

Pressure Zone 4 Pumping Energy Analysis

Report to the Water Utility Board

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Project Introduction:

H₂OMAP Water GIS distribution system model used to simulate PZ4 and model energy requirements. PZ4 selected due to the fact zone is isolated and has only 2 wells that have significantly different hydraulic characteristics.

- Calibrate computer model with UW9 MG&E billing records
- Input UW31 well characteristics
- Use model output to predict optimal VFD setting, flow distribution, and HGL with respect to energy use for various system demands

Key inputs to model:

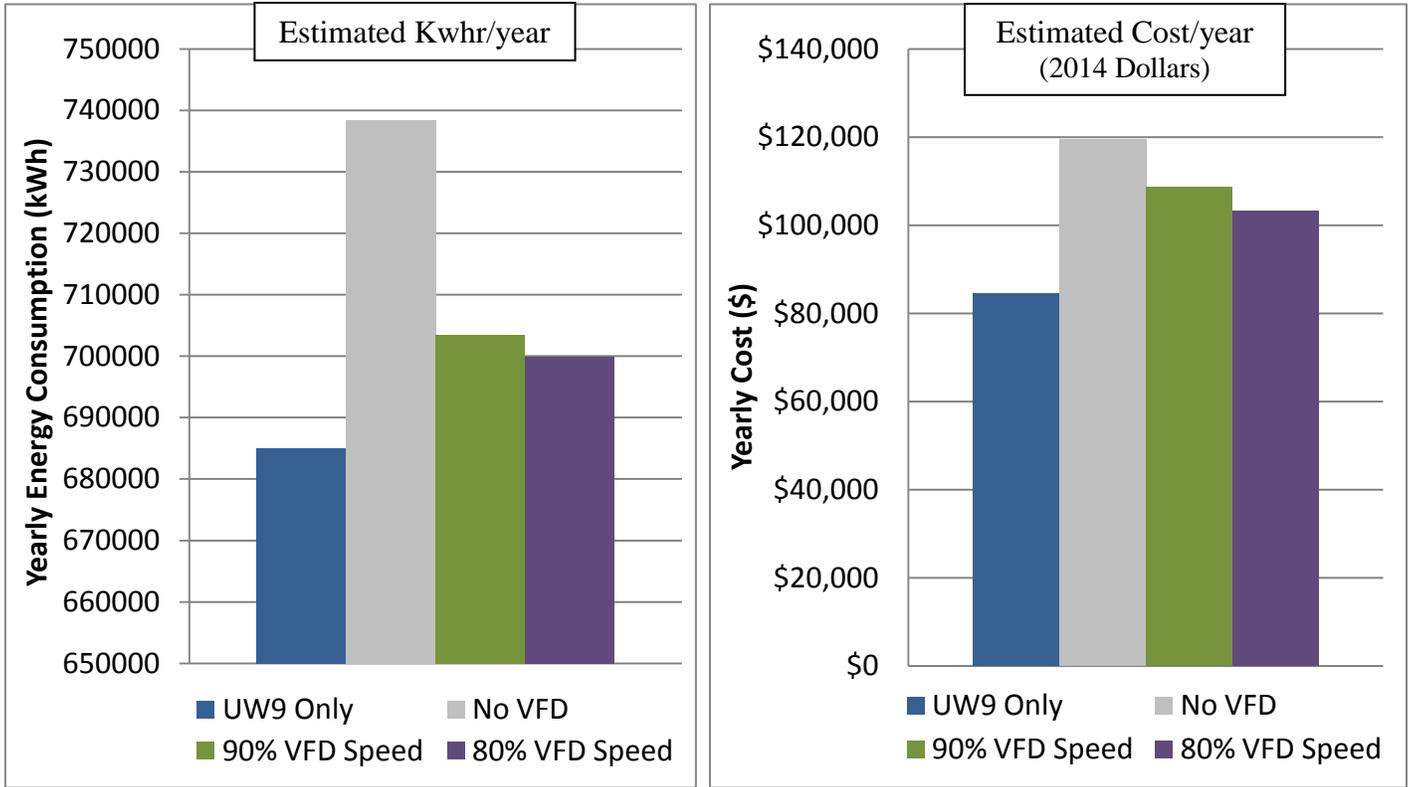
VFD Speed	Flow (gpm)	Head Reduction (ft)	Deep Well Pump Efficiency (%)
100%	2100	-	84
90%	1750	35	81
80%	1350	75	71

NOTE: Specific well capacity estimated at 10gpm/ft

4 major variables to examine:

- **VFD speed:** optimize head reduction with pump inefficiency when speed is reduced
- **Off-peak pumping:** cost savings, no energy savings
- **Flow distribution:** portion of flow that each well has pumped
- **HGL:** reservoir level management to maintain adequate pressure, minimize head loss

Results: 1.31 MGD demand (average day 2014), 50/50 flow, CG-4B rate structure



* Note: "UW 9 Only" illustrates the energy use and cost required if Well 9 is used alone and Well 31 is off line

** Note: VFD illustrated refers to only a VFD on the deep well pump at Well 31. Other VFD's may provide additional savings but were not included in this analysis

100% VFD Speed cost breakdown:

- UW31 deep well pump: \$44,000 (37%)
- UW31 booster pump: \$22,000 (18%)
- UW9 deep well pump: \$53,000 (45%)

If 80% VFD speed for Well 31 deep well is selected to reduce energy consumption:

- Approximate average energy savings: 39,000 kWh/year
- Approximate average cost savings: \$16,000/year = 3 year payback of VFD
- Additional \$7,500 savings with off-peak pumping

Future Work:

- Test flow distributions with greater percentage of water being pumped from UW9
 - 40% UW31 and 60% UW9 proposed to be optimal
- Test VFD speeds down to 70% to determine if any additional savings potential
- Determine energy savings if hydraulic grade line at both Well 9 and Well 31 can be reduced seasonally