Presentation to

MWRA Advisory Board

Energy and Sustainability Program Update

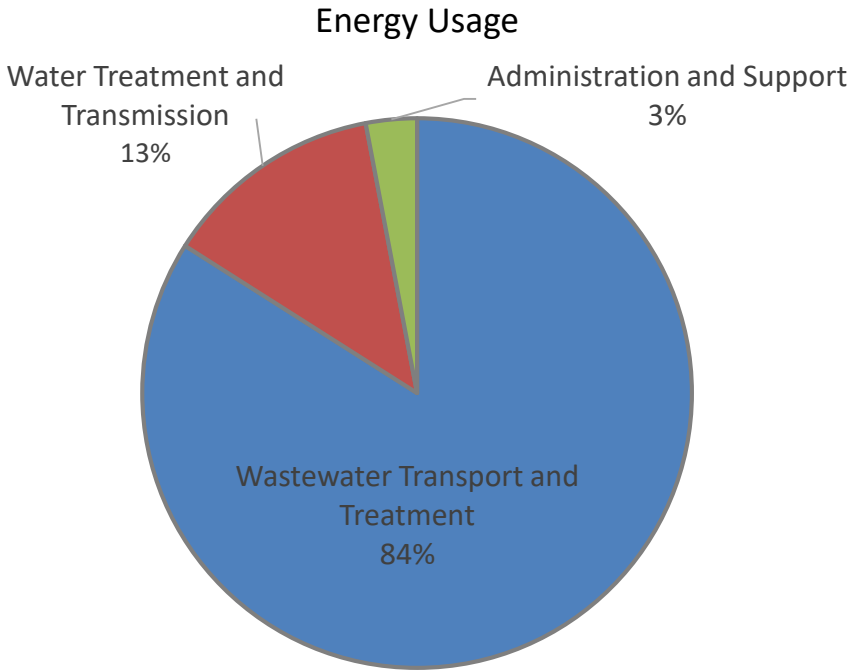
November 21, 2024

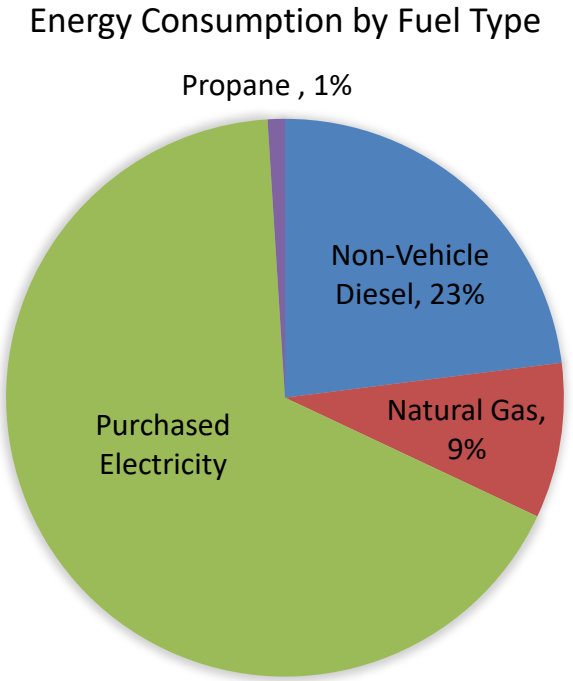
Energy and Sustainability Program Update Agenda

- MassDEP Climate Protection & Mitigation Trust Grant
- Deer Island Combined Heat and Power
- Greenhouse Gas Forecasting & Reduction Planning
- Resiliency and Innovation
- Other Decarbonization Efforts

Energy Intensive Operations

- Utility Expenses >12% of MWRA's operating budget at ~$30M/yr
- Equivalent of over 16,000 homes' energy use for one year

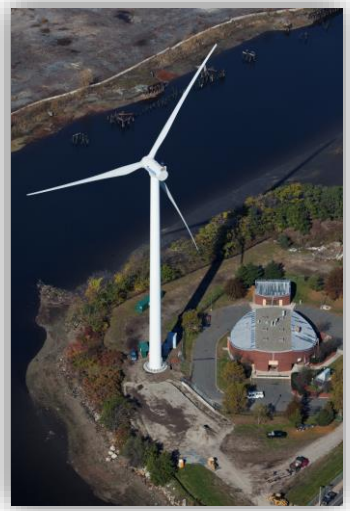


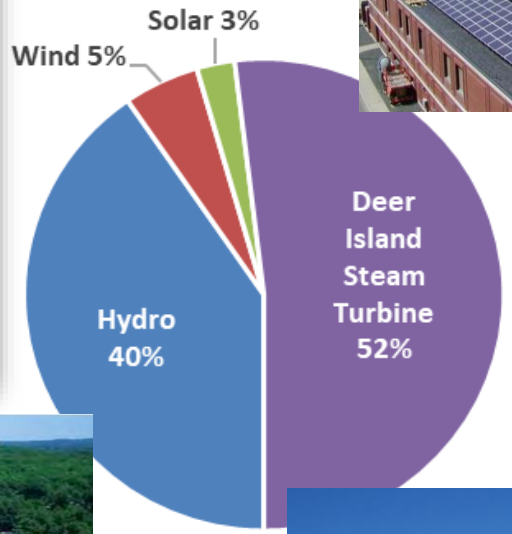


MWRA Renewable Energy Assets

- DITP Steam Turbine Generators
- 6 Solar Installations
- 5 Hydro Power Sites
- 2 Wind Turbine Sites

- Used Onsite ~66%
  - mostly DITP digester gas
  - 20% of overall electricity usage
- Exported ~34%
  - supports greening of regional grid





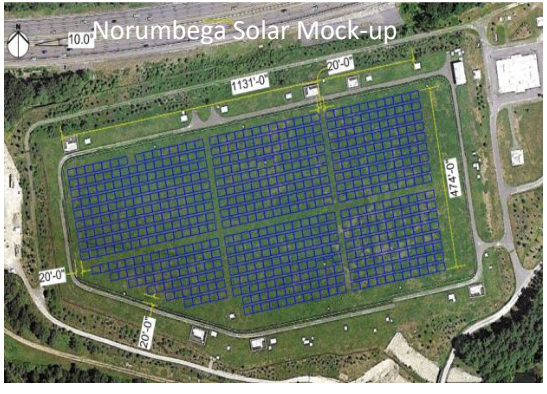
MassDEP Climate Mitigation Trust Grant

PROJECT SUMMARY
The Massachusetts Department of Environmental Protection ("MassDEP") shall contribute **twenty million dollars ($20,000,000.00)**, via a Best Value Grant("BVG") from the Commonwealth of Massachusetts Climate Protection and Mitigation Expendable Trust ("Trust") in support of Climate Mitigation and GHG Emission Reduction Projects (collectively the "Program" or "Programs")at MWRA facilities or properties. The Program shall include two components: **(1) Building Electrification projects; (2) Renewable Energy projects.**

- Fully Executed – October 2024
- Grant duration – 5 yrs w/ 1 yr extension option
- Proposed Project List
  - DITP Solar Canopy
  - Norumbega Solar
  - DITP Wind Turbine Replacement
  - Building Electrification

MassDEP Climate Mitigation Trust Grant – Project Details

- DITP Solar Canopy (Boston) ~ 2 yrs - $10M
- Norumbega Solar (Weston): ~3 yrs - $8-12M
- Building Electrification (Heat Pumps)
  - Norumbega (Weston): ~ 6 mo - $165k
  - New Neponset Pump Station (Canton): ~12 mo
  - Newton St Pump Station (Brookline): ~12 mo
  - Wachusett Lower GH (Clinton): ~12 mo - $1.3M
  - Chelsea Admin: ~10 mo - $2.5M
  - Others
- DITP Wind Turbine Replacement: ~ 2 yrs - $2M



Deer Island Combined Heat and Power (CHP) Project

- Replacement of steam boiler based system
- New reciprocating engines - generate electricity and heat
- New water boilers - meet thermal demand
- New building to house new equipment

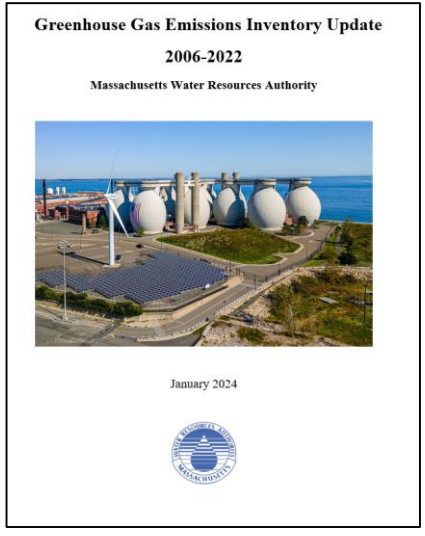
- Contract 6730 – Design/ESDC
  - Awarded to Burns & McDonnell
  - Project Kick-off Meeting - 10/15/24
  - Contract value - $18.4M
  - 100 mo (8 yrs 4 mo) Total Duration
    - 34 mo (2 yrs 10 mo) Design
    - 6 mo Bid
    - 60 mo (5 yrs) Construction

Energy Performance Metrics for Existing and New CHP	Existing CHP	Proposed CHP
Electricity from Combined Heat and Power (CHP)	21%	48%
Combined Heat and Power (CHP) Efficiency	52%	68%
Energy from On-site Resources	~60%	~75%

Source	Source Reduction	GHG Reduction	Social Cost of Carbon
Fuel Oil Reduction	300,000 Gallons/yr	3,000 MT/yr	$0.375M/yr
Purchased Electricity	40 GWh/yr	9,800 MT/yr	$1.225M/yr
Totals	**n/a**	**12,800 MT/yr**	**$1.6M/yr**

MWRA's Commitment to Energy Savings and Emissions Reduction

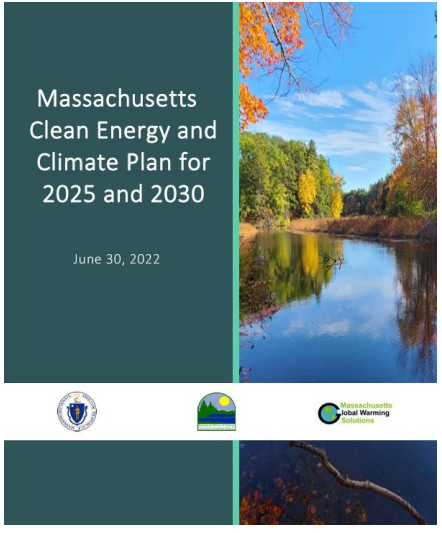
- Nearly 20 years of emissions reduction - started tracking in 2006
  - Energy efficiency
  - Electrification
  - Renewables
- Released first inventory in 2016
- Guided by State climate goals
- Selected for the 2023 Leading by Example Award


Greenhouse Gas Emissions Inventory Update

2006-2022

Massachusetts Water Resources Authority

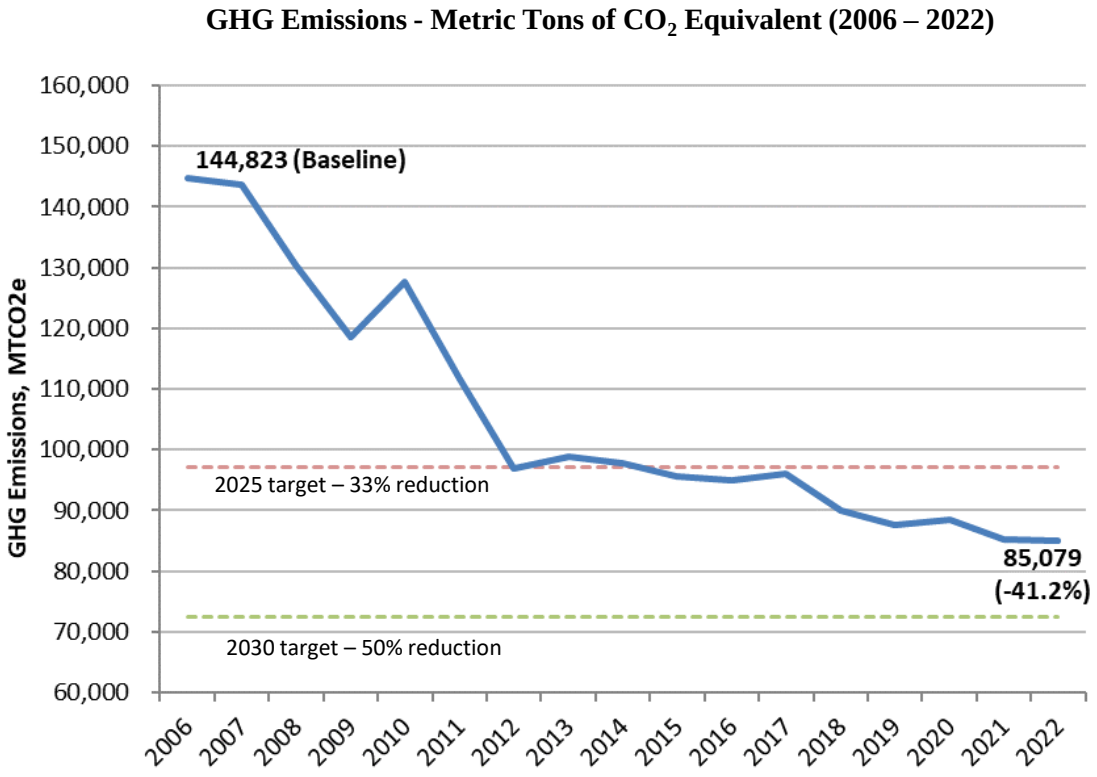
January 2024


Massachusetts Clean Energy and Climate Plan for 2025 and 2030

June 30, 2022

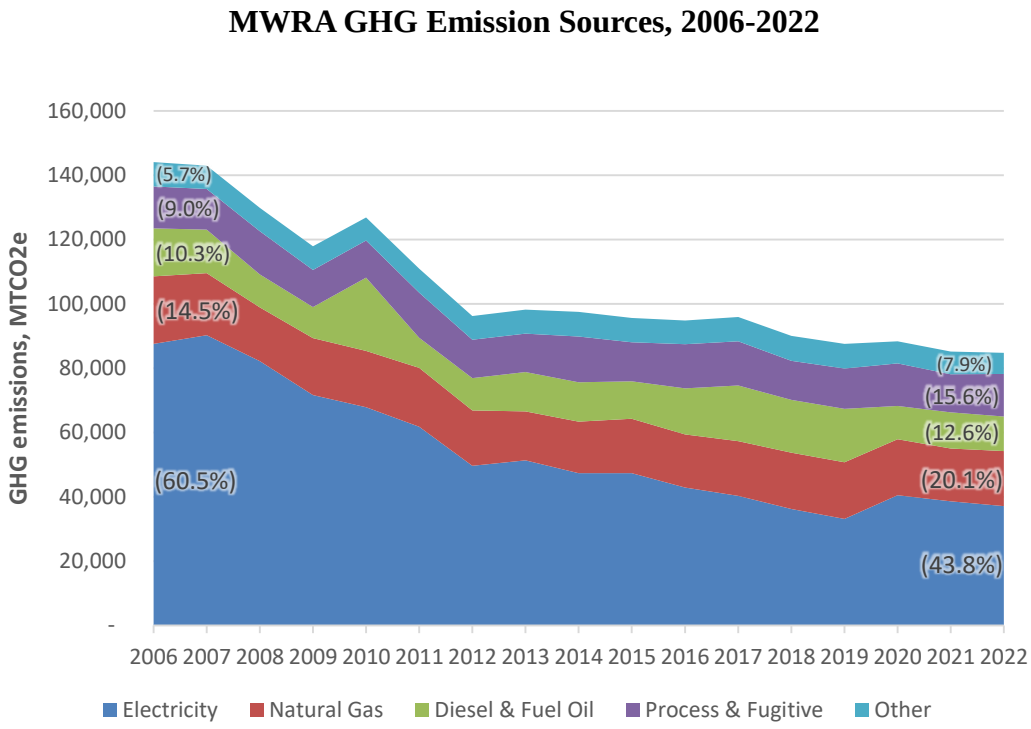
Major Emissions Reductions Aligned with State Targets

- 41% reduction since 2006
  - 60,000 $MTCO_2e$ = 13,000 vehicles off the road/year
- Already met State 2025 target of 33%



Four Main Sources of GHG Emissions

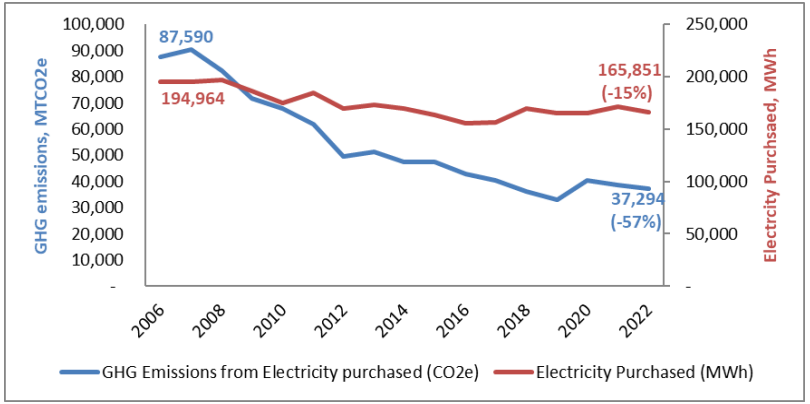
- Electricity: 44%
- Natural Gas: 20%
  - Space heating and pelletizing plant
- Process & Fugitive: 16%
  - Methane, nitrous oxide
- Diesel & Fuel Oil: 13%
  - Space heating and emergency generators
- Other: 8%
  - Fleet, digester gas combustion, etc.



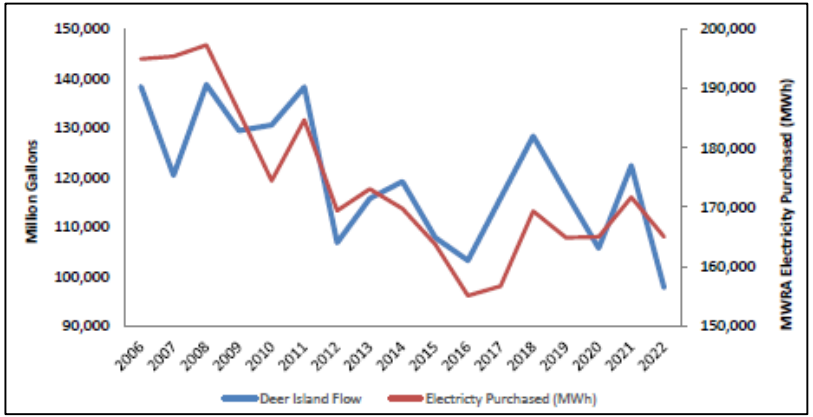
Majority of Emissions Reductions are Associated with Electricity

- 84% of MWRA's reductions are from electricity
  - Energy efficiency
  - Renewables
  - Greener electric grid amplifies MWRA's efforts
- Continued focus on electrification
- Electricity emissions are tied to precipitation and flow

MWRA Electricity Purchases and Resulting Emissions

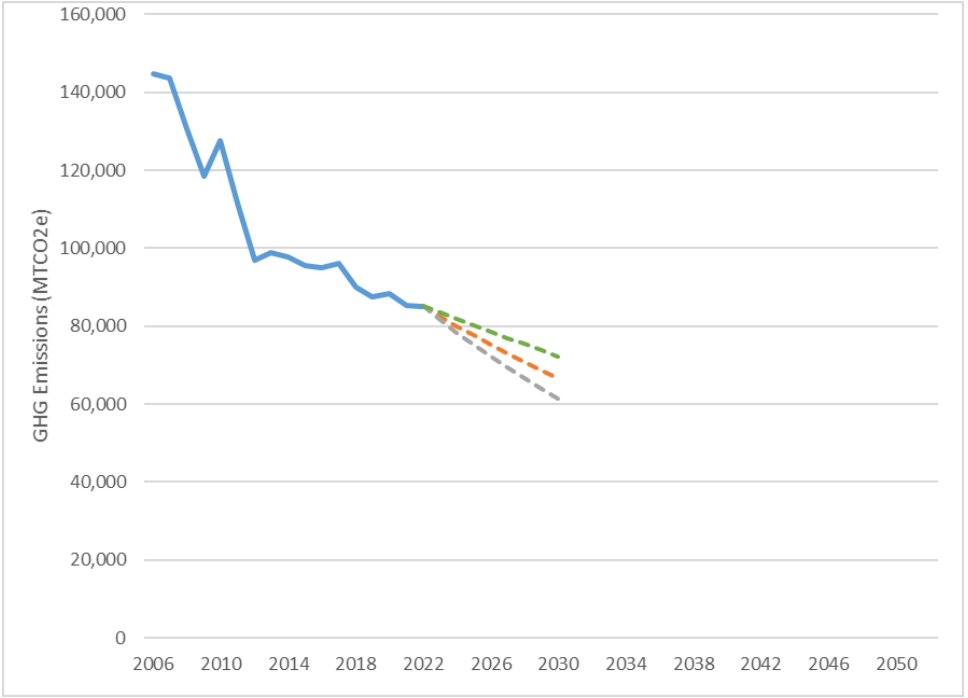


MWRA Electricity Purchases and Deer Island Flow



Next Steps and Emission Reduction Projections

- Continue multi-pronged approach
  - Energy efficiency
  - Electrification
  - Renewables
- Develop emissions projections and pathways
- Set achievable targets

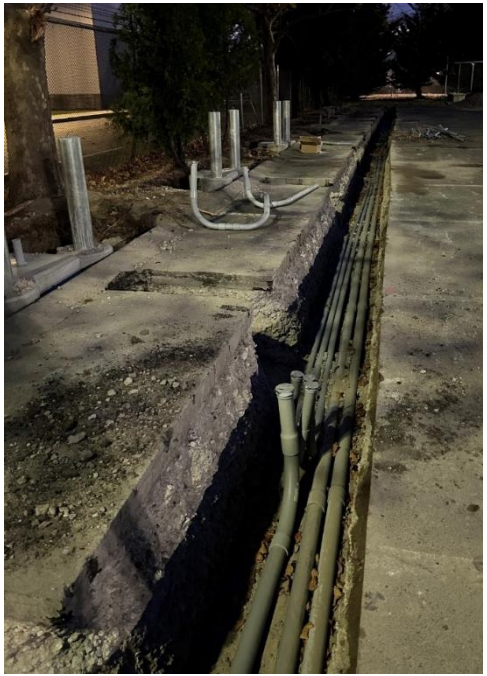


Other Decarbonization Efforts - Lighting

Mass Save Lighting Incentives end Dec 31, 2024

- **M.G. L. Ch 25A s. 14 Procurement**
- DeLauri PS - Interior and exterior lights
  - Net cost $26k (utility incentive - $4k)
- Chelsea Administration Building - Server room lights
  - Net cost - $5.2k (utility incentive - $4.2k)
- South Boston CSO - Interior lights
  - Net cost - $12k (utility incentive - $2k)
- Deer Island – Winthrop Terminal, N. Main PS, Maint/Warehouse, Hydro, Centrifuge, Fuel Facility
  - Interior and exterior lights
  - Total net cost - $340k (total utility incentives - $150k)

Other Decarbonization Efforts - EV Charging Infrastructure

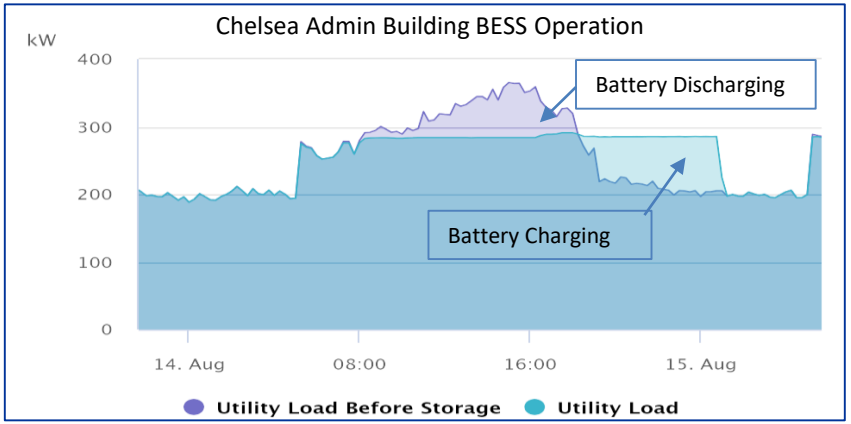


- Utility EV Make Ready
  - Chelsea – **Work ongoing**
  - Southborough – pending EVIP grant
  - Deer Island – pending Eversource review
  - Carroll WTP – working on NGRID application
- Employee Charging Policy
  - Finalizing price proposal

Resiliency and Innovation – Battery Energy Storage System (BESS) Pilots

- **Background**
  - Funded by Eversource
  - Chelsea Administration Building
  - Brattle Court Pump Station (water)
  - Use Cases
    - Demand Cost Reduction
    - Grid Peak Reduction Revenue
  - 250kW/500kWh - Not large enough for resiliency

- **Savings/Revenue to Date**
  - Demand (kW) Savings:
    - March 1, 2021-March 1, 2022: **$1,115**
    - March 2, 2022-March 1, 2023: **$25,032**
  - Grid peak reductions:
    - Summer of 2022: Not enrolled in the program
    - Summer of 2023: **$16,081**
    - Summer of 2024: TBD



Resiliency and Innovation – DITP Large Scale BESS Feasibility Study

Large-Scale Battery Energy Storage Feasibility Study

- DOER Leading by Example Grant - $150k
- Awarded to Sustainable Energy Advantage, LLC
- Project Kick-off Meeting – 10/29/24
- Contract value - $274.5k
- 10 Months duration

- **Goals**
  - Basic Information on BESS Options
  - Technical Viability for Various Use Cases

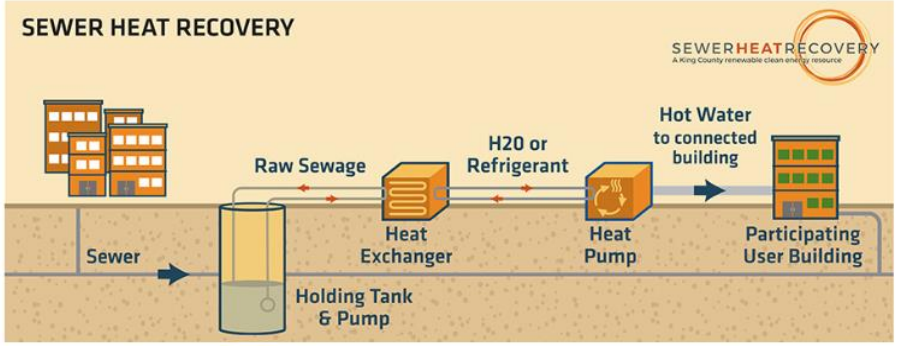
- **Implementation Measurements**
  - Increase Operational Resiliency
  - Financial Advantage
  - Environmental/Societal Value – Greenhouse Gas Emissions Reduction

Resiliency and Innovation - Wastewater Heat Recovery

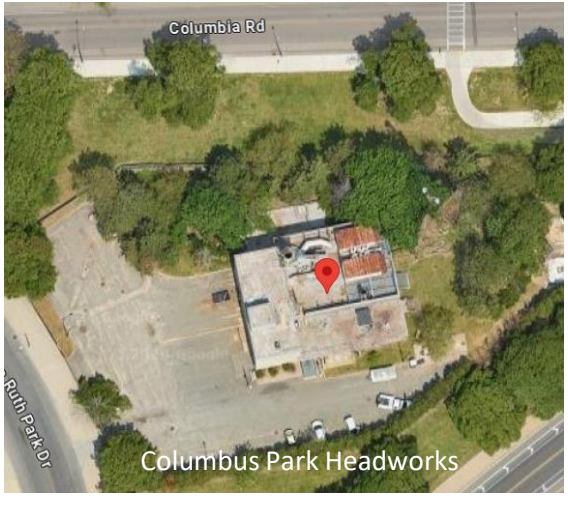
- MWRA Facilities
- Community Development
  - Research and Outreach

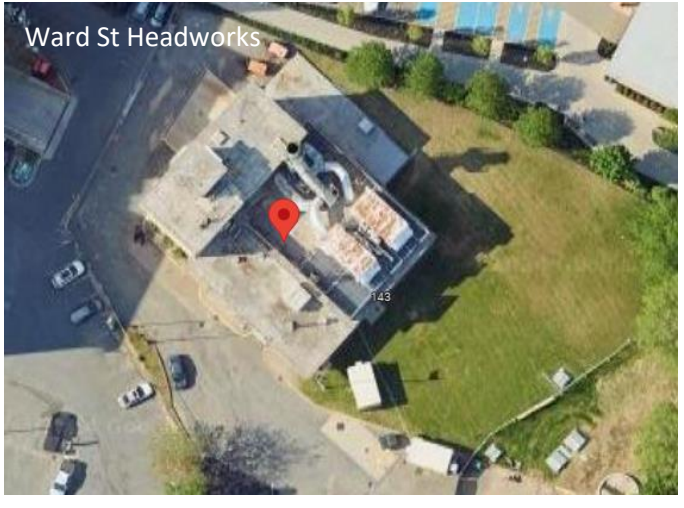
Considerations & Challenges

- Timing
- Technical
  - Design Standards
  - Civil Work
  - Operations
  - Maintenance
- Legal
- Permitting
- Pilots



Wastewater Heat Recovery schematic (*image from King County*)





Incorporate Social Cost of Carbon into Project Analysis

- Estimate of **economic damage** caused by **emitting** a ton of CO_2e
- Take **climate change** into consideration in **financial decision-making** – localizing a global problem
- Factor into Life-cycle Cost Analyses (**LCCA**)
  - Sensitivity Assessment
  - $125/ton CO_2e