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# Valuing energy flexibility from water systems

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## Abstract

Water systems represent an untapped source of electric power load flexibility, but determining the value of this flexibility requires quantitative comparisons to other grid-scale energy storage technologies and a compelling economic case for water system operators. Here we present a unified framework for representing water asset flexibility using grid-scale energy storage metrics (round-trip efficiency, energy capacity and power capacity) and assessing the technoeconomic benefits of energy flexibility at the water facility scale (levelized cost of water and levelized value of flexibility). We apply this framework to case studies of an advanced water treatment (desalination) plant, a water distribution network and a wastewater treatment plant. The framework reveals strengths and limitations of water system flexibility relative to other grid-scale energy storage solutions, high-value opportunities for flexible load operation of water assets and the critical role of electricity tariff structures and energy service markets in determining water sector participation in load flexibility. Ultimately, this unified framework for valuing water asset flexibility enables both electricity and water asset managers to prioritize investments based on levelized cost comparisons across their respective portfolios.