Heat Impacts on Infrastructure & Personnel: A SNWA Case Study

Final Report

Resilient Analytics

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Executive Summary

SNWA will experience several vulnerabilities due to future increases in extreme heat events as a result of projected changes in climate. Resilient Analytics (RA) is using a climate stressor methodology to analyze the impact of such extreme temperature events on critical Southern Nevada Water System (SNWS) physical infrastructure assets as well as Southern Nevada Water Authority (SNWA) and Las Vegas Valley Water District (LVVWD) personnel. The methodology focuses on examining the effects of extreme temperatures on personnel and facilities in the years 2030, 2050 and 2070. Note that projected costs do not account for inflation.

Increases in daily heat index and daily maximum temperatures will put additional stress on the outdoor workers. This could lead to additional workplace accidents resulting in additional costs for SNWA.

- By 2030, it is projected that the SNWA service area will see an additional four weeks of temperatures over 105°F, and two weeks of temperatures over 110°F each year.
- By 2070, it is projected that the SNWA service area will see an additional six and a half weeks of temperatures over 105°F, four and a half weeks of temperatures over 110°F, and one and a half weeks of temperatures over 115°F each year.
- If SNWA does nothing, the risk of workplace accidents and injuries is estimated to increase by 8% by 2030 and by as much as 17% by 2070. This could potentially result in annual losses of $320,000 to $730,000 due to costs associated with workplace injuries. Note that these values do not include the increase in risk to workplace fatalities.
- The number of High Heat Index days (103°F to 114°F)- a measure of temperature and humidity, is estimated to increase from 20 days to 30 days by 2030, and to 50 days by 2070. Historically almost zero Extreme Heat Index (greater than 115°F) days occur. By 2070 it is projected that there will be two to five days of Extreme Heat Index. These days will present extreme risk to outdoor worker safety.
- A national heat stress standard could be put into place, which would require SNWA to follow a regulated work/rest cycle. Implementing a standard work/rest cycle will help to avoid additional worker accidents and fatalities from increased heat.
- To offset losses in productivity associated with increases in work/rest cycles, SNWA should implement scheduling related adaptation strategies to reduce exposure to mid-day heat. One example would be to flex outdoor worker schedules to earlier in the morning. Under this scenario, SNWA would see savings from increased productivity. Annual savings range from $26,000 to $166,000 in 2030 and $73,000 to $793,000 in 2070 under the moderate and strict heat standard, respectively.

The facilities and assets owned and operated by SNWA will also experience additional stress due to increases in temperature. Cooling operating costs are projected to increase and the increase in outdoor temperature is projected to reduce the lifespan of critical assets.

- Cooling costs are projected to increase by 4% to 5% by 2030, 9% to 13% by 2050 and 12% to 23% by 2070.
- From 2021 to 2080, we estimate the average increase in cooling cost for the facilities included in this study to be between $2.6 million and $4.1 million.
- We recommend these additional costs be considered in near- and long-term budget planning.

- We recommend that SNWA upgrade outdated cooling equipment including chillers and evaporative coolers to increase system efficiency, which will help to offset the additional cost of cooling.
- We recommend HVAC commissioning and/or retrofits as a less costly and near-term solution to help offset increased cooling costs. SNWA has several facilities with large evaporative coolers that could benefit from retrofits such as the installation of pre-coils.
- We recommend that the Alfred Merritt Smith Water Treatment Facility and River Mountain Water Treatment Facility cooling systems be prioritized. The two facilities make up 41% and 20% of the cooling costs estimated in this study and have short estimated payback periods ranging from seven to nine years.
- While the pump replacement costs are low for the conditioned spaces, any equipment that exists in spaces that are unconditioned, outdoors or ventilated will experience much higher changes in ambient operating conditions and therefore higher replacement costs. We recommend that cooling systems, or other means of temperature control, are installed in such spaces to control ambient operating temperatures.
- Motors with higher NEMA temperature ratings can withstand higher operating temperatures with less impact to life expectancy. When replacing motors in the future, evaluate the upfront cost vs the increased motor lifespan benefit of installing higher rated motors.
- Based on the ozone generation facility internal temperature sensor data provided, it appears that the cooling system in this space is only operating intermittently in the hottest times of the year. Running the cooling system more will lower the ambient operating temperature for all motors within this facility. We recommend evaluating the cost of running the cooling system to maintain a lower space setpoint vs. the savings expected in motor lifespan.