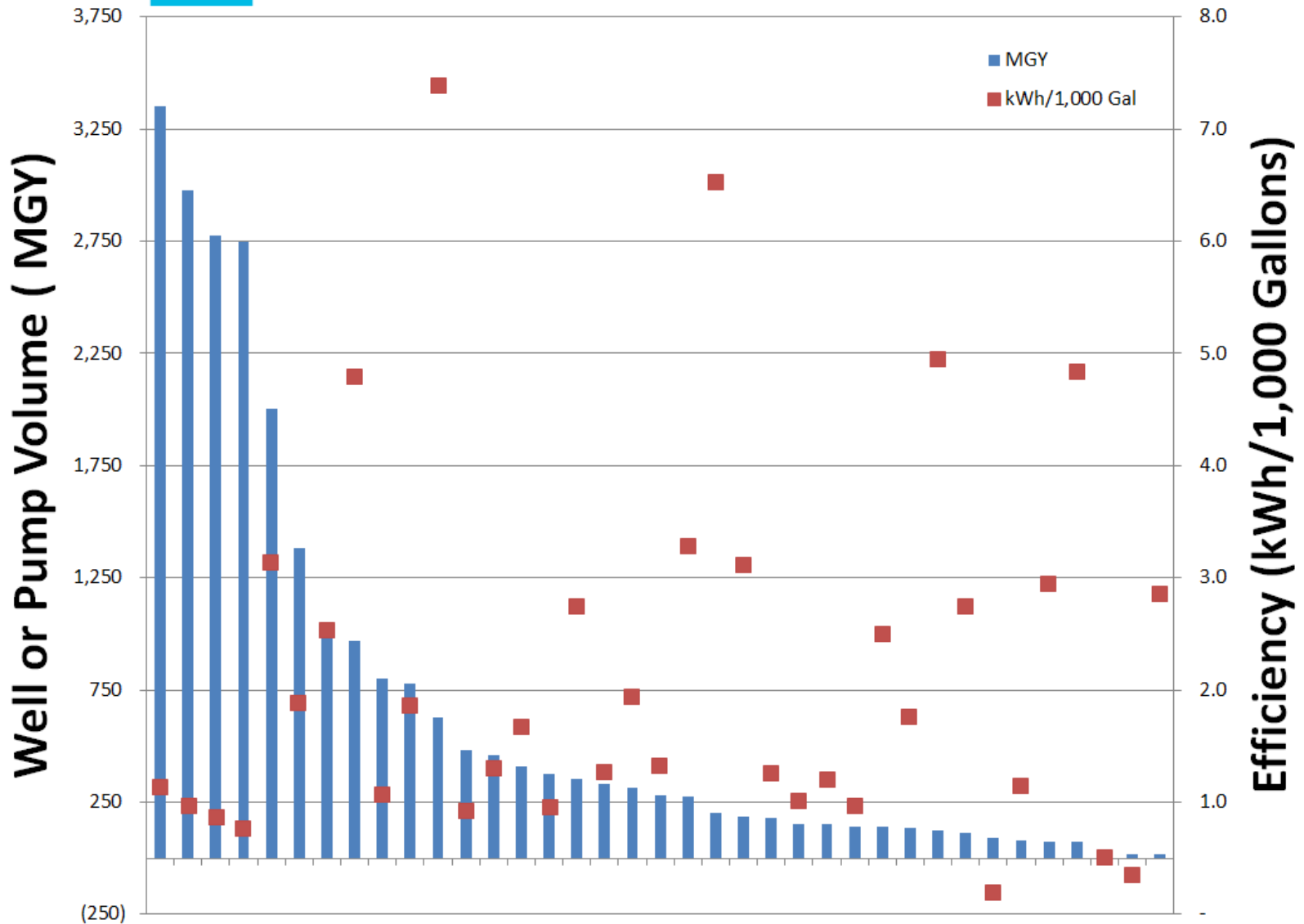
**Table 2**  
**Energy Use Rates at Drinking Water Utilities**

Type	kWh/1000 gallons
<b>Class AB</b> (>4000 customers)	<b>1.51</b>
<b>Class C</b> (1000-4000 customers)	<b>1.85</b>
<b>Class D</b> (<1000 customers)	<b>1.89</b>
<b>Surface water source</b> (US)	<b>1.4</b>
<b>Groundwater source</b> (US)	<b>1.8</b>

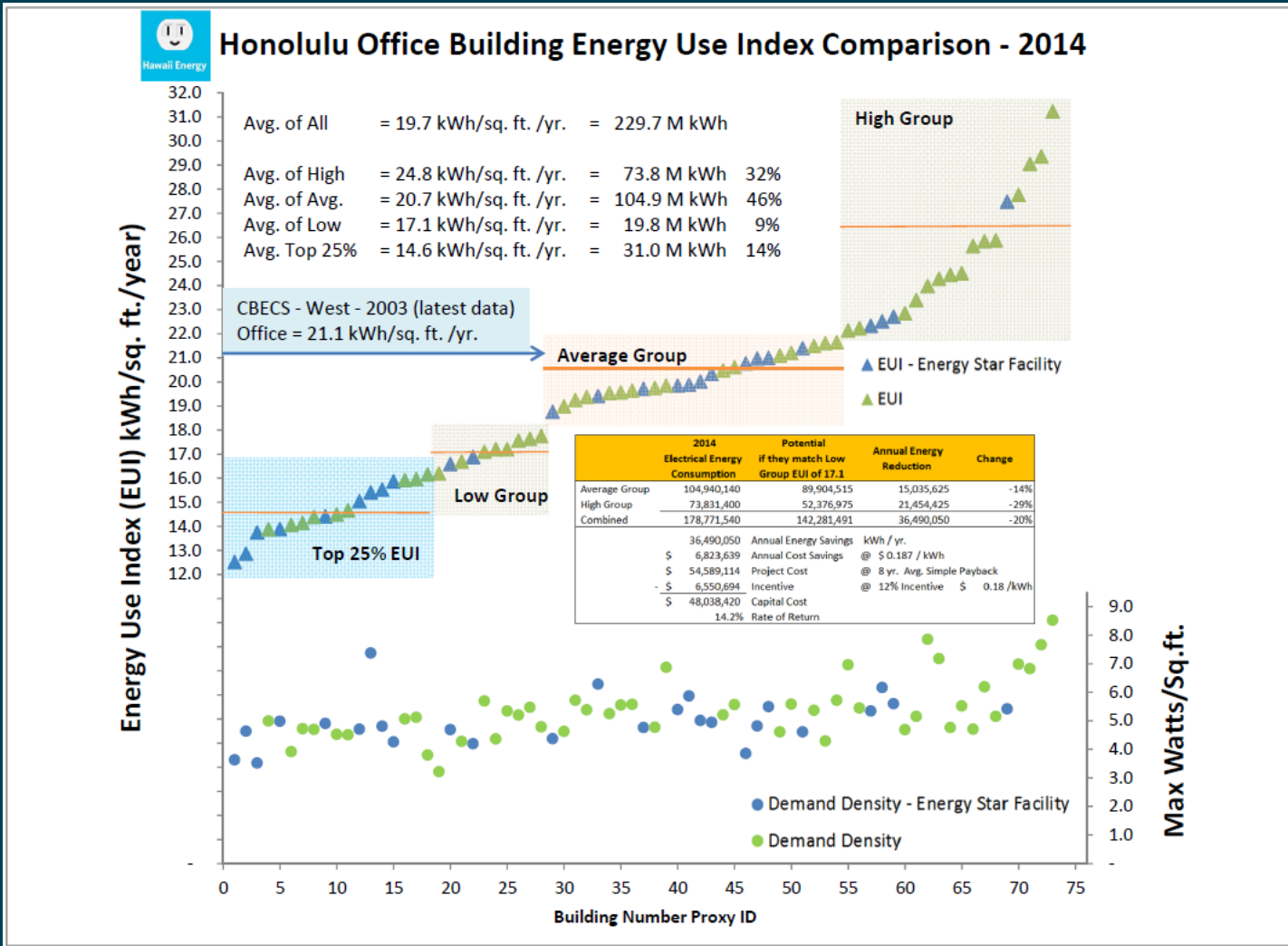
Note: The energy rates for the three classes of utility include distribution losses and delivery to customers. The average water loss for the state is 11% of the water produced.



# 2015 Water Pumping Volume vs. Efficiency Benchmarking

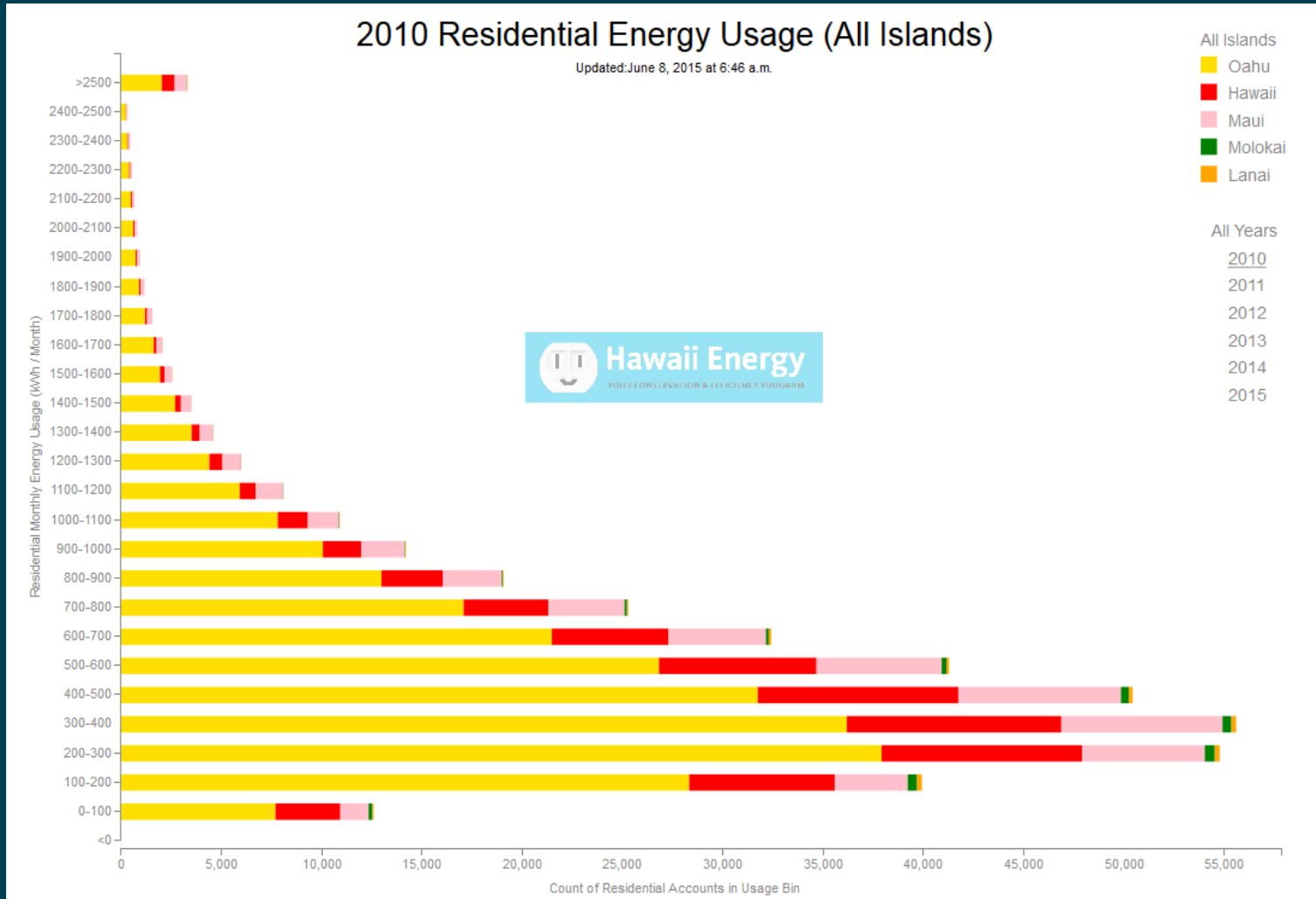


# COMMERCIAL OFFICE BENCHMARKS





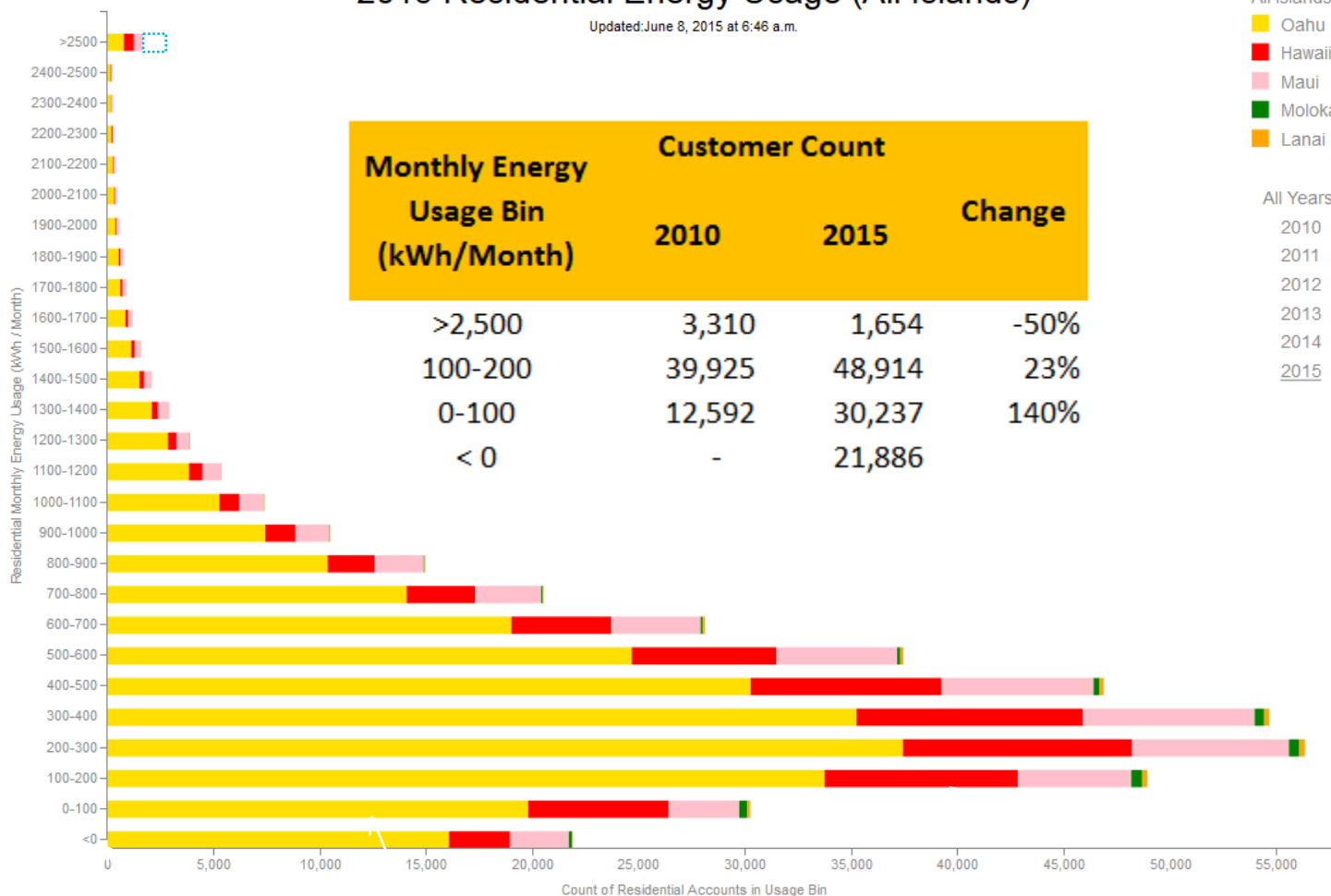
# RESIDENTIAL MARKET IDENTIFICATION



# CHANGE IN USAGE OVER TIME

## 2015 Residential Energy Usage (All Islands)

Updated: June 8, 2015 at 6:46 a.m.



# IDENTIFICATION OF OPPORTUNITIES

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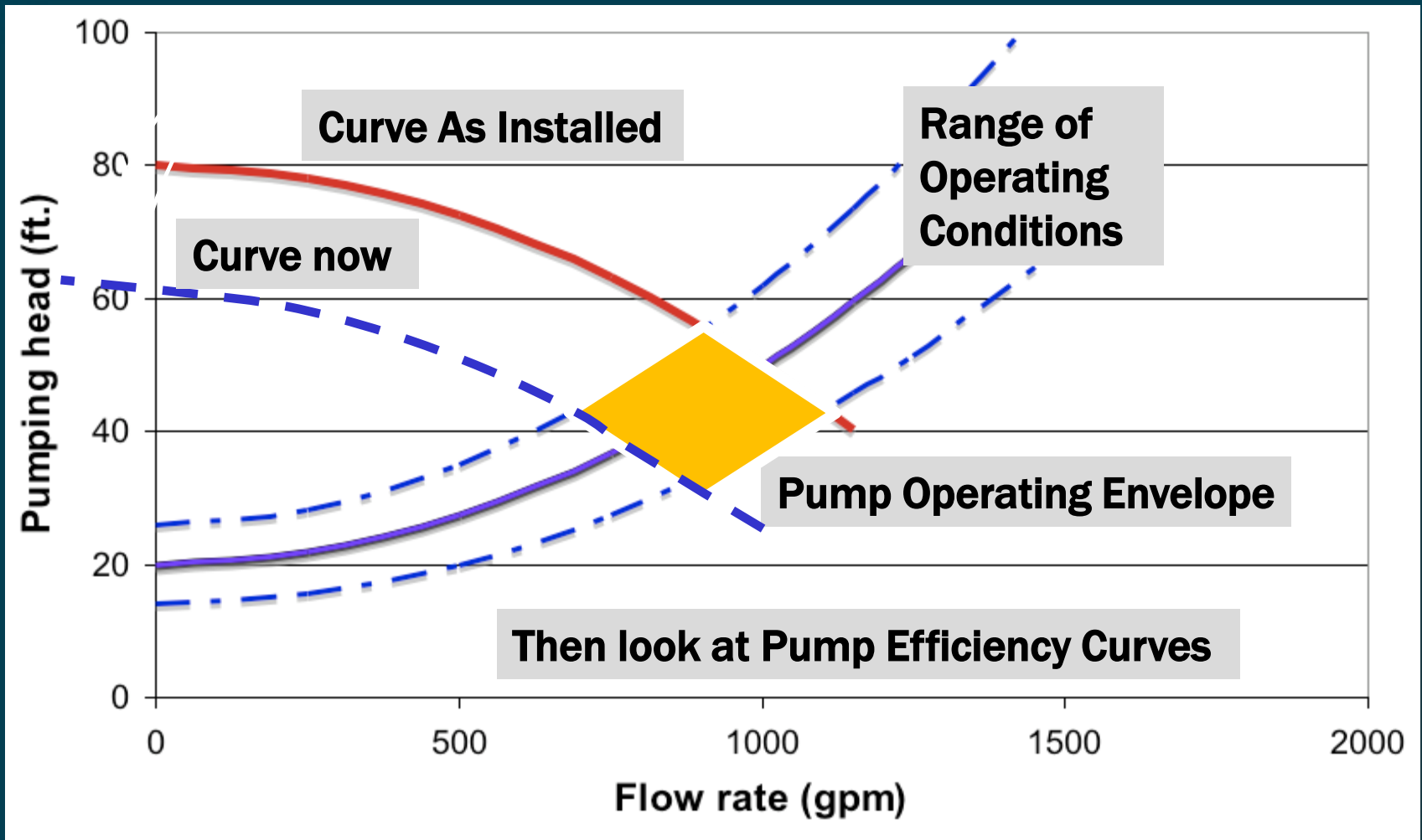
- **Analyze System Information**
- **Develop energy cost per thousand gallons for each source**
- **Analyze utilization of storage – is it operated efficiently**
- **How much power is consumed during peak and non-peak time periods?**
- **Can non-peak operations be increased to save power?**

# IDENTIFICATION OF OPPORTUNITIES

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- **Can pressure in the system be decreased yet meet all demand requirements?**
- **Can elevations in storage vessels be modified?**
- **Any potential to reduce amount of pumping or re-pumping?**
- **Are all motors energy efficient?**
- **Are the combinations of pumps, drives and motors the most efficient?**

# WHERE DOES THE PUMP LIVE NOW?



# PUMPING ASSESSMENT

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- Pump performance curve
- Drive Data, if applicable
- Motor specifications
- Design information
- Amp draw (field-measured)
- Existing flow conditions
- Operations personnel discussion
- System components
- Static
- Dynamic – conveyance configuration



# PUMPING ASSESSMENT

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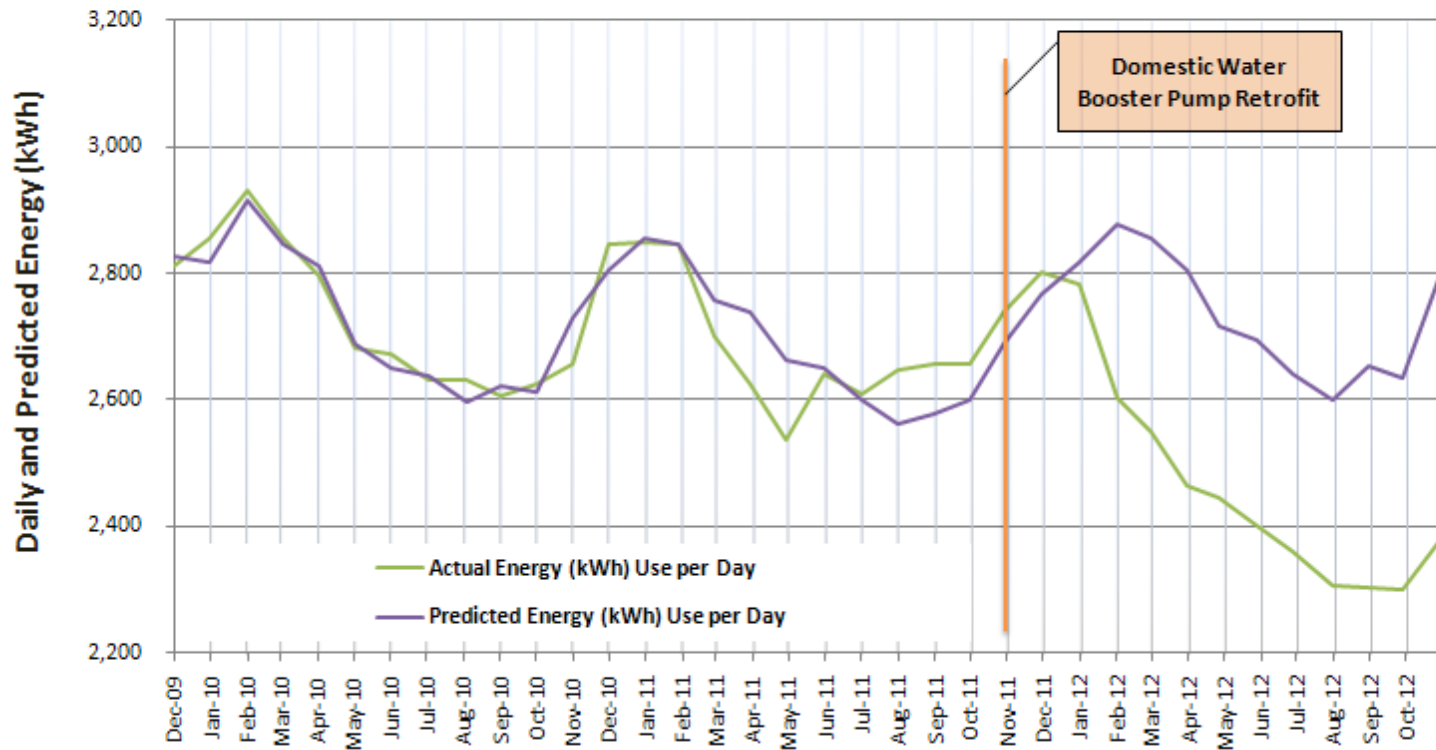
- Has the water table dropped in your area?
- Have you or will you need to drop your well pumps?
- Will you need/use energy efficient motors?
- Are you throttling valves?
  
- Do you have a SCADA System?
  - What does it provide you?
  - Can it assist in operation?
  
- Chemical addition/disinfection system operation

# PROJECT RESULT REVIEWS



Hawaii Energy

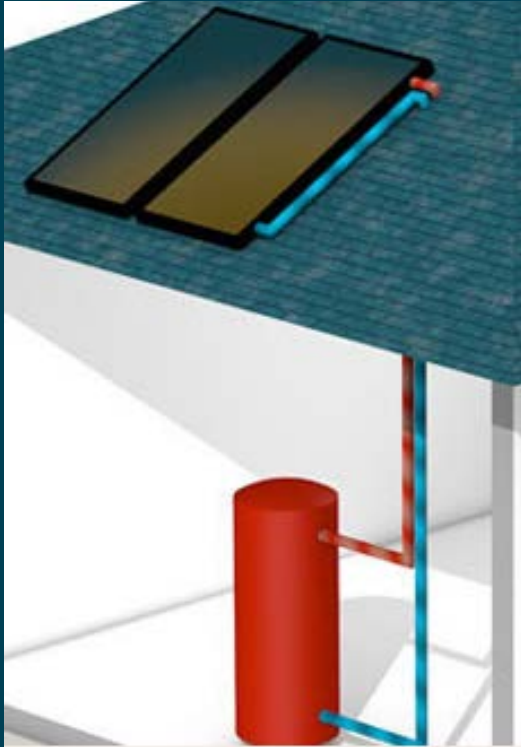
## Weatherized - Baseline Energy Forecast vs. Actual Usage





# SOLAR WATER HEATING

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- **\$750 Contractor Incentive or**
- **\$750 Interest Buy-Down**
- **100 point inspection**
- **90% water heating cost reduction - about \$10-\$15 per person**
- **35% Hawaii State Renewable Energy Tax Credit**
- **30% Federal Tax Credit**
- **Opportunities for Water Conservation actions**



# LIGHTING INCENTIVES

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- **Incandescent Lamps**
  - Ceramic Metal Halide
  - CFL
  - LED
- **Four Foot Lamps**
  - Low Wattage T8s – (25/28 W)
  - High Efficiency Ballasts
  - Delamping
- **Controls**
  - Occupancy Sensor
  - Time Clock / EMCS
  - Bi-Level / Re-circuiting



# CUSTOMIZED INCENTIVES

Measure of Life	Average Energy Reduction Incentive	Evening Peak Demand Incentive 5 to 9 p.m.	Day Peak Demand Incentive (HVAC Only) 12 to 2 p.m.
$\leq 5$ years	\$0.11/kWh	\$125/kW	\$100/kW
$> 5$ years	\$0.15/kWh	\$125/kW	\$100/kW



US EPA through the New England Water Treatment Technology Assistance Center at the University of New Hampshire.

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**“Progress is not created  
by contented people”  
— *Frank Tyger***

# CONTACT INFORMATION

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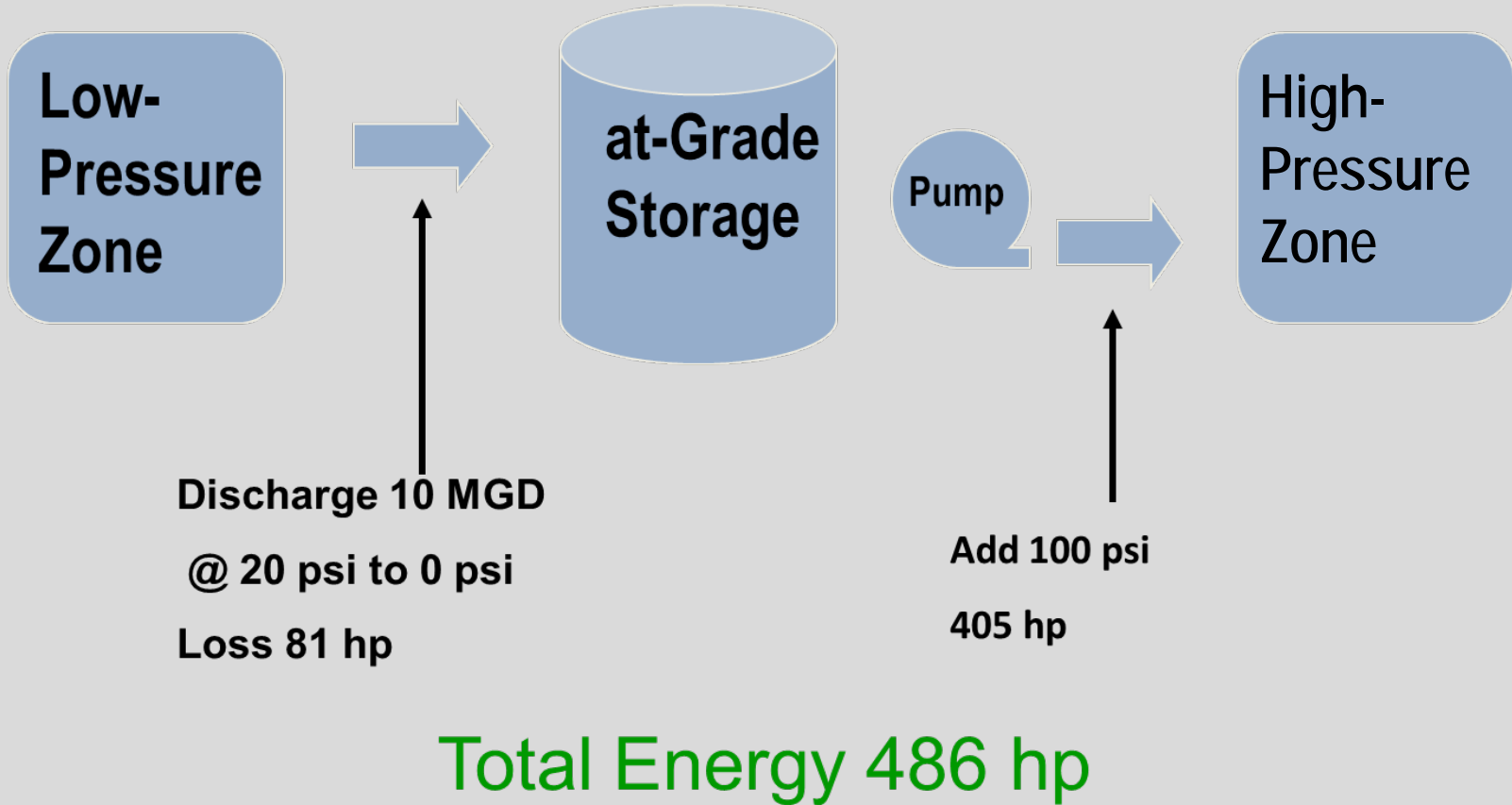
# Mahalo

Oahu 1-808-537-5577

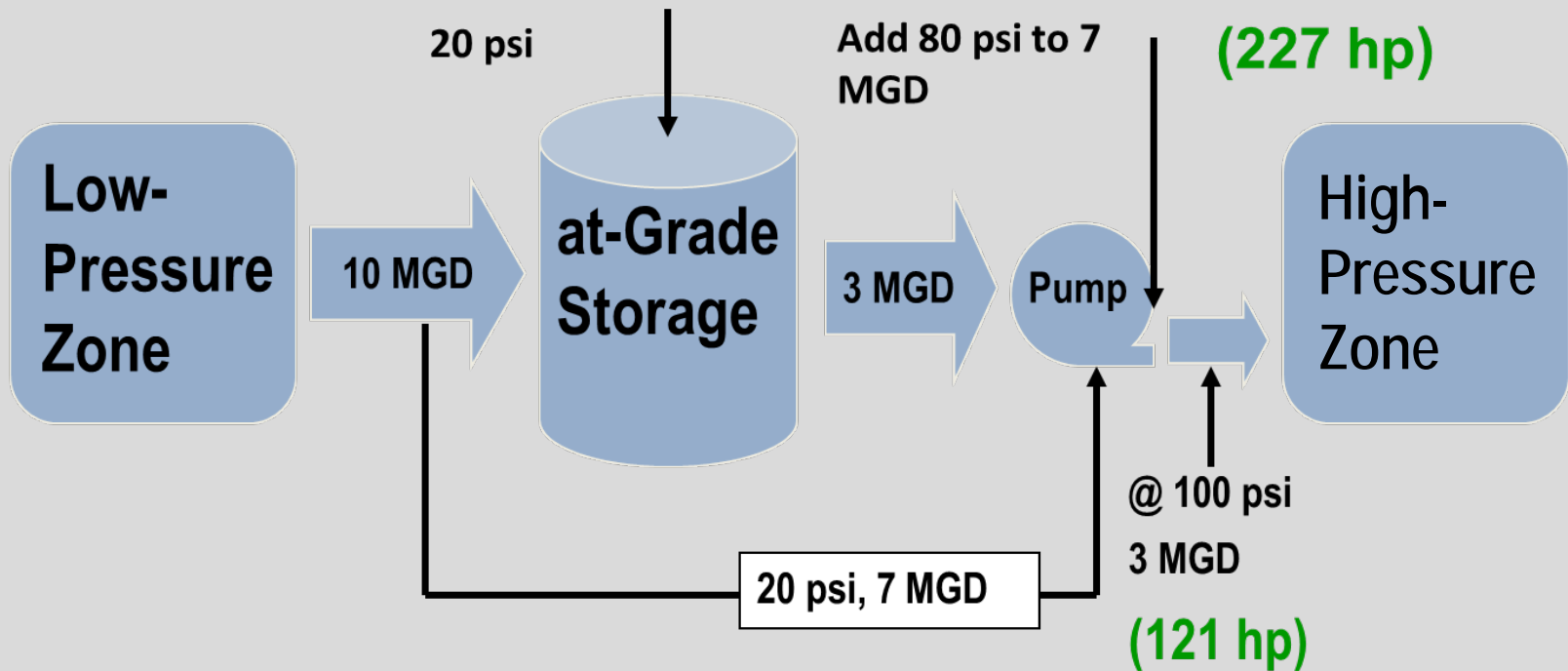
Neighbor Island 1-877-999-7242



# ENERGY RELEASED



# ENERGY REDUCTION

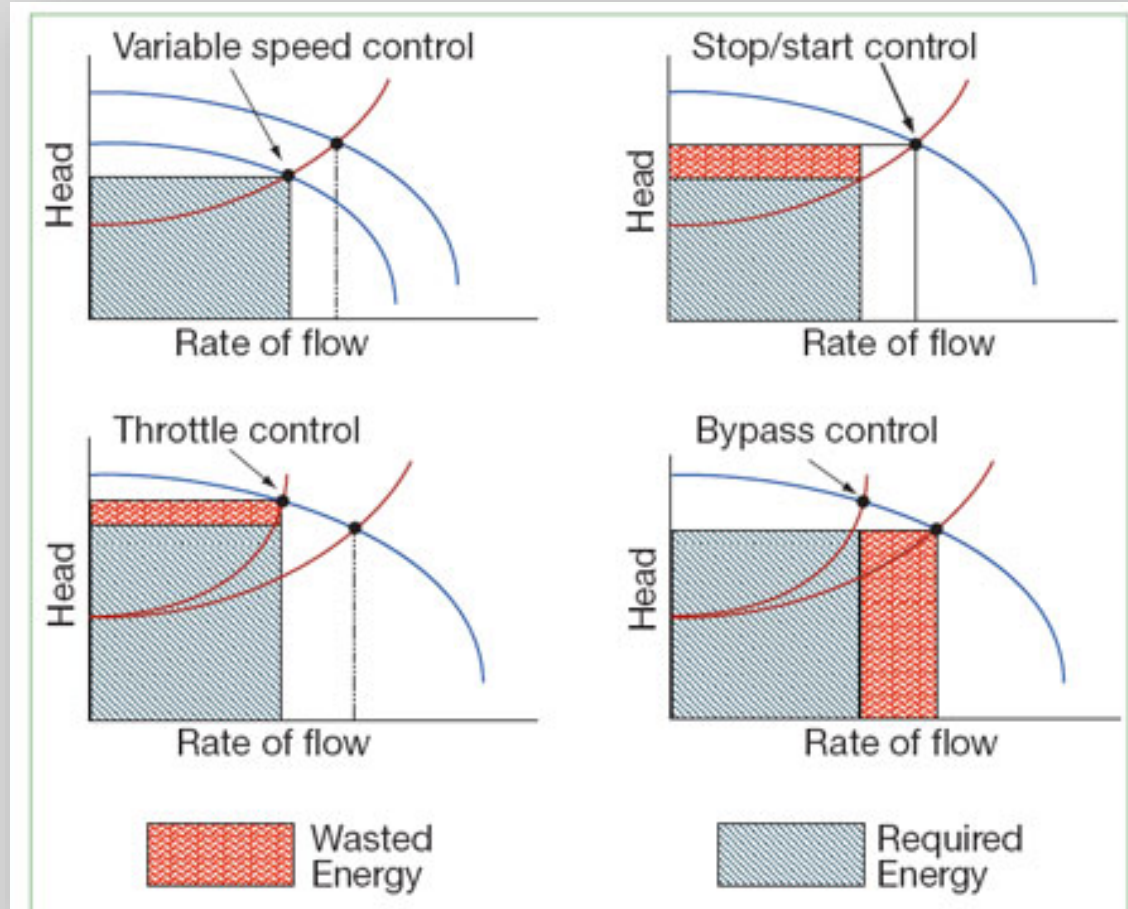


**Total Energy = 348 hp**





# FLOW CONTROL



Courtesy of Hydraulic Institute, Parsippany, NJ, [www.pumps.org](http://www.pumps.org)



# IS VARIABLE SPEED ALWAYS BENEFICIAL?

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- Do you pump a wide range of flows?
- How much of system headloss is static?
- How much is dynamic?
- Can the existing pump accept a VSD?
- Will existing pump curve work well with speed variations?

**VSD is not always applicable – a detailed assessment should be completed**

