Energy Optimization in Water Supply System in the Sultanate of Oman

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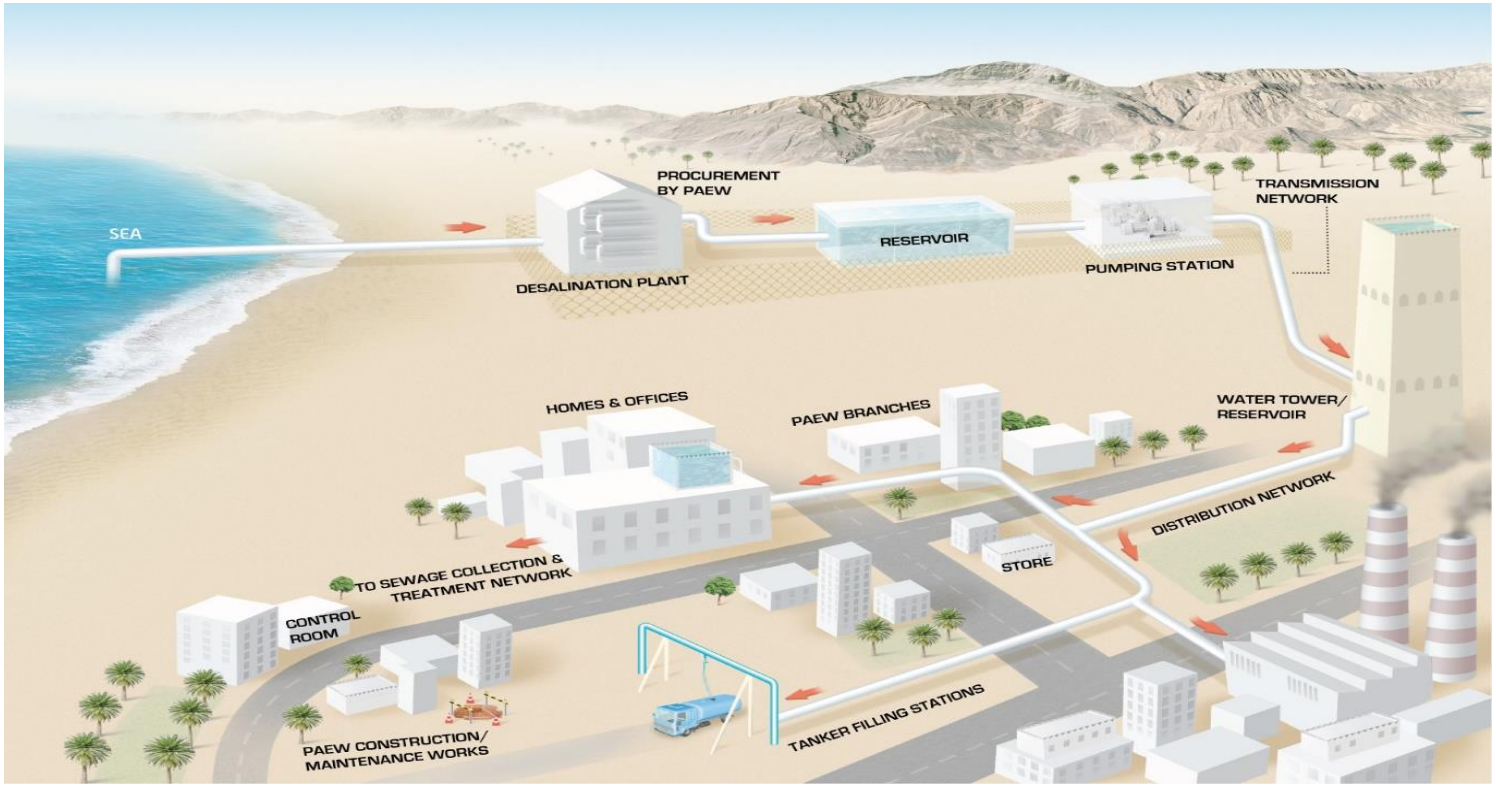
Overview

- Water supply system in Oman
- Comparison of energy consumption
- Efficiency of Muscat Governorate Well Fields
- Actions required for power optimization
- Case studies & initiatives
- Conclusion & recommendations

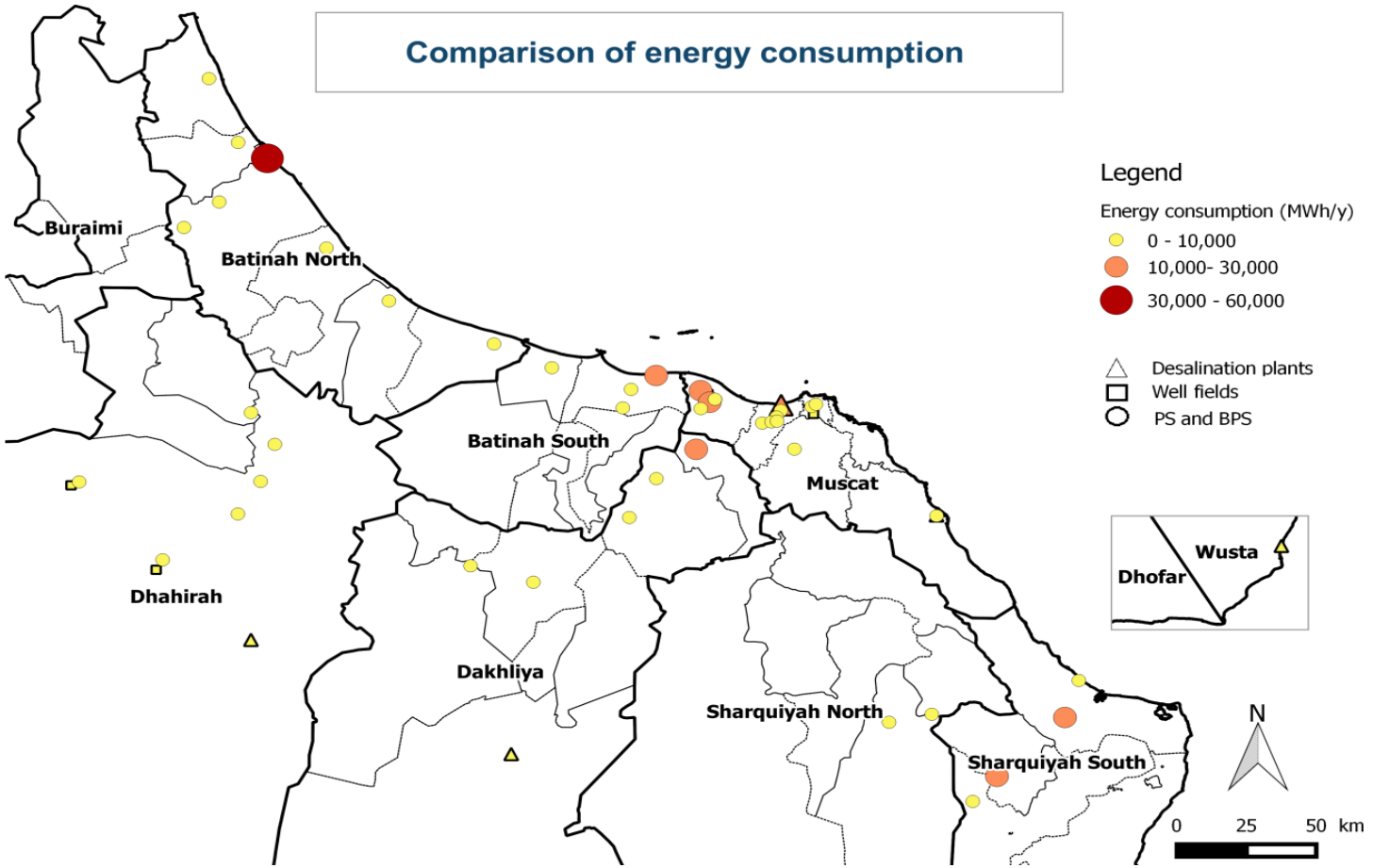
Introduction

- Providing safe drinking water is a highly energy-intensive activity.
- Energy usage vary based on water source, facility age, treatment type, storage capacity, topography, and system size.
- Power demand growing has a direct impact on the environment.
- Drinking water and wastewater systems are typically the largest energy consumers accounting for 25 to 40 percent of a municipality's total energy bill.
- Increasing efficiency of water systems is one of the essential targets in The Public Authority for Water in Oman (Diam).
- Energy optimization methodologies and tools used by Diam in its water supply

Water supply system in Oman



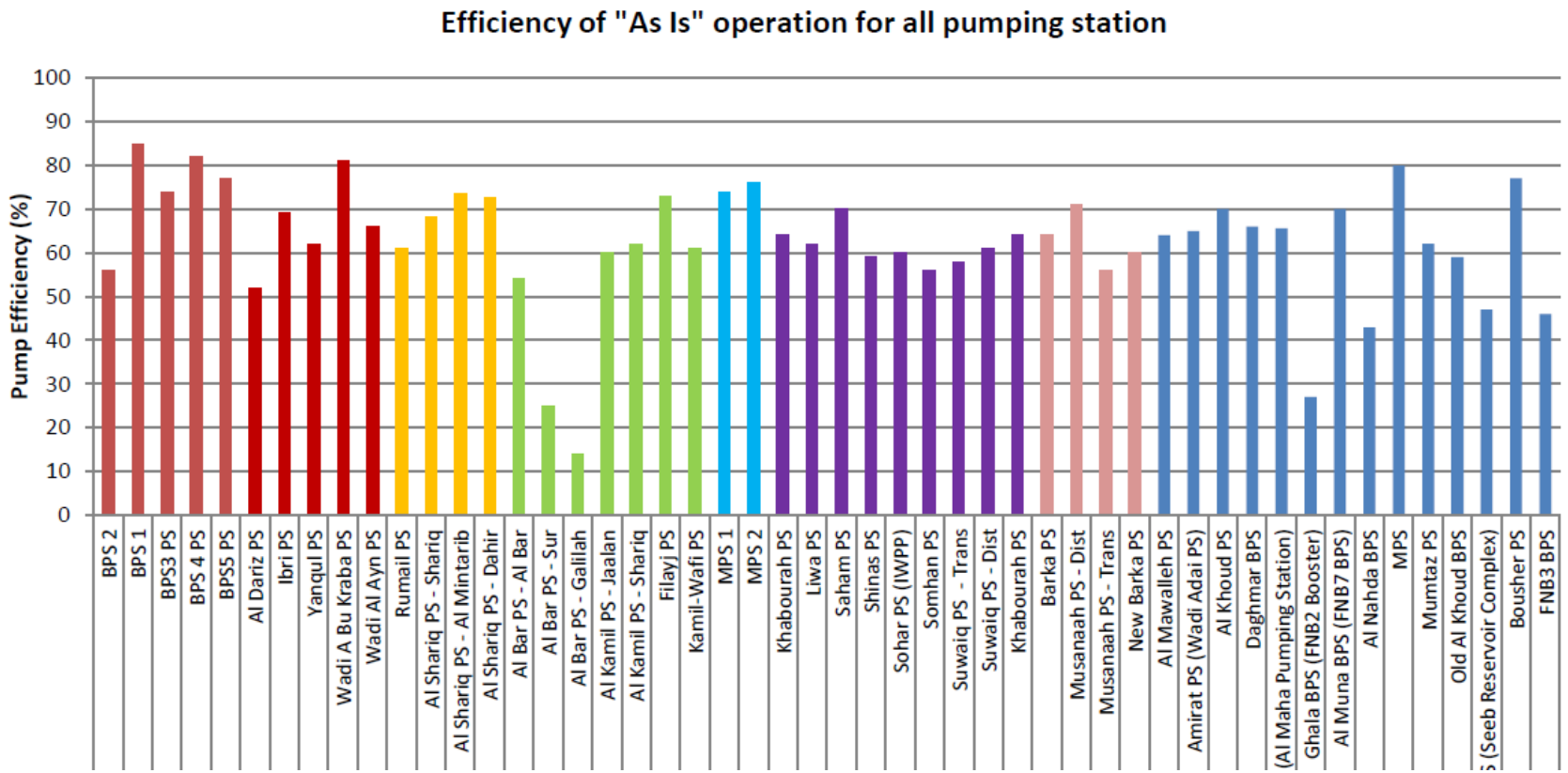
Comparison of energy consumption



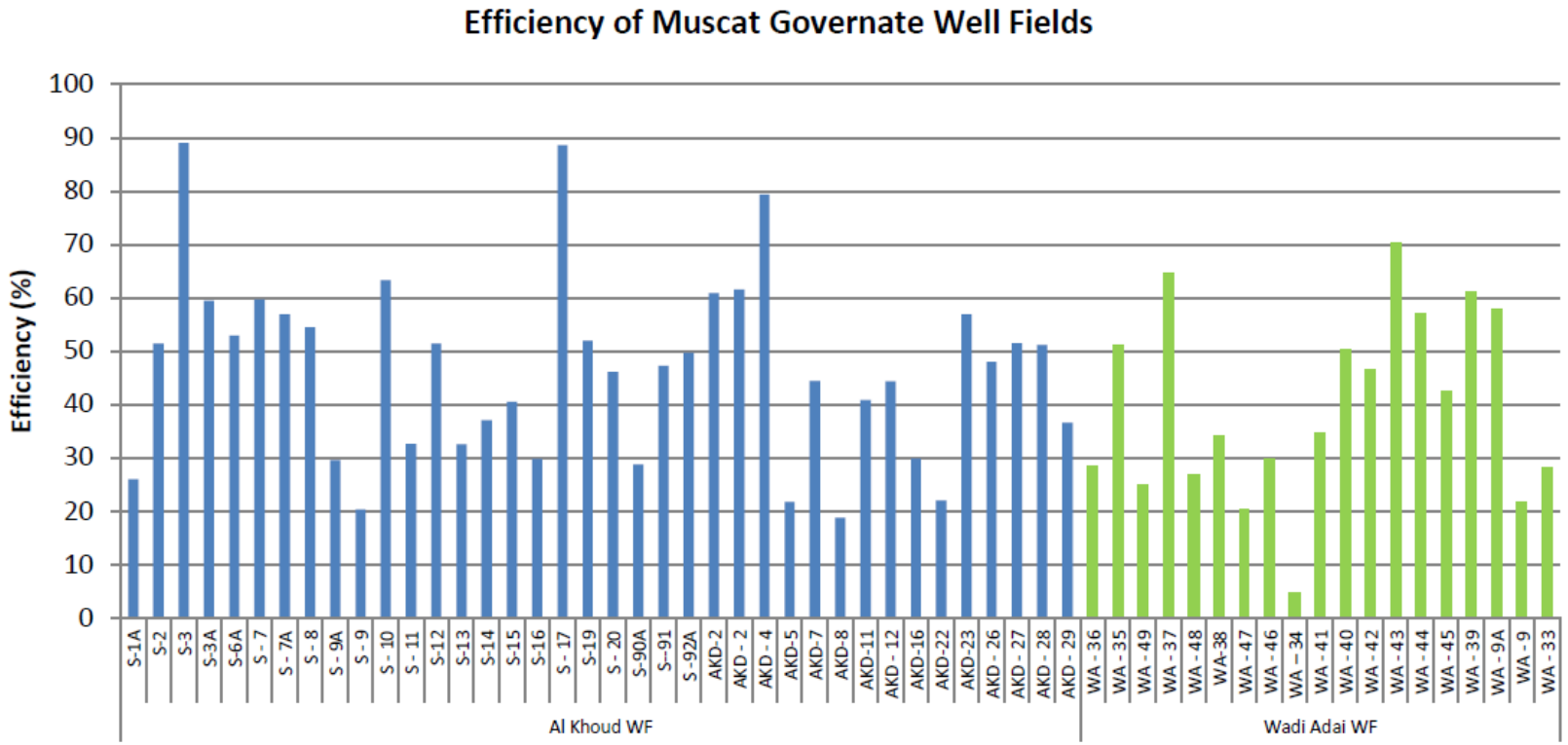
Comparison of energy consumption

Name of the desalination plant	Type of raw water	TDS of raw water (ppm)	Recovery percentage	TDS of product water (ppm)	Specific Energy Consumption (kWh/m^3)
Adam DP	Brackish water	1,607	69%	386	2.37
Ghubrah DP	Sea water	40,000	36%	400	4.15
Hamra DP	Brackish water	2,910	67%	73	3.40
Lakbi DP	Sea water	27,500	34%	330	5.24
Quriyat	High brackish water	18,000	42%	480	3.97

Comparison of energy consumption



Efficiency of Muscat Governorate Well Fields



Actions required for power optimization

Sr.	Required action
1	Bypassing the pumping stations to supply water directly to networks
2	Change of impeller and coating
3	Cleaning of suction line
4	Frequent maintenance/cleaning of strainer for well fields
5	Installation of new pump with motor & as a replacement of existing
6	Installation of VFD in pumping stations
7	Lighting optimization
8	Optimization of impeller diameter
9	Pump operation at valve throttled opening
10	Installation of ERD in desalination plants
11	Reduction/change in operating hours of pump & combinations
12	Refurbishment/ internal coating of pump
13	Replacement of existing belt to flat belt for high pressure pump driven
14	Voltage optimization
15	Suction lines modifications
16	Trimming Impeller

Case studies & initiatives

- Running the most efficient pumps in Malallah Pump Station.
- Bypass the pumping station.
- Energy optimization by avoiding the peak tariff time (CRT).
- Using LED lights.
- Cleaning the Strainers in wells.
- Installing & utilizing variable frequency drives in pumping stations.
- Changing the old membranes in Desalination plant.
- Installing & utilizing energy recovery devices in Desalination plan.
- Pumps maintenance and overhauling

Results

- (OMR 110,988.121 per year) cost saving for running the most efficient pumps in Malallah Pump Station.
- (OMR 6,845.093 per year) cost saving for Bypassing the pumping stations.
- (OMR 238.52 per year) cost saving by using LED lights.
- Energy optimization by avoiding the peak tariff time (CRT)

Conclusion & Recommendations

- Operating water supply systems requires significant amount of energy.
- Using energy optimization methods such as bypassing pumping station, installing variable frequency drivers,.. & etc. led into significant savings in the overall operational cost.
- Using advanced tools & systems is very important to do a close monitoring of energy consumption in water supply systems.
- Using a special software for power analysis to have clear data for each individual site from production to the networks.