November 2023

PROJECT BRIEF

Evaluating Changes in Peak Demand and How That May Affect the Choice, Design, Management, and Evaluation of Demand Management Strategies

Challenge

Water efficiency and conservation programs, policies, and regulations have been utilized to reduce peak demand, which can significantly decrease infrastructure and operating expenses for water utilities in addition to helping ensure reliable water supplies as climate change contributes to more frequent and severe droughts. However, there is no comprehensive evaluation of these peak demand strategies or understanding of the benefits and costs of employing these strategies. Moreover, peak demand patterns and characteristics are changing due to climate change, urbanization/densification, trends in landscape irrigation system technologies and prevalence, working-from-home, increasing market penetration of water-efficient devices, changing population demographics, and other factors. These changes create additional uncertainty about how water agencies can most effectively plan for and manage peak demand.

Opportunity

This research effort was identified as a priority for the Alliance for Water Efficiency's Research Committee. By evaluating which water efficiency and conservation strategies are most useful to reduce peak demand - including when, where, and how to deploy them - conservation teams can better work in concert with the utility operations and capital planning teams. Further, this effort can help identify internal opportunities for utility operations to reduce their contribution to peak water and energy patterns. This research can help utilities extend existing water supplies and infrastructure, avoid expenditures, minimize water bills, and become more adaptable and resilient. This project will help cultivate conversations across multiple utility departments to develop shared understanding of how certain strategies affect other utility operations and costs (e.g. how day of week irrigation schedules affect water treatment operations).

Research Questions

- What are the different definitions of peak demand that are relevant to utility operations?
- What are the trends over time and the drivers of peak demand patterns across different geographies and contexts?
- How might climate change and extreme weather patterns influence peak demand in the future?
- What are peak demand strategies, which are effective, and why?
- What are the potential cost savings related to avoided capital expenditures and reductions in operating expenses, including energy expenses?

Expected Deliverables

Analytical Report:

- Analysis of trends and the variables that are correlated with peak demands across multiple utilities and climates.
- Descriptions and examples of use cases for managing peak demands.
- Descriptions of and analyses of efficacy of peak demand management strategies.

Guidance Document:

- Guidance on which strategies are most useful to reduce peak demand - including when, where, and how to deploy them.
- Guidance on how to incorporate expectations for future peak demand scenarios.
- Guidance on potential costs and benefits of peak demand management strategies.

Task	Description
1	**Literature Review, Definitions, Use Case Examples.** Summarize and define key terms and measurements for peak demands. Give examples of how peak demand concepts are used from different utilities and across different use cases (i.e. demand forecasting, capital project planning and design, system operations, extreme weather responses). This may be accomplished through a variety of means including interviews, focus groups, review of documents and data, etc.
2	**Data Sharing, Transfer, and Clean-up.** Set up data-sharing agreements and systems. Data will be transferred, reviewed for completeness, and address any issues that will impact the analysis.
3	**Peak Demand History; Describe and Analyze Trends.** Document and analyze 10+ year history of peak demand across a diverse set of water service areas from water agencies. Describe trends and explore underlying factors behind changes and variability. Address key questions such as: • How has peak demand varied based on customer classes, age of homes/development, geographies, utility sizes, water supplies, population growths, land uses, climates, etc.? • How might peak demand be affected by climate change, weather, changing demographics, employment patterns, etc.?
4	**Peak Demand Management Strategies; Evaluate Impact.** Document water demand management and efficiency strategies used by utilities that may have affected peak demand trends and evaluate their impact, as best as possible. May include: rate structures, regulations/restrictions, water loss management, outdoor water use programs like landscape transformations and irrigation management/ equipment upgrades, use of alternative water sources • How impactful were these strategies (and what measures should be used for evaluation)? • Identify lessons learned/best practices to date; evaluate impacts in terms of avoided costs and resilience improvements.
5	**Recommendations/Guide.** Drawing from this research, create recommendations and/or a guide for how utilities choose, design, manage and evaluate demand management strategies in the context of changing peak demand patterns.

	• What strategies work best under different conditions, when to use, how to make more impactful. • How to account for climate change and other changes. • Identify additional information, research, education, and/or training that is needed or could be useful.
6	**Report and Educational Event(s).** Create a report that captures all of the above, and host at least one educational event, like a recorded webinar or workshop.

Benefits for Participating Agencies:

- Understand changes in peak demands and implications for demand forecasting, capital project planning and design, system operations, extreme weather responses.
- Improve the efficacy of your peak demand strategies.
- Participate in group conversations and learn what other utilities are doing with peak demand.
- Opportunity to serve on the PAC and better ensure your agency's perspective and issues are addressed.
- Cost-effective means to get individualized technical analyses by coordinating with multiple utilities on single research effort.
- Early access to report findings.
- Professional development and networking opportunity.

Utility Funding and Participation: This project can be scaled based on the number of participants. While it is possible to increase the numbers and types of participants and supporters, our initial goal is as follows:

Utility Participants	$16,500	Provide data, interviews, etc.; Participate in PAC
Active Sponsors	$7,500	Participate in PAC. No data involvement. May provide qualitative information.
Research Supporters	$2,500	Interested in supporting project but have limited time for involvement

Estimated Timeline: Approximately 18 months from project kick-off. Project is expected to launch in early 2024.