Concept Report

Electrical Improvement and Microgrid Implementation at Blue Plains Advanced Wastewater Treatment Plant

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Introduction

The DC Water's Blue Plains Advanced Wastewater Treatment Plant (AWTP) is one of the largest wastewater treatment plants in the world, with the capacity to process 1 billion gallons per day (GPD) at peak flows, and one of the largest single point consumers of electricity in the Washington DC Metropolitan area. Peak power consumption at the Blue Plains AWTP fluctuates between 25 and 40 megawatts, with an average of 28 megawatts.

In the summer of 2022, DC Water was invited to participate in a challenge sponsored by the Advanced Energy Group (AEG), an organization with over 50 members that creates and implements energy policies and solutions. AEG partners with governments, utilities, regulators, and organizations to remove barriers to systemic energy and equity transformation. After a robust round of various challenge and solution statements presented in the AEG Challenge, DC Water won with its "*Electrical Improvement and Microgrid Implementation at Blue Plains Advanced Wastewater Treatment Plant"* project.

To address Critical Infrastructure, Resilience, and Equity Goals, the DC Water Team embarked on a 12-month journey to not only create a challenge statement that supports the DC's Clean Energy Goals, but also to ensure that the project is in line with President Biden's Justice40 Goals and the DC Water Blueprint 2.0 Initiative.

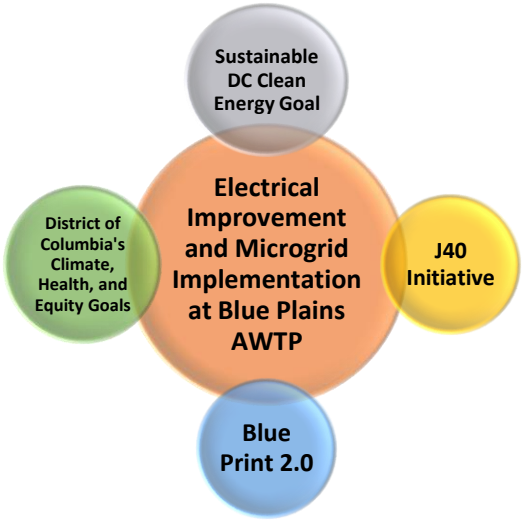

Figure 1: Central Idea of the Project

Scope of Work

Microgrids are an innovative technology that can significantly improve the reliability and resilience of wastewater treatment plants while providing various economic benefits. By integrating a microgrid at Blue Plains AWTP, the facility can transform its substantial electrical load into a valuable grid resource, which can help balance power supply and demand, and facilitate the integration of renewable energy sources.

In addition to reducing operational costs, wastewater treatment plants that adopt microgrid technology can benefit from a secure power source in the event of a widespread power outage, thereby ensuring uninterrupted wastewater treatment. Moreover, microgrids can create various workforce opportunities, promote capacity growth, enhance learning and engagement, foster small and diverse business opportunities, and contribute to overall economic development in the region.

The AEG challenge lasts 12 months, whereas the Blue Plains Microgrid project is expected to be completed in 6 years and will be implemented in phases, beginning with the creation of a microgrid roadmap or conceptual study for the replacement and modernization of electrical assets at the Blue Plains AWTP that have reached the end of their useful

life. As the second phase of this ambitious AEG challenge and strategic project, DC water will develop a strategy in cooperation with a cross-section of key stakeholders capable of supporting the framework strategy and addressing impending challenges while assisting with funding prospects. The remaining phases of the project will consist of detailed design, procurement, construction, and commissioning.

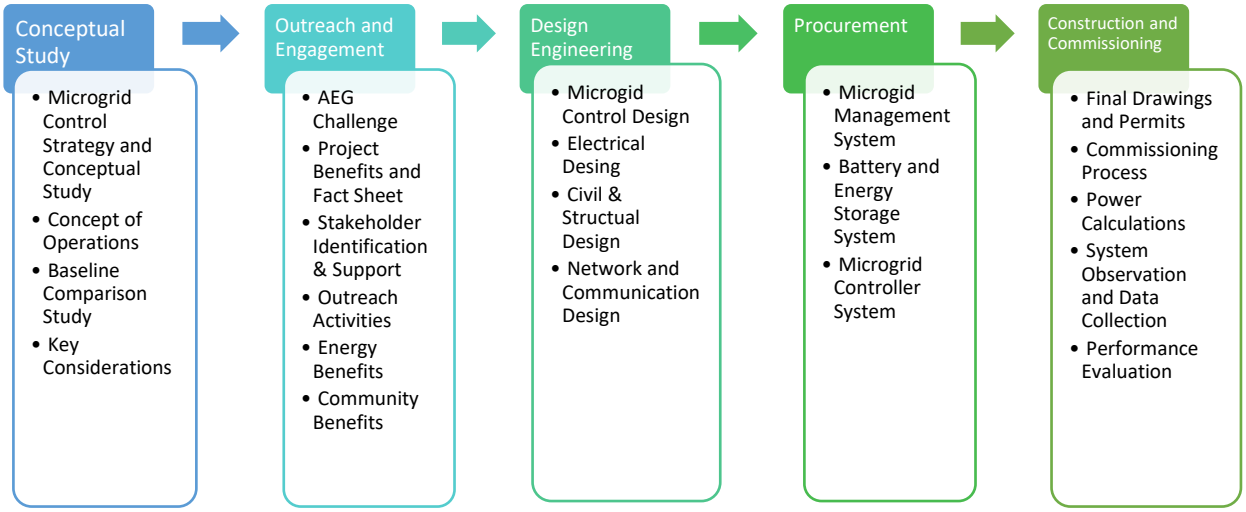

Figure 2: Scope of Work

Project Description

In this project, the Blue Plains AWTP electrical distribution system will be upgraded to handle present and future distributed energy resources (DER), with the end goal of creating a Microgrid. The project will be implemented in phases, beginning with the creation of a Microgrid Roadmap and concept designs for the replacement of ageing electrical assets. The Electrical Improvement and Microgrid Implementation at Blue Plains AWTP project is a part of 12-month AEG Challenge that supports the District of Columbia's Climate, Health, and Equity Goals and coincides with DC Water's Blueprint 2.0 Organizational Imperative and President Biden's Justice40 Goals.

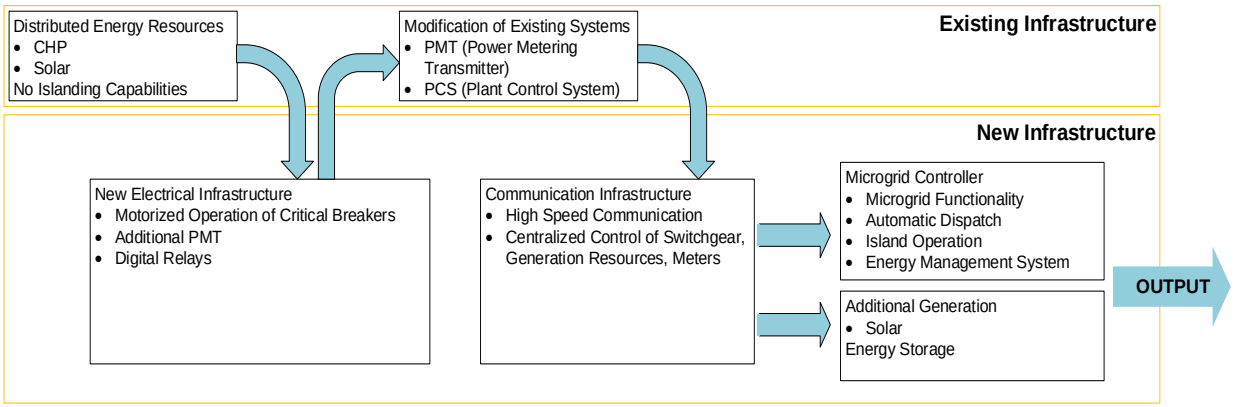

Figure 3: Microgrid Architecture for Blue Plains AWTP

Project Objectives

Adapting and integrating a microgrid at Blue Plains AWTP will provide the possibility to turn a major electrical load into a grid resource, which can help preserve power quantity, facilitate the integration of renewable energy sources, and generate new revenue for the plant operations. In addition to reducing and stabilizing electricity costs, wastewater facilities that implement microgrid technology get a resilient power source to maintain electric service following a severe power outage. The potential benefits also include workforce opportunities, capacity growth,

learning & engagement, small and diverse business opportunities, and overall economic growth for the region. Key goals of the microgrid project are listed below:

- Support Sustainable DC Climate Goals: Sustainable DC Climate Goals are to reduce greenhouse gas emissions for all local sources to put the District on track to eliminate emissions by 2050 and to advance physical adaptation and human preparedness to increase the District's resilience to climate change.
- Reduce operational costs: Replacing manual load switching with remote control load switching will reduce the amount of time required for load switching and thereby reduce maintenance costs and improve efficiency of process operations. Also, there is potential to reduce the cost of purchasing grid power by the addition of new clean energy generation and energy storage which will be integrated with existing resources and help to optimize reduction and consumption cycles combined when the grid is heavily loaded.
- Maintain reliability: The AWTP at Blue Plains is a critical facility for Washington DC and therefore maintains reliable power delivery to critical equipment.
- Optimization of Distributed Energy: A 21st century power monitoring and control system will enable DC Water to effectively use its distributed energy resources. Automating decision-making within the electrical system to allow power dispatch from distributed energy resources (DERs) and existing power supply could facilitate load shedding as needed to accommodate construction and maintenance activities or to island the DERs from the grid in response to disaster conditions, or economics.
- Improve Power Quality: A microgrid could ensure that the power quality is continuously monitored throughout the system, documented, and properly addressed. Real time and historic data could be vital in decision making for immediate action as well as scheduled or planned changes to equipment and operating procedures.
- Improve Resilience: Use backup energy sources to restore electric service following a disruption.
- Synchronized Reserves program: The Blue Plains Project is interconnected with utilities which are part of the Pennsylvania New Jersey Maryland Interconnection (PJM). A microgrid could enable enhanced participation in the programs under PJM by improving knowledge of and control over internal electrical power distribution.
- Improve safety: Replacing manual load switching with remote control load switching will improve safety of personnel who maintain the electrical power distribution system. Increased visibility and coordination with personnel working on equipment also enhances safety protocols.
- Invest effectively in infrastructure: Blue Plains has an aging electrical infrastructure that supports its operation and distributed energy system, and capital investments are made continually to maintain the appropriate level of service that the system provides. Any equipment and system upgrades should be based on usage.
- Expand analysis and reporting: Increasing the amount of power demand data and analytics will improve DC Water's ability to perform meaningful post-mortem diagnostics in real time for trouble shooting. Monitoring power flow and power quality will provide for real-time decisions to address problems.
- Community Benefits: Clean energy deployment, particularly renewable energy initiatives such as microgrids, reduces energy burden (e.g. the share of household income spent on energy costs). These programs also provide opportunities for Training and Workforce Development, including employment prospects. In addition, it provides community involvement training and small business development capacity support.

Stakeholder Engagement

Active participation of stakeholders is required for this project in order to get meaningful input for funding support and to achieve desired outcomes.

i. Conduct outreach in coordination with the outreach taskforce in capacity building to assist in accessing financing, managing it, and reporting on the results.

ii. Review the solicitations to emphasize on securing additional points to projects that meet the criteria for improving disadvantaged communities and incorporate community participation, planning, and feedback.

iii. Help establish targets or minimum levels for a particular benefit when designing eligibility requirements for project guidelines. For instance, to achieve a better funding priority, an agency could designate a particular percentage of total jobs for a project to be held by residents of a marginalized community.

iv. Support DC Water in implementing cost savings to help disadvantaged communities (e.g. energy cost savings reinvested in the local community to promote workforce development and community health).

Conclusion

The AEG Challenge and the Electrical Improvement and Microgrid Implementation at Blue Plains Advanced Wastewater Treatment Plant project outlines the key imperatives that DC Water will prioritize, which will not only generate economic benefits and returns for the rate payers, but also have a significant impact on the macro socioeconomic agenda that addresses key issues of equity, resilience, health and safety, and innovation. This project is a paradigm for the contemporary infrastructure framework. To properly execute and implement a project of this magnitude, 25+ million dollars would be required. This is an essential and worthwhile investment, especially considering that it is required to improve the reliability and resilience of the nation's capital's only water and wastewater treatment facility.

DC Water's goals for this project reflect those of the region, which is why we at DC Water wanted to use this report to not only brief the efforts but also, ideally, find ways in which we can connect our work for this project with those who can help. This will require cooperation, and we look forward to working with you to find funding opportunities so that this project can be successfully completed. DC Water is also committed to participation and the creation of productive relationships for the completion of this project and requests assistance in recommending strategies and solutions. DC Water believes in creation of a system for continual collaboration with stakeholders and strategy for involvement. More information about the project can be found at: https://goadvancedenergy.com/wae-22q4-clean-transportation.