Brief Overview of MWRA's Energy and Sustainability Efforts

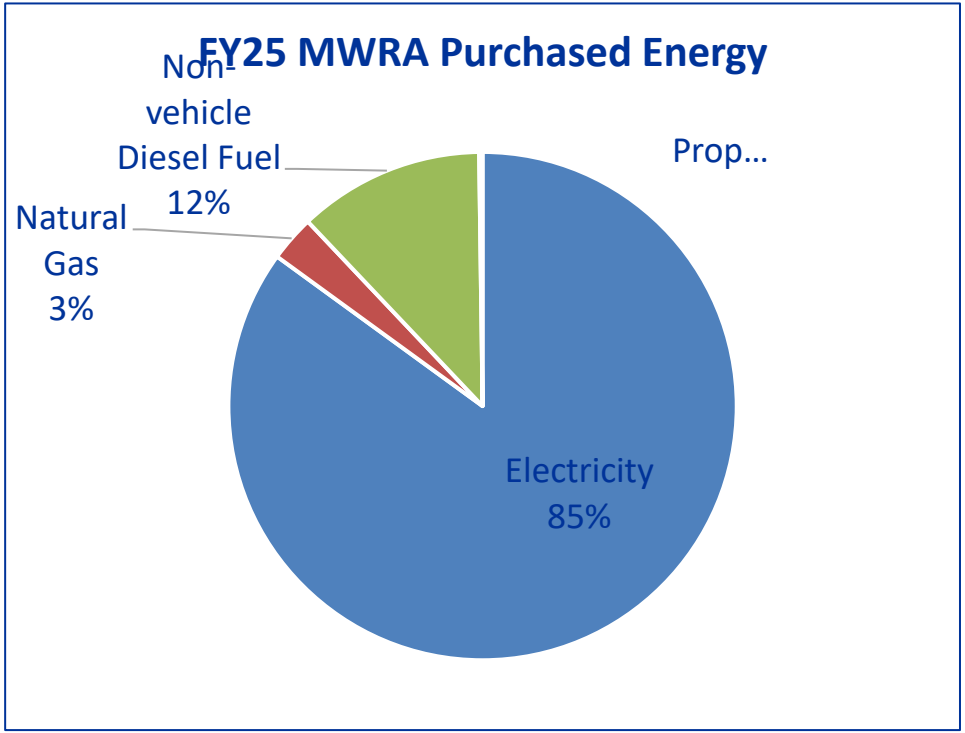
May 15, 2026

Energy Intensive Operations

Total Energy Used in FY25

- **Electricity** – 157 million kWh, and $24.5 million
- **Fuel Oil** – 1 million gal, and $3.4 million
- **Natural Gas** – 670,000 therms, and $850,000

Equivalent of over 17,000 homes' energy use for one year.



Deer Island

- 68% of total electricity purchased
- 60% of total fuel oil used
- 54% of total electricity budget

Energy Efficiency – What We've Done

Decarbonization Standard Procedures

Date of Original Issuance: 3/27/2014

Latest Revision: 3/27/2024

Contacts: Denise Breiteneicher, Christian Murphy, Kristen Patneaude

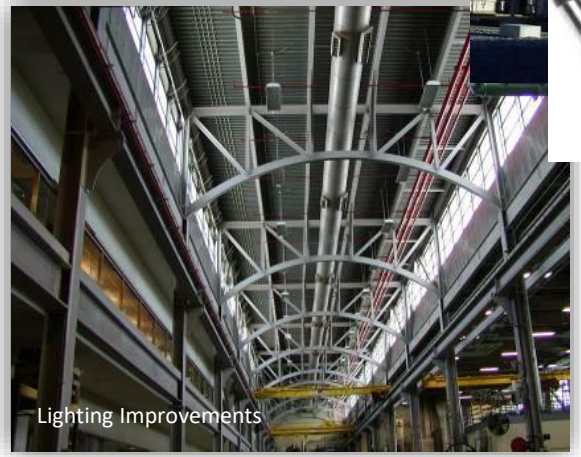
Reviewed by Deputy COO: Rebecca Weidman Date: 3/27/2024

Reviewed by Procurement: Douglas Date: 3/27/24


Heat Pumps


BWRPS Jockey Pump


Process Improvements


Lighting Improvements


Pipe Insulation

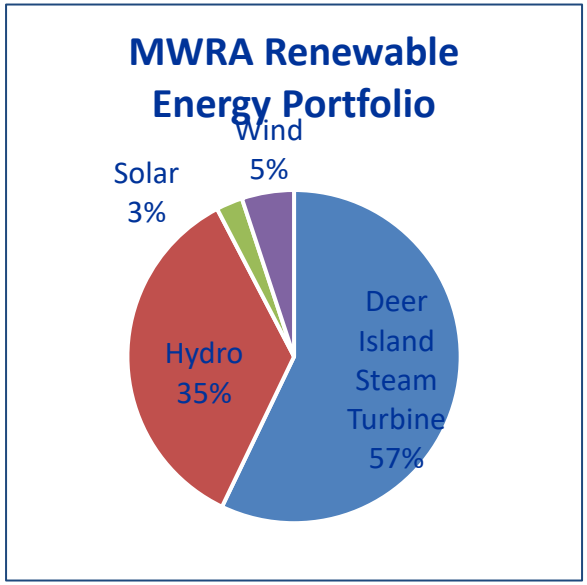

Variable Frequency Drives

mass save
Savings through energy efficiency

Renewable Energy – What We've Done

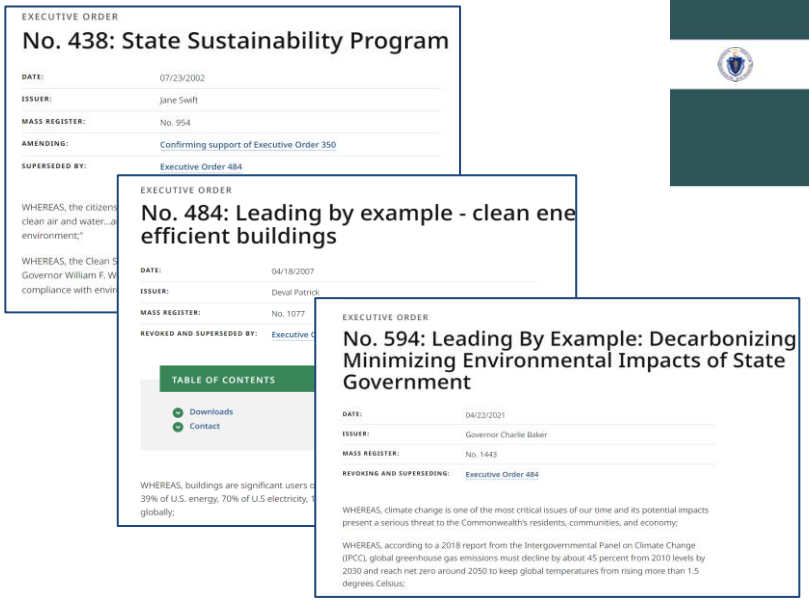
- DITP Steam Turbine Generators
- 6 Solar Installations
- 5 Hydro Power Sites
- 2 Wind Turbine Sites

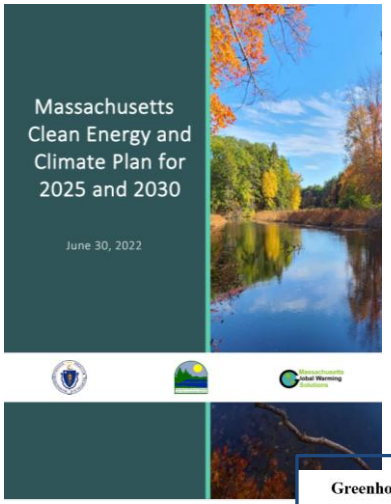
Using biomass, wind, solar, and hydroelectric, MWRA generated about 58 million kWh in FY24, at a value of nearly **$8 million** in avoided purchased energy costs.

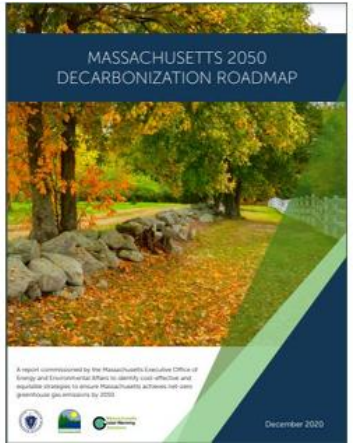


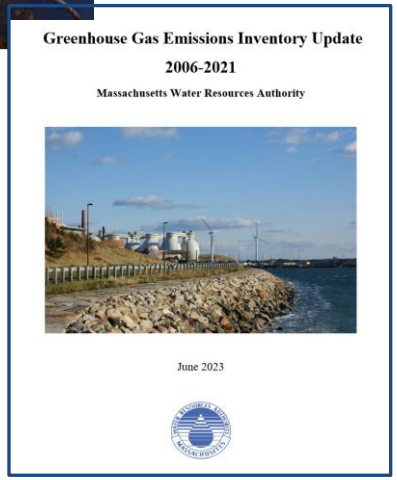
Energy Management Drivers

- State Climate Goals
- Executive Orders
- Environmental agency
- Fiscal responsibility

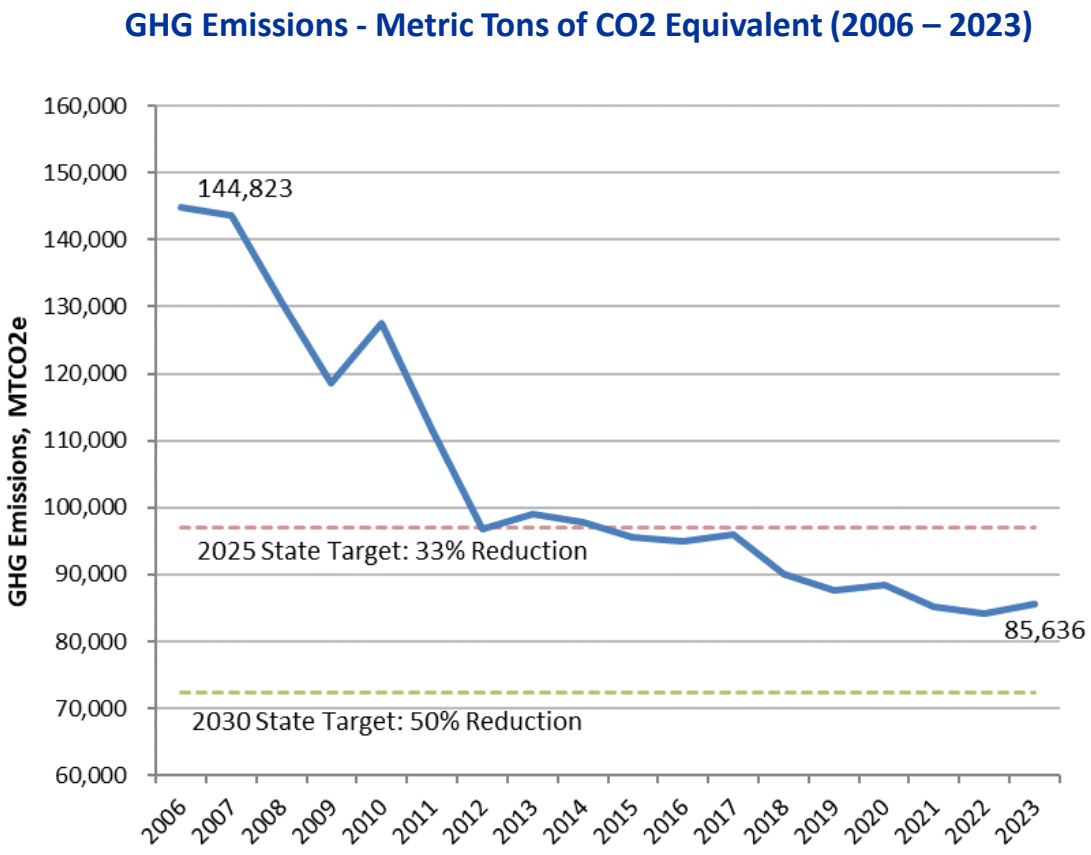








MWRA Greenhouse Gas Emissions



- 41% reduction since 2006
- 2025 target of 33% reduction met
- Continue multi-pronged approach
  - Energy efficiency
  - Electrification
  - Renewables

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 Canopy and Roof Solar
  - Norumbega Solar
  - DITP Wind Turbine Replacement
  - Building Electrification

Clean Transportation

- 37 electric vehicles in MWRA fleet (over 9%)

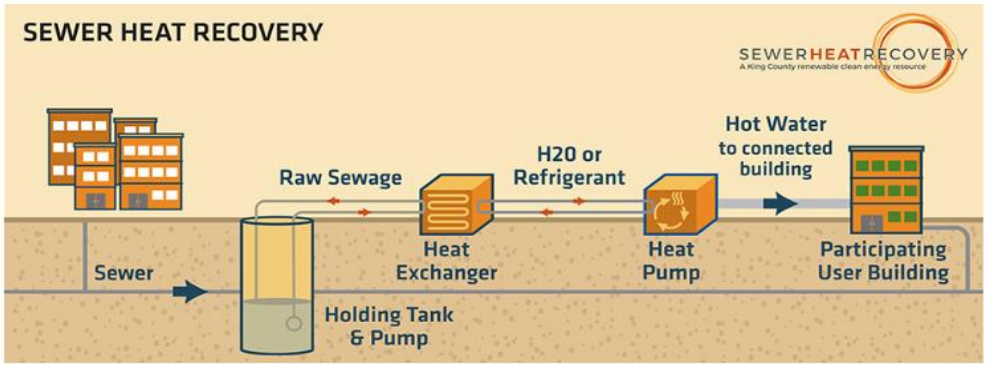
- Chelsea - 30 Level 2 ports, 5 Level 3 (DCFC) ports
- Southborough - 10 Level 2 ports
- Deer Island (pending) - 6 Level 2 ports, 6 Level 2 pre-wired
- CWTP - In planning phase

- Non-networked chargers located at various facilities
- Employee charging policy
- Fleet electrification assessments by NGRID and Eversource

Resiliency and Innovation

- **Eversource BESS Pilot**
  - Chelsea Admin & Brattle Court PS
    - Demand Cost Reduction
    - Grid Peak Reduction Revenue
- **DITP Large-Scale Battery Energy Storage**
- **Wastewater Energy Recovery**
  - MWRA Facilities
  - Community Development
  - Pilot opportunities

Battery Pilot Projects - Chelsea Admin Building and Brattle Court Pump Station

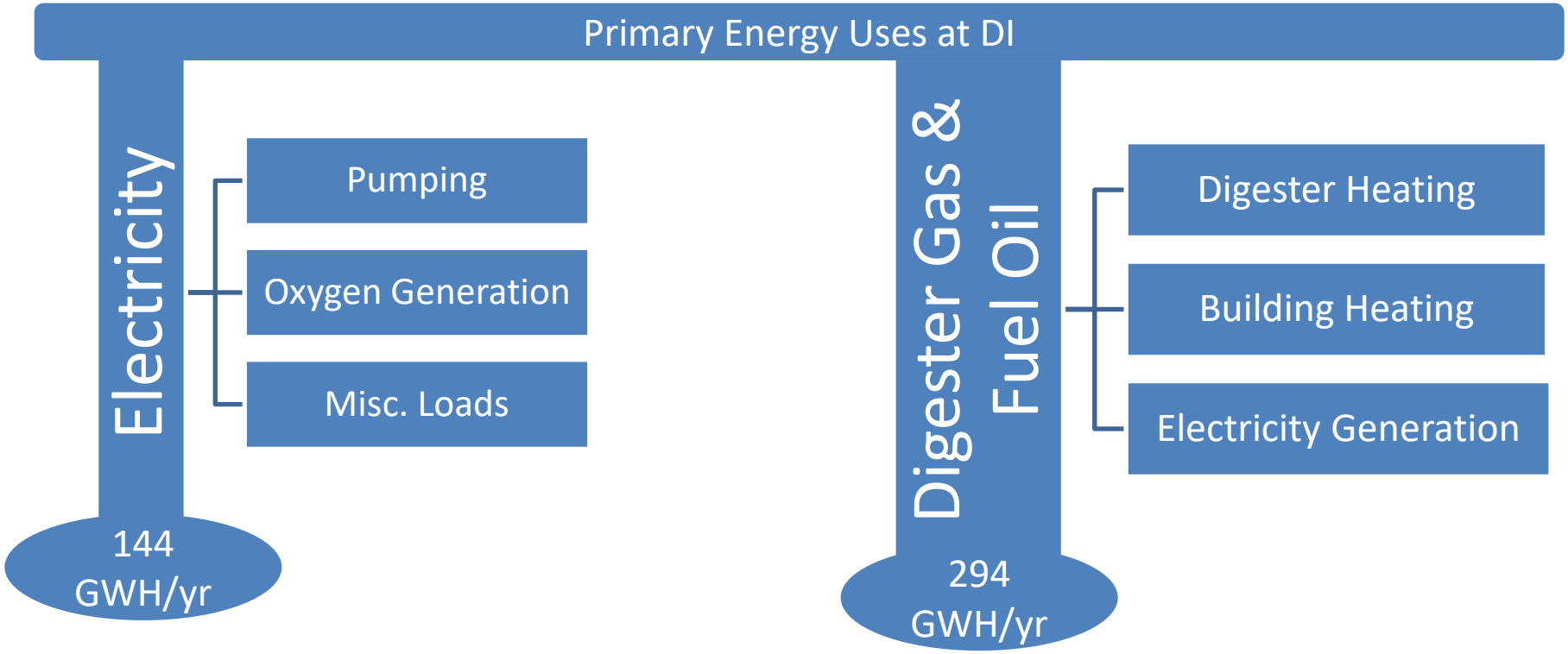


Wastewater Heat Recovery schematic (*image from King County*)

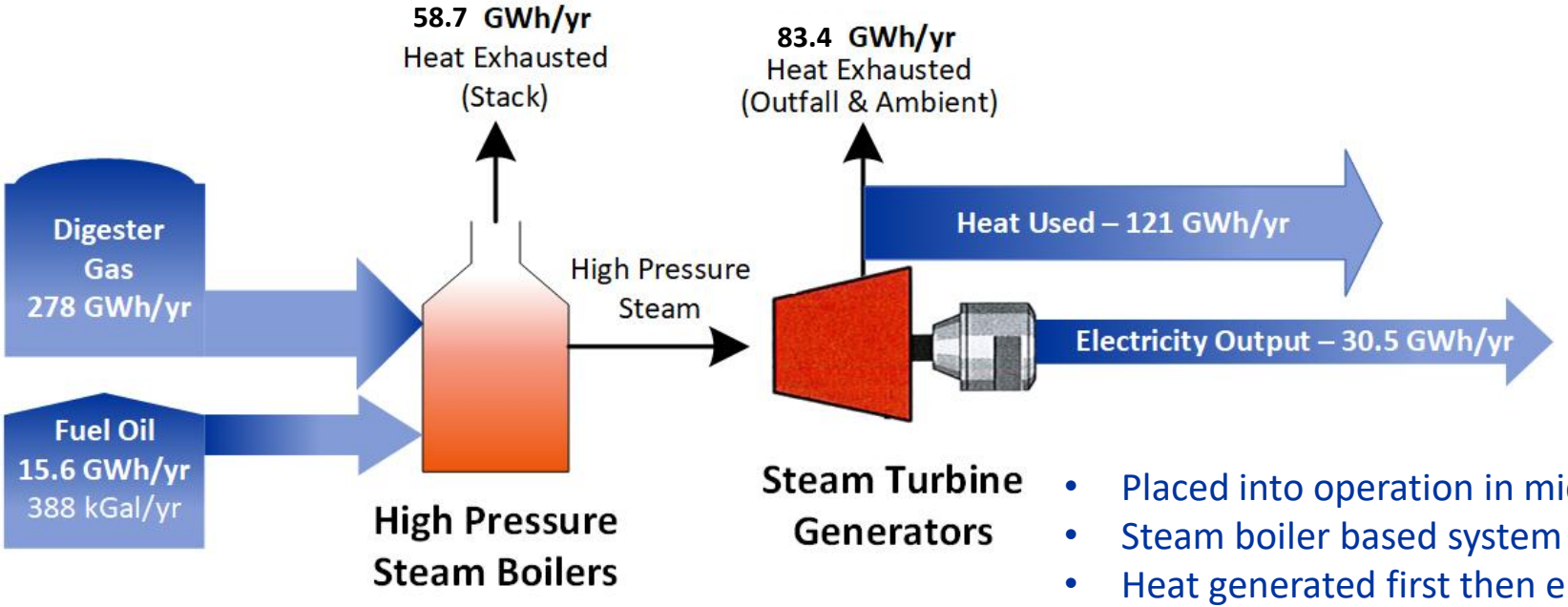
Deer Island
Combined Heat and Power
&
Battery Energy Storage System

May 15, 2026

Energy Use at Deer Island



Existing Combined Heat and Power (CHP) System Overview



- Placed into operation in mid 1990's
- Steam boiler based system
- Heat generated first then electricity

	Percent electricity from CHP	CHP Efficiency	Percent energy from onsite sources
Key Metrics	21%	52%	57%

Ideas for a New Combined Heat and Power

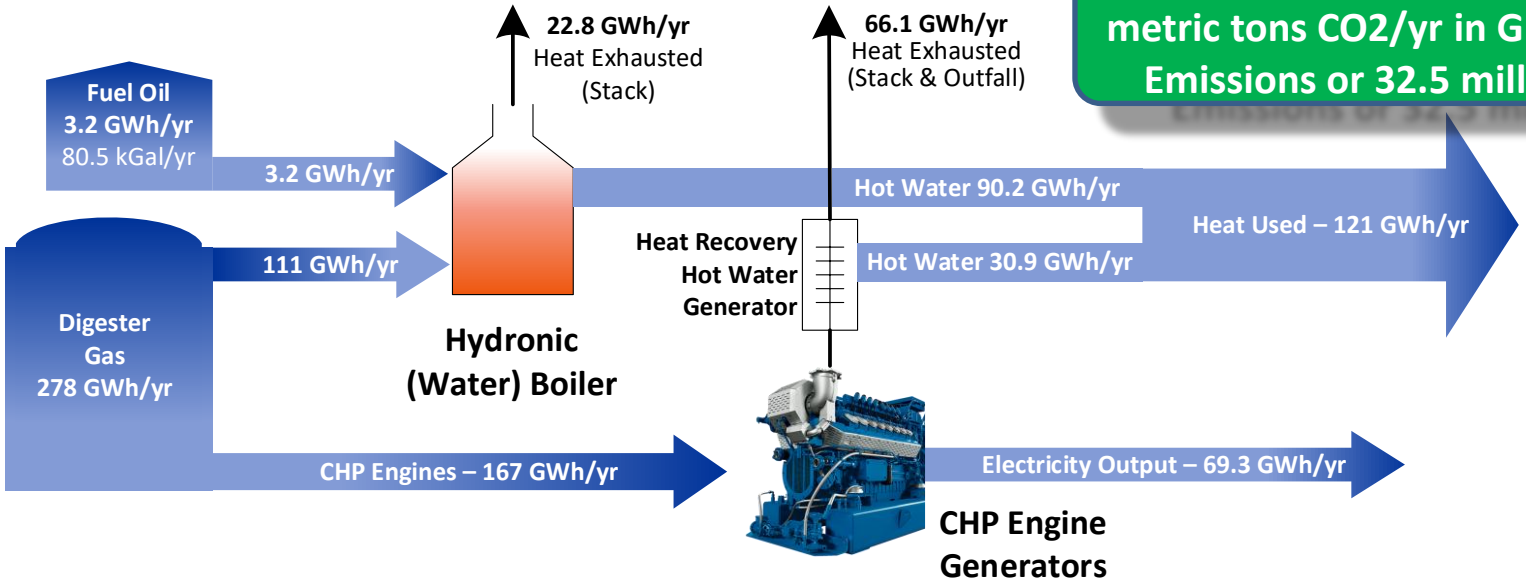
In 2021 MWRA completed an analysis evaluating opportunities to replace the existing CHP system

Efficiency & Update

This resulted in the choice to move forward with a detailed design for a new CHP facility

New Combined Heat and Power (CHP) System Overview

Predicted to save 12,800 metric tons CO2/yr in Greenhouse Gas Emissions or 32.5 million car miles



	Percent electricity from CHP	CHP Efficiency	Percent energy from onsite sources
Est. Metrics	48%	68%	74%

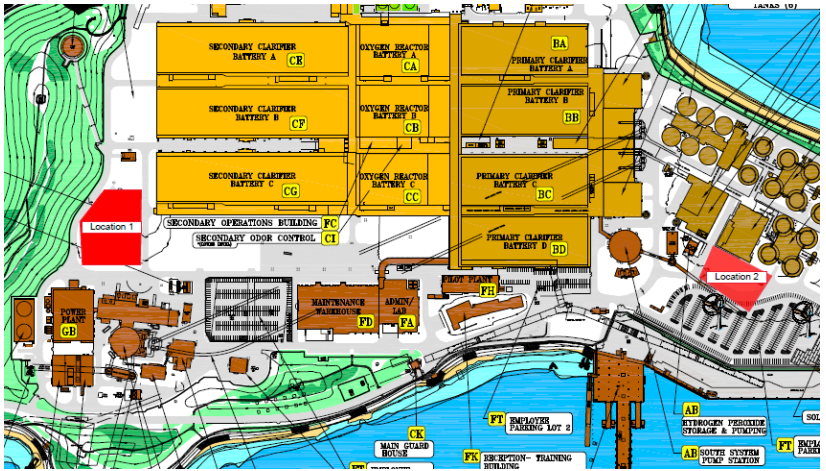
- Array of five reciprocating engines with a total rating of 15-17.5 MW
- Generates electricity and then extracts heat from exhaust
- Water boilers to meet heat demand

CHP Detailed Design Contract

- **Combined Heat and Power** – Contract 6730
  - Awarded to Burns & McDonnell
  - Project Kick-off Meeting - 10/15/24
  - Design contract value - $18.4M
  - 100 Months (8 yrs 4 mo) duration
    - 34 Months (2 yrs 10 mo) Design
    - 6 Months Bid
    - 60 Months (5 yrs) Construction
    - Maybe some adjustment to schedule due to other large capital projects as currently looking at project prioritization

Deer Island Treatment Plant Combined Heat & Power (CHP)

- **Status**
  - Preliminary work is completed
  - Second revision of Preliminary Design Report (PDR) Submitted to MWRA
  - Locations for buildings determined
  - Overall building aesthetics and layout is being worked on



Battery Energy Storage System (BESS) Study - Contract Overview and Scope

Contract S622

- Procured through OSD PRF74* State Contract
- Team lead - Sustainable Energy Advantage (SEA) with Customized Energy Solutions (CES) and Power Engineers
- Contract Term – Oct 29, 2024 to Aug 29,2025
  Extended to Dec 15, 2025
- Cost – $274,473
  Grant from MA DOER LBE - $150,000

Scope

Can BESS at DITP support MWRA goals of reducing GHG emissions, increasing operational resilience, and net financial benefits?

Provide basic information about BESS options and determine a storage technology

Size both the power and energy storage for a BESS

Perform energy and economic simulation to evaluate performance

*PRF74: Energy, Climate Action, and Facility Advisory Services

BESS Study - Use Cases

Primary Use Case – GHG Reduction

- No Preemptive Operation of CTG During Storm Events
- Using BESS instead of CTG For ICAP Tag Reduction

1,300 MT CO2e/yr Saved

Economic Advantage Stacked Use Cases

- Utility System Peak Demand Reduction
  - Connected Solutions
  - Eversource Demand Charge Management
  - ISO-NE Capacity Charge Management
- Daily Utility Load Leveling
  - Energy Arbitrage
- Clean Energy Demand Management
  - Clean Peak Standard
- Savings
  - Fuel Oil Use Reduction

BESS Study - Findings

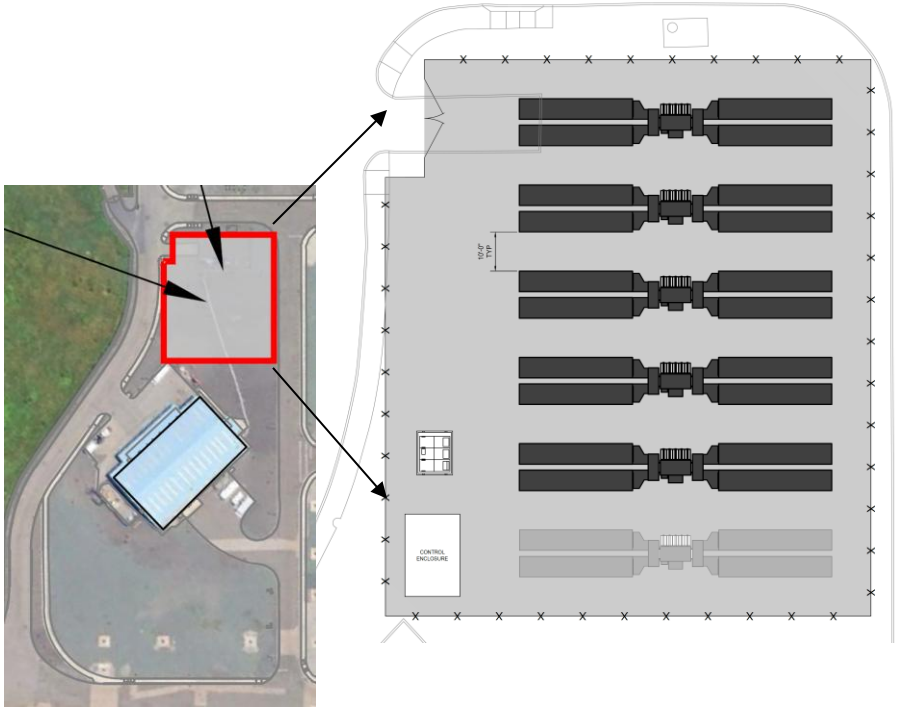
- Recommended: Lithium-Ion Batteries
  - Mature technology
  - Right scale for application
  - Declining capital costs
- Housing Recommendation: Container
  - Modular
  - Easier Construction

Half Plant 4 hr scenario chosen as it provides same storm backup functionality as existing operation while having strong financials and the discharge duration for most programs

	Half Plant 4 hr @15.5 MW
Capital Cost	$31M
O&M (20 yr)	$11.5M
Benefit (20 yr)	$114M
NPV (20 yr)*	$72M

*Add $3.2M to include social cost of carbon

BESS Study - Space Requirements – 15.5 MW @ 4 Hr



BESS Study - Design Pathway Recommendation

- Wrap design into CHP project

- Burns and McDonnell experienced with BESS Projects
  - More than 100,000 MWh of BESS projects
  - List experience with ~230 projects

- **Next step** – Get estimate for BESS design integration with CHP design and determine if it continues to make sense to proceed

Thank you!