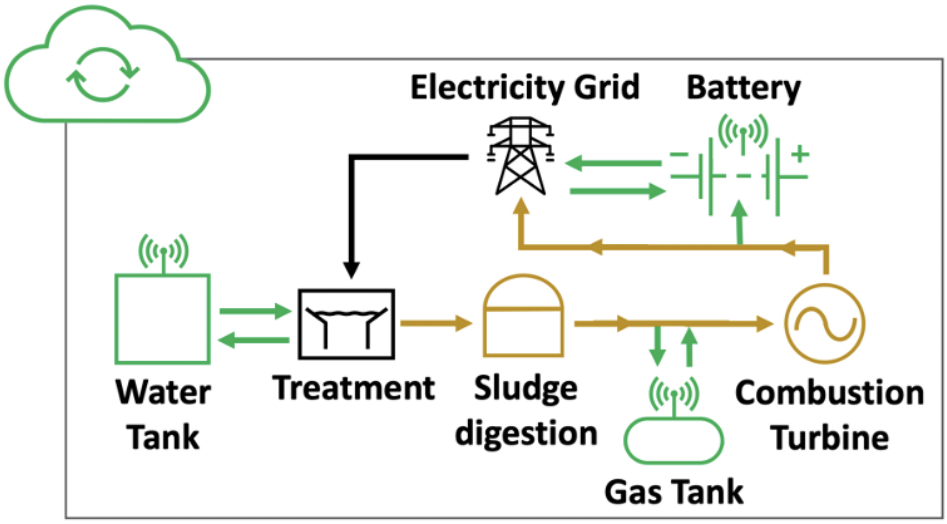
Docket #: S21-048

Predictive Control Platform for Wastewater Treatment Energy Storage and Generation

Stanford researchers in the WE3 and S3 Labs developed a cloud-based computation and predictive control platform for wastewater treatment facilities energy storage and energy generation. Wastewater treatment is energy and cost intensive. Electricity demand charges often account for a large share of electricity costs, creating strong incentives for shifting load peaks away from time-of-use periods. INtegrated FLexible Operation of Wastewater Systems (ENERGY-INFLOWS) is a computational platform for integrated management of the energy flexibility upgrades available to wastewater treatment facilities including: biogas storage, water storage, and batteries. The tool uses facility-specific metering data and treatment characteristics to identify cost-optimal energy flexibility upgrades. Its runtime controller uses artificial intelligence and facility-specific load models to operationalize a facility's existing energy flexibility resources in real-time. Overall, the tool provides a scalable platform for facilities to lower electricity costs and earn revenues from the sale of demand response and other services to electricity grids.



INtegrated FLexible Operation of Wastewater Systems (ENERGY-INFLOWS) manages energy flows between wastewater treatment, resource recovery and storage. (Image courtesy the WE3 and S3 Labs)

Stage of Development – Prototype

Applications

- Wastewater treatment plant management: coordinated operation of treatment and energy storage components
- Treatment facility optimization: calculate facility upgrade designs, reduce energy requirements, reduce operating emissions

Advantages

- Flexible, cloud-based approach
- Integrated energy recovery and energy storage with wastewater treatment
- More energy efficient and cost effective - results for a California anaerobic sludge digestion and biogas cogeneration facility predicted a 17% reduction in electricity costs
- Recycled biogas production into energy generation

Publications

- Bolorinos, J., Mauter, M. S., & Rajagopal, R. (2023). Integrated energy flexibility management at wastewater treatment facilities. *Environmental Science & Technology, 57*(46), 18362-18371.

Patents

- Published Application: WO2022232603

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