Energy Storage at Water Pumping Stations for resiliency and backup power

Energy Storage has several benefits, one of which is resiliency and backup power[1]. With weather-related events such as hurricanes, floods, and wildfires increasingly occurring, there is a risk of losing power for water pumping stations. Ash from wild fires can potentially get into the water streams that feed the water treatment plants. As a result, this strains the energy grid that provides power to run those water pumping stations and treatment facilities. Energy storage can support by providing backup power.

Context

Water pumping stations bring water from the source and discharge water into lakes and streams as an input into water treatment facilities. If water pumping stations do not work or fail, consequences can be fatal, as Hurricane Sandy demonstrated in New York.

"***42 of 96 pumping stations that keep stormwater, wastewater, or combined sewage moving through the system were temporarily out of service because they were damaged or lost power***.[2]"

As recently as summer of 2019, Hurricane Barry stressed the water pumping stations in New Orleans[3].

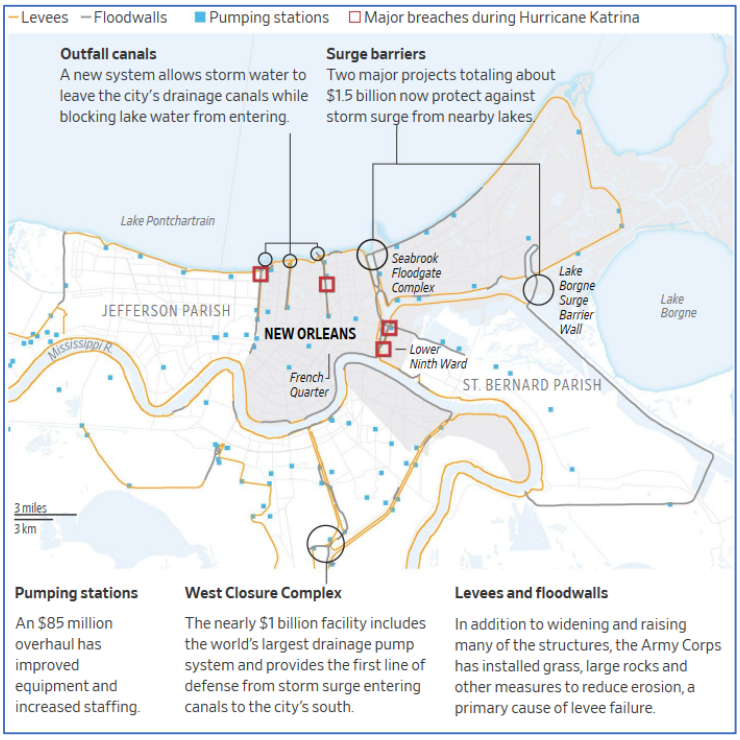

Figure 1: US Army Corps of Engineers source, WSJ article

[1] https://www.nrel.gov/state-local-tribal/blog/posts/batteries-101-series-use-cases-and-value-streams-for-energy-storage.html
[2] http://www.nyc.gov/html/sirr/downloads/pdf/final_report/Ch_1_SandyImpacts_FINAL_singles.pdf
[3] https://www.wsj.com/articles/barry-to-test-new-orleans-levees-pumps-and-gates-11562957817

Cities such as Eugene, Oregon realized the benefit of energy storage to provide this resiliency benefit at an elementary school designated for a water well in the community to improve clean drinking water availability during power outages –

"***This project is also part of EWEB's long-term resiliency planning efforts to establish community points of water distribution around the city of Eugene to be used by its customers during restoration following a large-scale disaster***[4]."

Additional information on Worley website is available[5]. On an average for one million gallons ("MG") of water pumped, transported and distributed, the energy consumed is approximately 1,500 kWh[6]. This 1,500 kWh seems small, but when you factor in current and future water needs plus the number of pumping stations – the energy consumed adds up in a hurry.

Each year City of Minneapolis Water Treatment Distribution Service (WTDS) estimates 21 billion gallons (21,000 MG) of water [7]Energy-wise this translates into 31,500 MWh of annual energy consumption (1 MG equals 1,500 kWh). St. Paul Regional Water Services (SPRWS) estimates 39 MG with a total capacity of 90 MG annually.

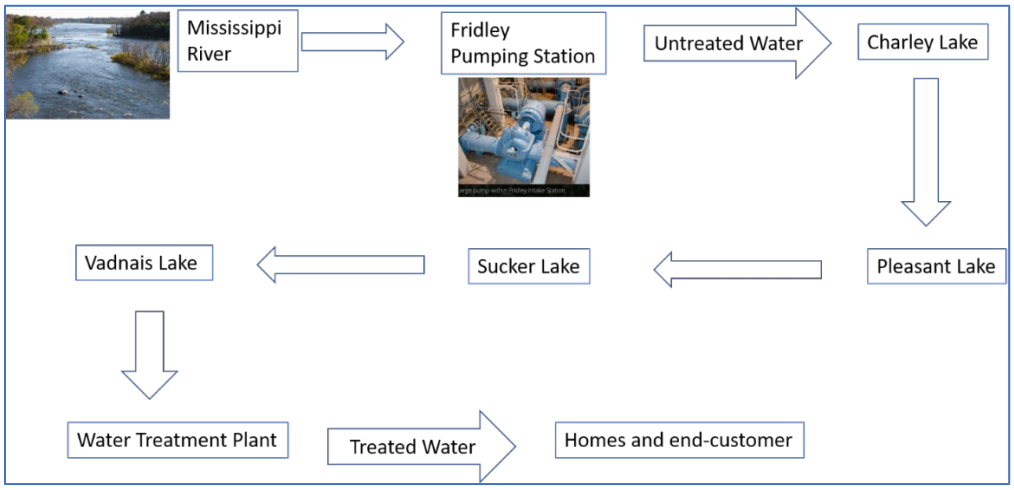

Figure 2: St Paul Regional Water Services - Water Flow Diagram (Source: https://www.stpaul.gov/departments/water-services)

A sample of cities water energy needs basing on that metric of 1 MG of water consumes 1,500 kWh indicates energy consumed annually at these locations.

[4] https://www.power-grid.com/2019/05/14/nec-finishes-microgrid-project-in-eugene-oregon/#gref
[5] https://www.worleyparsons.com/our-work/eweb-power
[6] https://www.epa.gov/sites/production/files/2015-04/documents/epa816f13004.pdf
[7]is pumped. http://www.minneapolismn.gov/publicworks/water/water_waterfacts

Table 1: Annual Energy Consumption at select Cities

City	Million Gallons (MG)	Energy Required (kWh)	Energy (MWh)	Pump Stations	Location
St Paul RWS	39	58,500	58.50	1	Fridley
St Paul capacity	90	135,000	135		
Minneapolis WTDS	21,000	31,500,000	31,500	9	
City of Houston	160,000	240,000,000	240,000		

Irvine Ranch Water District (IRWD) in Irvine, California 40 miles south-east of Los Angeles International Airport is installing 6.25 MW/35.7 MWh Tesla batteries, owned and operated by Advanced Microgrid Solutions, at water pumping stations, water treatment stations and water recycling plants[8].

Caldwell Wastewater Treatment Plant in Caldwell, NJ, half-hour north-west of Newark International Airport installed 250 kW/1MWh Eos battery storage with 896 kW of solar for backup power[9].

Next Steps

Now is the time for authorities responsible for water and wastewater treatment plants to consider energy storage as part of the toolkit to address resiliency and backup power challenges that are becoming the norm due to weather and other natural events.

[8] https://www.irwd.com/home/liquid-news/money-saving-tesla-batteries-arrive-at-irwd-s-michelson-plant
[9] https://www.cleanegroup.org/caldwell-wastewater-treatment-plant/