Leading by Example Council Agenda
March 14th, 2023

Welcome

News and Updates

MA Initiatives Driving Decarbonization Efforts

Actionizing Decarbonization Plans

DOER
Massachusetts Department of Energy Resources

News and Updates: Massachusetts

MA Pie Facts!

New DOER Commissioner: Elizabeth Mahony

- Most recently worked for Attorneys General Andrea Joy Campbell and Maura Healey as an Assistant Attorney General and Senior Policy Advisor for Energy
  - Focused on utility clean energy procurements, solar program development, clean energy rate design, consumer protections, and legislative engagement
- Elizabeth's resume prior to joining the AG's Office includes:
  - Acting General Counsel for DOER
  - Committee Counsel to Benjamin Downing, Senate Chair of the Joint Committee on Telecommunications, Utilities and Energy
  - Associate at a small litigation firm in Quincy
  - Public Affairs Director for the late Senator Susan Fargo

Jason Marshall
Deputy Secretary and Special Counsel
Former Deputy Executive Director and General Counsel for New England States Committee on Electricity

New EEA Positions: Office for Federal and Regional Energy Affairs

Will lead the Secretariat's regional, inter-regional, and federal energy strategies and serve as Commonwealth's emissaries to:

- Promote clean energy development and procurement
- Build regional transmission
- Support grid reliability and affordability
- Enhance energy markets
- Pursue federal support

Mary Louise Nuara
Assistant Secretary
Former state policy director for Dominion Energy

Undersecretary of Environmental Justice & Equity: María Belén Power

- Will oversee training of EEA agency staff and establish EJ principles in the work of the secretariat
- Will work to ensure that historically marginalized communities are represented as Administration advances energy and environmental agenda
- Served as Assistant Executive Director of GreenRoots, a community-based organization dedicated to enhancing the urban environment and public health in Chelsea
- Appointed by President Biden to serve on the White House Environmental Justice Advisory Council

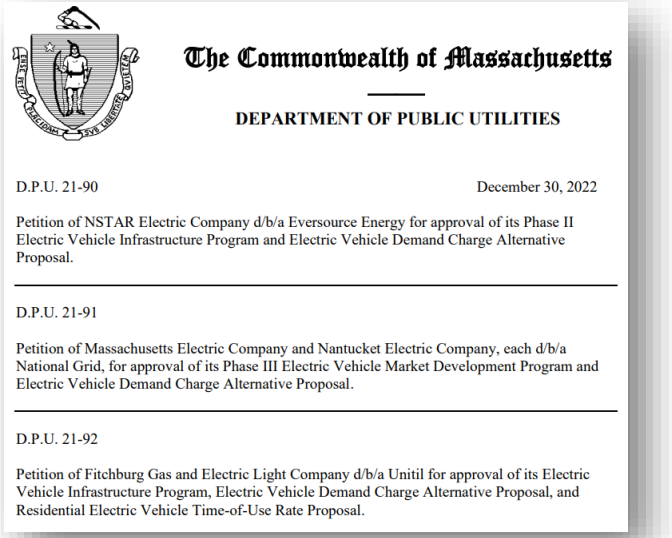
New DPU Ruling & Utility EVSE Programs

- Allows utilities to add surcharge to ratepayers' electric bills to support the build-out of EVSE
  - Utilities plan to use the surcharge to fund upgrades and installation of transmission and distribution circuits to support new EV chargers
- Eversource and National Grid programs:
  - Up to 100% upgrade costs on utility-side of meter
  - Up to 100% installation costs on customer side (including fleets)
  - Restructured demand payments for DCFC, based on use instead of capacity
  - Fleet advisory services, including government fleets
  - Networking rebates for publicly accessible sites (same definition as MassEVIP) and MUDs
- Portion of funding reserved for environmental justice communities
  - Up to 100% equipment cost coverage for publicly accessible charging and public fleet charging
- Participation in EVSE programs requires signing of utility T&Cs

New DPU Ruling & Utility EVSE Programs

The utilities have submitted a joint petition that is pending DPU response and includes the following requests:

- **Reconsideration of a third-party funding requirement**: "…the total amount of third-party funding received must be applied against the combined make-ready and EVSE incentives that a customer is eligible to receive through the EV program absent outside funding regardless of whether the outside funding received was designated for utility-side infrastructure, customer-side infrastructure, or EVSE costs."



The Commonwealth of Massachusetts

DEPARTMENT OF PUBLIC UTILITIES

D.P.U. 21-90 December 30, 2022

Petition of NSTAR Electric Company d/b/a Eversource Energy for approval of its Phase II Electric Vehicle Infrastructure Program and Electric Vehicle Demand Charge Alternative Proposal.

D.P.U. 21-91

Petition of Massachusetts Electric Company and Nantucket Electric Company, each d/b/a National Grid, for approval of its Phase III Electric Vehicle Market Development Program and Electric Vehicle Demand Charge Alternative Proposal.

D.P.U. 21-92

Petition of Fitchburg Gas and Electric Light Company d/b/a Unitil for approval of its Electric Vehicle Infrastructure Program, Electric Vehicle Demand Charge Alternative Proposal, and Residential Electric Vehicle Time-of-Use Rate Proposal.

- **Clarification regarding definition of the term** "public fleets" and whether this includes public transit, school buses, and government-owned fleets

Note: State entity participation in these programs on hold until DPU response is issued.

Massachusetts Department of Energy Resources

News and Updates: National

Fix a Leak Week March 20–26, 2023

EPA WaterSense

- ❑ **Twitter posts**
- ❑ **Newsletters**
- ❑ **State facility leak checks**

Feel free to reach out to share ideas!

jason.duff@mass.gov

DOE Better Climate Challenge

- The U.S. Dept. of Energy Better Climate Challenge (BCC) is a voluntary platform for organizations, including campuses, to set GHG emissions reduction goals and showcase their progress
- DOE provides technical assistance, facilitates peer-to-peer learning, shares the work of leaders, and highlights real-world replicable solutions

Individual entities are welcome to join on their own. To learn more, contact LBE or see the DOE Better Buildings Solution Center

BCC Commitment

- Reduce GHG emissions by 50% over 10 years, from baseline set in last 5 years
- Set energy use reduction target (typically 20%)
- Participate in a working group
- Develop org-wide GHG reduction plan
- Report annual progress to U.S. DOE

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Gas Stove Climate and Health Risks

- Previous studies found that 1.3% of methane gas used in stoves leaks into atmosphere
- Paper published in December found that stoves may be linked to ~13% of childhood cases of asthma
- 2017 paper found that nitrogen dioxide from cooking with gas led to an increase in rescue medication use in children with asthma
- Researchers collected 234 samples of unburned natural gas from 69 homes around Boston, found 21 toxic pollutants, including benzene, a carcinogen

Tips to lower your health risk:

- Increase ventilation
- Use exhaust hood
- Use stove less often
- Consider an air purifier
- Switch to an induction stove!

Sources: NPR, NY Times 1, 2

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News and Updates: LBE

LBE Progress Dashboard

What is the progress dashboard?

- Expands significantly the amount & granularity of LBE state portfolio data available on the website
- Includes data analysis on a wide range of topics (emissions, renewables, EVSE, etc.) at **portfolio-level & entity-level**
- Shows movement towards EO594 targets & objectives

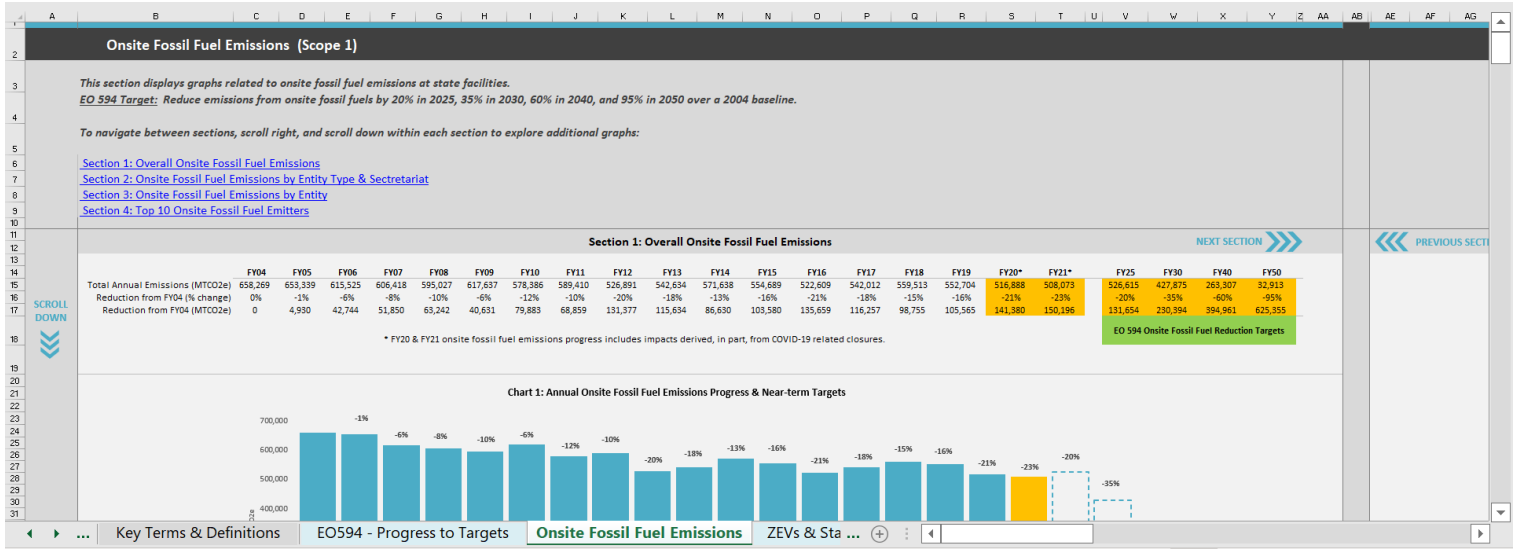
Dashboard to be updated each fiscal year

- Current version is updated through FY21

Interested in providing feedback before spring release?

Please reach out to Sophia Vitello (sophia.vitello@mass.gov)

LBE Progress Dashboard Overview



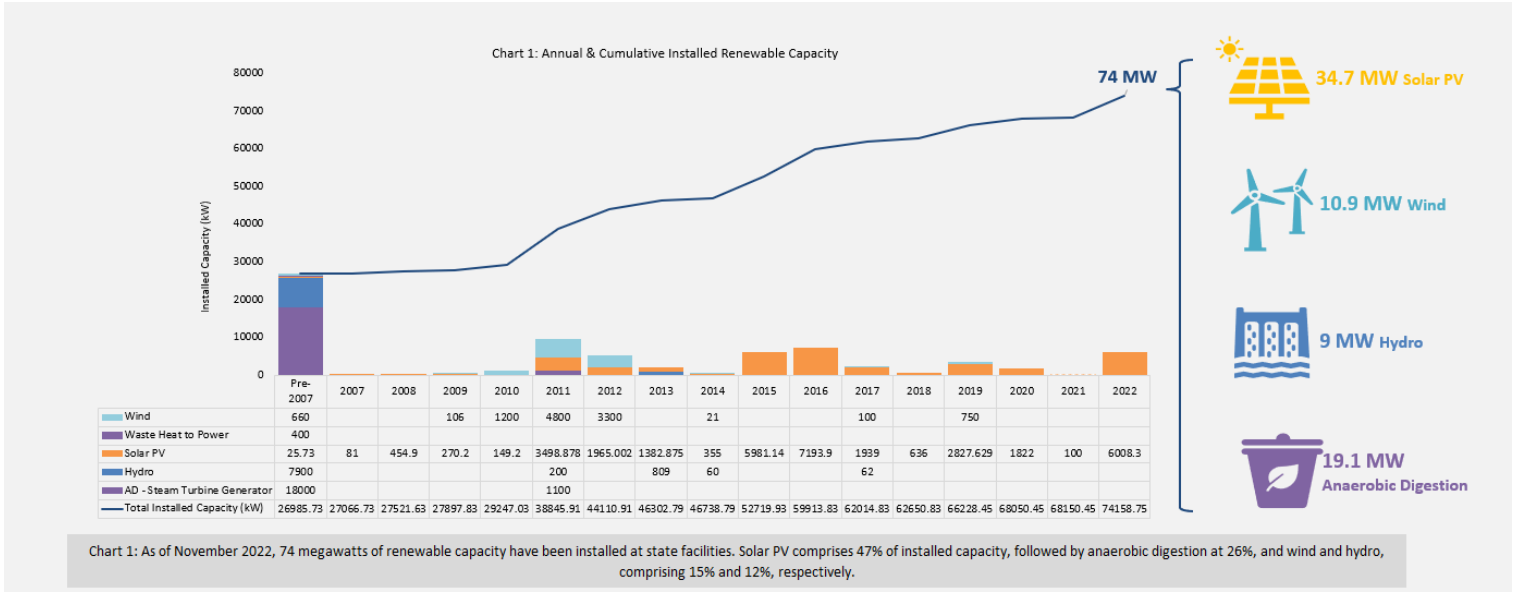


Chart 1: As of November 2022, 74 megawatts of renewable capacity have been installed at state facilities. Solar PV comprises 47% of installed capacity, followed by anaerobic digestion at 26%, and wind and hydro, comprising 15% and 12%, respectively.

Includes data at portfolio-level and entity-level for:

- ↑ Progress to EO594 Targets
- Onsite Fossil Fuel Emissions
- Fuel Consumption
- Energy Use Intensity
- ZEVs & State Fleet
- EV Charging Stations
- LEED Certified Buildings
- Installed Renewables
- Sustainable Landscaping
- $ LBE Grants
- Equity

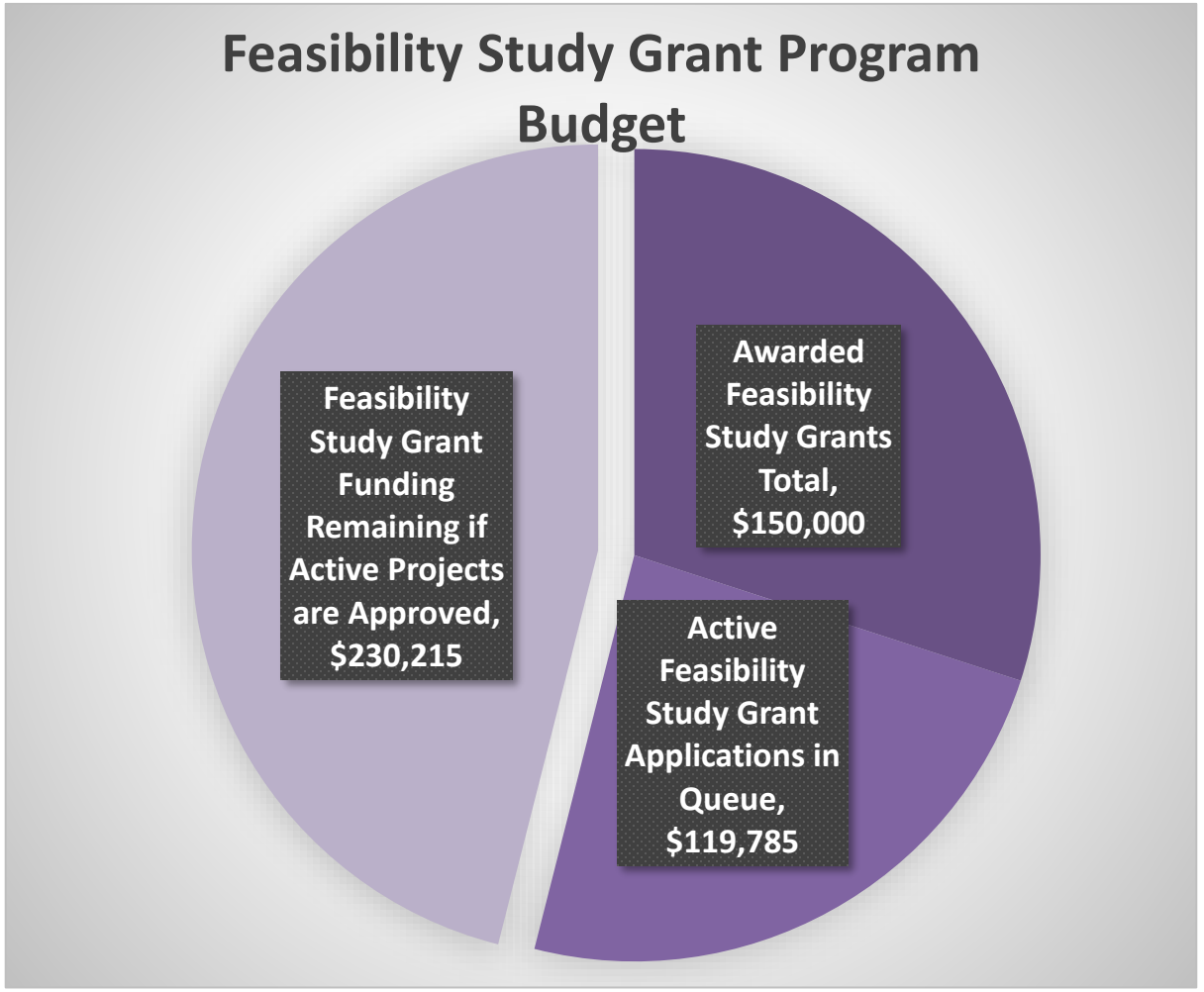
LBE Grant Program Status: Feasibility Studies

Total budget: $500,000

- $150,000 awarded to two studies
  - UMass Chan Medical School decarbonization study
  - Montachusett Regional Transit Authority Electrification Plan
- $120,000 of applications in the queue
  - Fleet EVSE planning
  - Battery energy storage study

Total uncommitted: ~$230,000

Current Application Deadline: June 30th, 2023



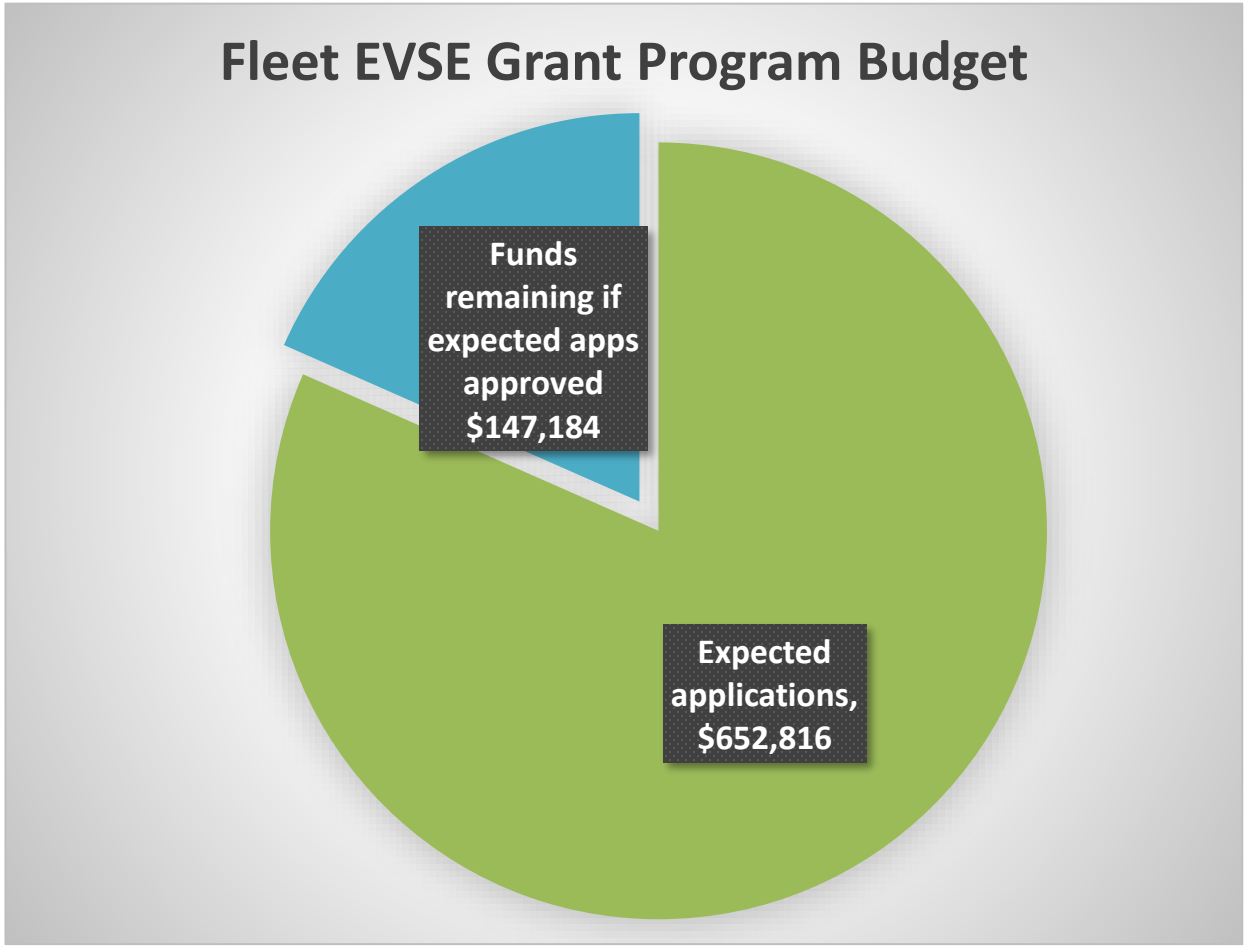
LBE Grant Program Status: Fleet EVSE Deployment

Total budget: $800,000

- No applications yet submitted
- ~$653,000 in expected applications*

Remaining funds if expected applications are approved: ~$147,000

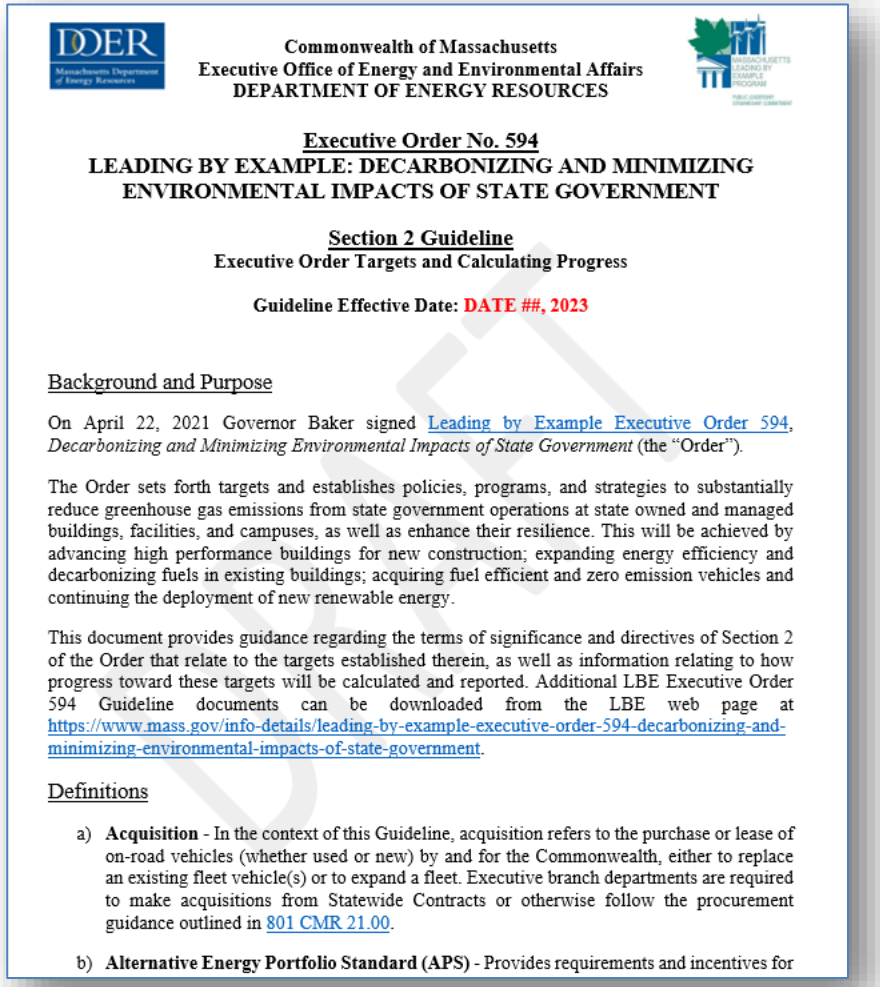
Current Application Deadline:
June 30th, 2024



*Based on draft EVSE project proposals received as of March 9, 2023

EO 594 Guidelines

- Various EO 594 implementation guidelines currently available
- Draft Section 2 Guideline (Targets and Calculating Progress) will be available for LBE stakeholder comment soon!
- Working on updated guideline for MA LEED Plus 2.0 Standard due to Specialized Opt-in Code promulgation



Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
DEPARTMENT OF ENERGY RESOURCES

Executive Order No. 594
LEADING BY EXAMPLE: DECARBONIZING AND MINIMIZING ENVIRONMENTAL IMPACTS OF STATE GOVERNMENT

Section 2 Guideline
Executive Order Targets and Calculating Progress

Guideline Effective Date: DATE ##, 2023

Background and Purpose

On April 22, 2021 Governor Baker signed Leading by Example Executive Order 594, *Decarbonizing and Minimizing Environmental Impacts of State Government* (the "Order").

The Order sets forth targets and establishes policies, programs, and strategies to substantially reduce greenhouse gas emissions from state government operations at state owned and managed buildings, facilities, and campuses, as well as enhance their resilience. This will be achieved by advancing high performance buildings for new construction; expanding energy efficiency and decarbonizing fuels in existing buildings; acquiring fuel efficient and zero emission vehicles and continuing the deployment of new renewable energy.

This document provides guidance regarding the terms of significance and directives of Section 2 of the Order that relate to the targets established therein, as well as information relating to how progress toward these targets will be calculated and reported. Additional LBE Executive Order 594 Guideline documents can be downloaded from the LBE web page at https://www.mass.gov/info-details/leading-by-example-executive-order-594-decarbonizing-and-minimizing-environmental-impacts-of-state-government.

Definitions

a) **Acquisition** - In the context of this Guideline, acquisition refers to the purchase or lease of on-road vehicles (whether used or new) by and for the Commonwealth, either to replace an existing fleet vehicle(s) or to expand a fleet. Executive branch departments are required to make acquisitions from Statewide Contracts or otherwise follow the procurement guidance outlined in 801 CMR 21.00.

b) **Alternative Energy Portfolio Standard (APS)** - Provides requirements and incentives for

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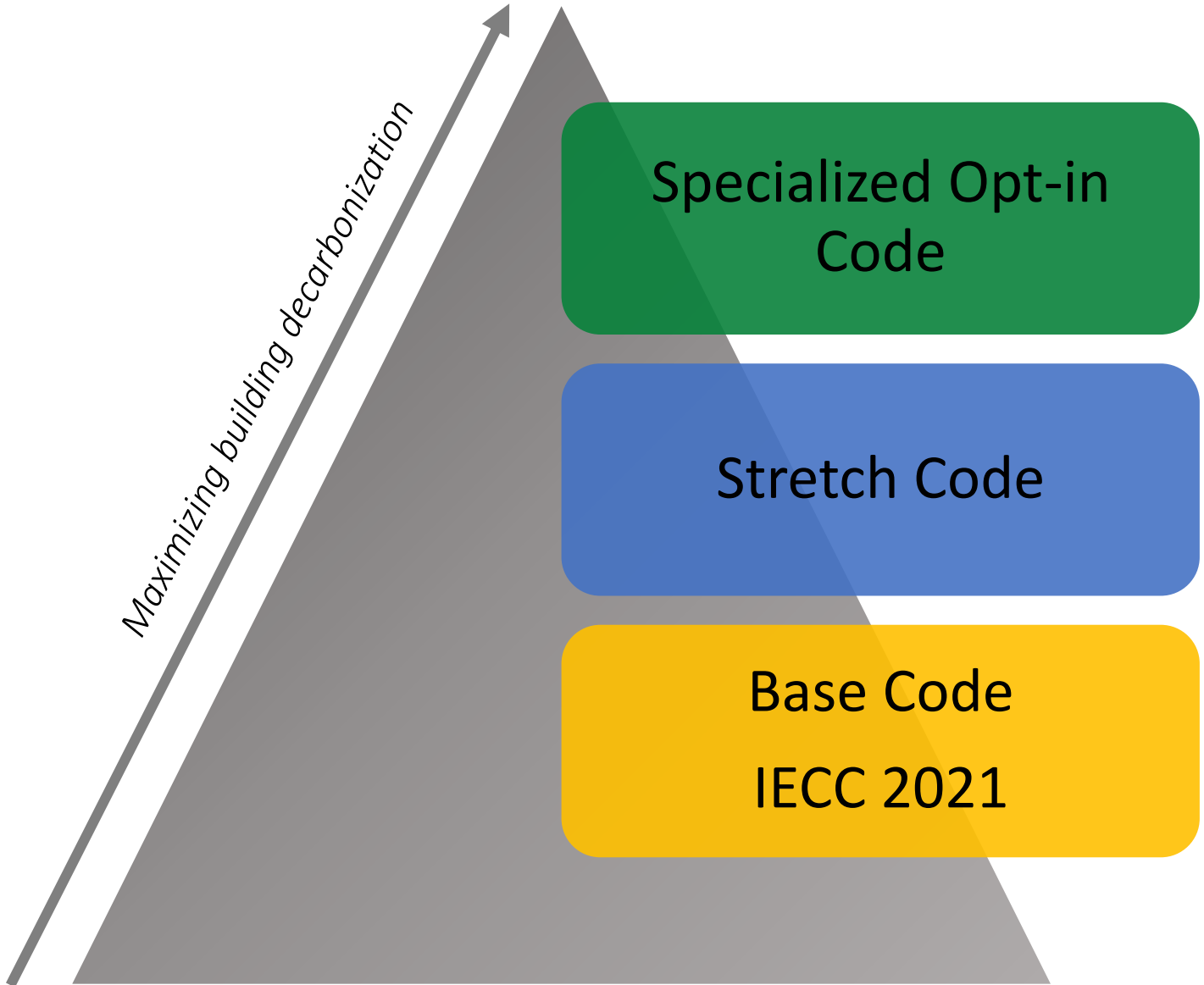
Reaching that Pie in the Sky

MA Initiatives Driving Decarbonization Efforts

- Updated Stretch Energy Code and Specialized Opt-In Code
- Ground-source Heat Pump District Pilot
- Fossil Fuel-Free Communities Pilot

Building Energy Code Focus on Decarbonization

- EO 594 and 2050 CECP: need to eliminate building fossil fuels
- For new construction and major renovations, revised code requirements are codifying this
- Implementation dates will vary
- Even though state entities aren't subject to local code adoption, **the Specialized Opt-in Code will become part of MA LEED Plus 2.0**



Specialized Opt-in Code: Key Elements

Stretch Code
Efficiency Requirements

IECC 2021 (Base Code)

+

- Thermal energy demand intensity (TEDI) requirements by building type
- EV-ready
- Solar-ready

+

Passive House
R-use buildings and multifamily

1. All-electric building

OR

2. Mixed-fuel building

OR

3. Zero energy building

Specialized Opt-in Code: Stretch Code TEDI Requirements

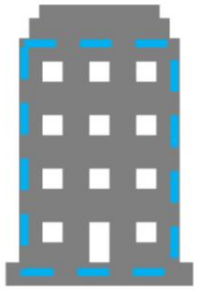
Stretch Code Efficiency Requirements

IECC 2021 (Base Code)

+

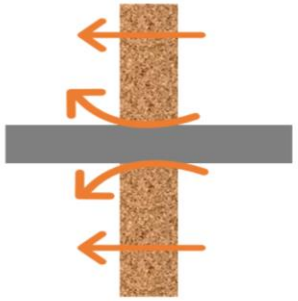
- Thermal energy demand intensity (TEDI) requirements by building type
- EV-ready
- Solar-ready

TEDI requirements aim to reduce the amount of heating or cooling load required by a building and thus its energy consumption and resulting greenhouse gas emissions impacts



Quality envelope and air leakage testing

Ventilation energy recovery



Mitigating thermal bridges

Specialized Opt-in Code: Stretch Code TEDI Requirements

Stretch Code Efficiency Requirements

IECC 2021 (Base Code)

+

- Thermal energy demand intensity (TEDI) requirements by building type
- EV-ready
- Solar-ready

TEDI a measure of the thermal energy required by a building for space and ventilation air conditioning, measured as kBtu per modeled square foot per year

Heating & Cooling TEDI Requirements for…
Offices, courthouses, fire stations, libraries, police stations
Residential, multifamily, dormitory
High ventilation buildings (e.g., labs and hospitals)*
Other building use types
Small commercial <20,000 sf, any use besides multifamily*
Existing building additions, alterations, change of use*
Mixed use buildings*

*Code allows an alternative efficiency pathway

Specialized Opt-in Code: Beyond Stretch Code

Note: Heating includes space and service water heating

Passive House
R-use buildings and multifamily

+ All-electric heating or electrification-ready
Phases in by January 2024

1. All-electric building

Stretch Code Efficiency Requirements
+ All-electric heating

OR

2. Mixed-fuel building

Stretch Code Efficiency Requirements
+ Maximize solar on roof where feasible
+ Electrification-ready

OR

3. Zero energy building

Stretch Code Efficiency Requirements
+ All-electric heating or electrification-ready
+ Sufficient onsite renewable generation (☼)

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Specialized Opt-In Code Guidance

- DOER is working with a consultant on energy models, including…
  - assessing the effect modeling assumptions and inputs have on outputs
  - assessing model conformance with the DOER guidelines
  - making recommendations, including potential changes and updates to the guidelines
- The assessment will include a review of the models used to develop the current TEDI requirements so that these models can be compared/contrasted with outside project consultants' models

Creating A Greener Energy Future For the Commonwealth

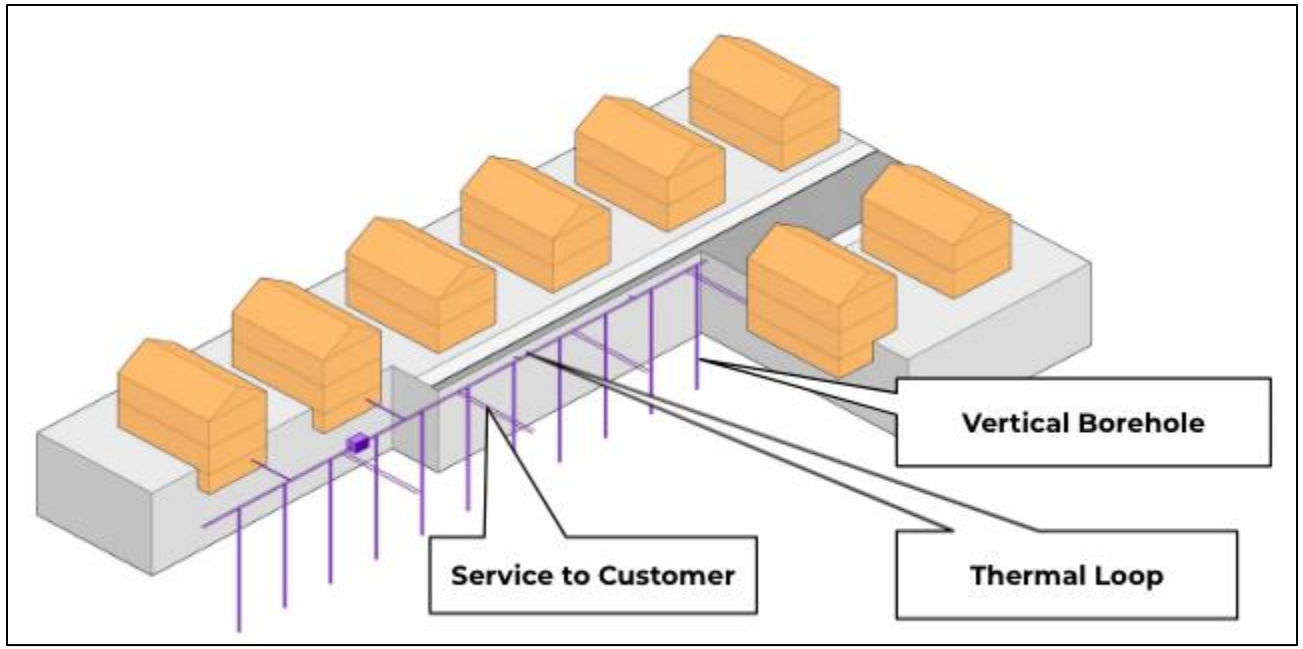
Massachusetts Department of Energy Resources

District Geothermal Energy in Massachusetts

Leading by Example Council Meeting
March 14, 2023

What is District Geothermal?

A geothermal system where one, communal geothermal well field serves multiple end-use customers.



Source: HEET

Eversource Demonstration Project

Location: Framingham, MA

Off takers:

- 24 Residential homes
- 5 Commercial buildings
- 10 Framingham Housing Authority buildings

Expected Cost: $12.4 million

Timeline:

- Begin construction – April/May, 2023
- Complete construction – September, 2023

Duration: Three years

Geothermal Pilot Program

Source: Eversource

Other District Geothermal Projects in Massachusetts

- National Grid Demonstration Project
  - Lowell, MA
  - $15 million budget approved by the DPU
- Merrimack Valley Relief Fund
  - Lawrence, Andover, or North Andover
  - $4 million in grant funding available

Massachusetts Clean Energy Center Research Efforts

- An Act Relative to Immediate COVID-19 Recovery Needs gave $5 million to establish a research team within MassCEC to oversee, collect, and analyze data related to the design and operation of networked geothermal demonstration projects
- MassCEC must coordinate with research, non-profit, and university entities
- The research team shall:
  - **model the system design and operation** of proposed networked geothermal demonstration project sites;
  - **monitor the thermal energy storage potential** of sites;
  - **create a public data bank** of normalized data, including data on costs, to compare sites;
  - **document and disseminate recommendations and best practices** for rapid scaling and optimization;
  - **provide projections of scaled-up site impacts** on heating, emissions, health, customer bills and other variables;
  - **engage and educate stakeholders** in the host communities of potential sites; and
  - **perform feasibility studies** for communities interested in serving as hosts for projects

Resources

- https://heet.org/
- GeoMicroDistrict Feasibility Study – HEET
- Eversource Geothermal Pilot
- National Grid Geothermal Pilot

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Municipal Fossil Fuel Free Demonstration Program

March 14, 2023

Municipal Fossil Fuel Free Building Demonstration

DOER demonstration enabling cities and towns to adopt and amend general or zoning ordinances or by-laws to require new building construction or major renovation projects to be fossil fuel-free

- An Act Driving Clean Energy and Offshore Wind (St. 2022, c. 179, § 84) requires the Massachusetts Department of Energy Resources (DOER) to establish a demonstration project in which cities and towns may adopt and amend general or zoning ordinances or by-laws that require new building construction or major renovation projects to be fossil fuel-free

- The purpose of 225 CMR 24.00 is to establish the framework, requirements, and timeline for cities and towns to participate in the DOER's Municipal Fossil Fuel Free Building Construction and Renovation Demonstration Project as authorized by St. 2022, c. 179, § 84

- Includes requirements that community has met 10% housing affordability threshold

Fossil Fuel Free Demonstration Status and Timeline

- DOER issued **draft regulations and model rule** on December 23, 2022 for public comment
- **January 24th & 26th**: DOER hosted information session and discussion with all 10 Prioritized Communities
- **February 8th**: Public Hearing
- **February 12th**: Written comment deadline
- **Week of April 3rd:** Submit final regulations to TUE
- **July 1:** Final regulations promulgated, program launch, and DOER begin accepting applications

Town/City
Arlington
Lexington
Brookline
Acton
Concord
Cambridge
Lincoln
Newton
West Tisbury (does not plan to participate)
Aquinnah

Red – communities that do not currently meet housing requirements

Overview of Draft Regulations and Model Rule

Key Components of Regulation

- **Application process**: requirements and schedule
- **Selection criteria**:
  - Prioritization of 10 communities with home rule petitions submitted prior to August 2022
  - Selection criteria for substitute communities if initial 10 do not apply or do not meet requirements for approval
- **Reporting requirements**:
  - Metrics and data to support analysis of emissions, operating and building costs, and affordability
  - Requirements for communities and utilities
  - Timeline for submission to DOER

Model Rule

- By-law with specific amendments that require buildings follow the all-electric path in the Specialized Opt-in Code

Model Rule: Implementation of Fossil Fuel Restrictions

Model rule: DOER's model rule is based on the Specialized Opt-in Code. The Specialized Code has two pathways for most building types: (1) all-electric/no fossil and (2) mixed fuel which uses fossil fuels.

Specialized Opt-in Code

- Optional Path 1: All electric
- Optional Path 2: Mixed fuel w/ prewiring and solar

Fossil Fuel Free Code

- Required Path: All electric
- Statutory Exemptions: Mixed fuel w/ prewiring and solar for statutory exemptions

The model rule simply eliminates the Mixed Fuel path for all building types except:

1. Research laboratories for scientific or medical research
2. Hospitals regulated by the department of public health as a health care facility
3. Medical offices regulated by the department of public health as a health care facility
4. Buildings heated with Clean Biomass Heating Systems as defined in 225 CMR 23 as the only combustion equipment
5. Multi-family buildings over 12,000 square feet with permit application filed prior to January 1, 2027 may utilize gas or propane for domestic water heating as the only combustion equipment

Reporting Requirements

- **Cities and Towns (participating communities and control group)**
  - Permit and certificate of occupancy data, including construction costs, square footage, etc.
  - Third party energy reporting
  - Due to DOER annually June 30th beginning in 2024

- **Utilities (electric and gas companies, investor owned and municipal where applicable)**
  - Billing data: usage and costs, monthly by fuel
  - Due to DOER annually September 30th beginning in 2024

- **DOER Report to Legislature**
  - Emissions data, impacts on housing production, housing affordability
  - Due to Legislature every two years September 30th beginning in 2025

Note: DOER is applying for federal DOE funding that will be available for implementation of codes to support this effort, including funding for DOER data collection tools and resources/technical assistance for community electronic data collection and reporting to DOER. See final slide for more details on concept paper.

Application Requirements

- Copy of **home rule petition** and date submitted.
- Copy of **proposed bylaw** or other ordinance for participation in the Demonstration Project. If the city or town proposes a bylaw or ordinance that is not the model bylaw or the Department's Fossil-Free Code, the application must include an explanation of differences and provide the applicant's rationale for any differences.
- An **implementation plan**
- Documentation sufficient to demonstrate that the applicant has achieved at least one of the three **housing production eligibility thresholds** set forth in 24.05(1)(c).
- Proof of **Local Approval**.

Timeline

- **Week of March 17**: Secretary/EEA Briefing, HED Briefing
- **March 22**: Final regs and model rule to EEA for review, specific sections to HED for review
- **March 27**: Final regs and model rule to ANF/ GOV
- **Week of March 22 or 27**: Gov briefing
- **Week of April 3**: TUE Submission of final regs (does not include model rule)
- **June 9**: Final regs filed with SOS, public release
- **June 23**: Promulgation before July 1 statutory deadline (next publication date is July 7)

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Massachusetts Department of Energy Resources

More Than One Way to Slice a Pie: Actionizing Decarbonization Plans

MWRA's EV Planning Strategy

Denise Breiteneicher, Program Manager, Energy & Environmental Management

March 14, 2023

Impetus for EV Deployment

- EO 594 provided impetus to ramp up MWRA's EV purchases.
- Positive experience with existing EVs in MWRA's fleet
- 29% of MWRA's fleet are made up of sedans and SUVs – plenty of EV choices available for these classes of vehicles
- About 25 vehicles are replaced each fiscal year
- Strong buy-in and support from MWRA's Fleet Manager and from staff who have been driving EVs

EV Strategy

- Assessed MWRA locations where the majority of the fleet is headquartered and how each vehicle is used
- Prioritized sites with the most fleet vehicles that are used off-site daily, as well as sites with the most staff
- Applied for Eversource EV Make Ready funding for 3 largest locations with the highest number of fleet vehicles and staff – Chelsea Headquarters, Deer Island, and Southborough.
- Implemented policy requiring one dual port EV charger to be included at all MWRA facilities undergoing major renovations
- Implementing education approach that includes both virtual and in-person training to combat range anxiety and ensure drivers get the most efficiency from the EV

BEVs & EV Chargers at Key Garages: Status and Future Plans

TOTAL	BEV	LEV II	DC FAST
Current	17	22	4
FY23 Addition	5	5	0
Next 5 Yrs.	40-50	25	5-7

Number of sedans, SUVs, and LD pickups garaged at facility

Clinton (4)	BEV	II	III
Current	0	0	0
FY21 Addition	1	1	0
Next 5 Years	1	1	0
Total	**2**	**2**	**0**

JCWTP (12)	BEV	II	III
Current	0	1	0
FY21 Addition	0	0	0
Next 5 Years	3	2	1
Total	**3**	**3**	**1**

Southboro (20)	BEV	II	III
Current	2	2	0
FY21 Addition	0	1	0
Next 5 Years	5	4	1
Total	**7**	**7**	**1**

Chelsea (92)	BEV	II	III
Current	5	4	0
FY21 Addition	2	2	0
Next 5 Years	13	14	5
Total	**20**	**20**	**5**

DITP (22)	BEV	II	III
Current	0	2	0
FY21 Addition	0	2	0
Next 5 Years	6	2	1
Total	**6**	**6**	**1**

Nut Island (7)	BEV	II	III
Current	0	0	0
FY21 Addition	0	0	0
Next 5 Years	2	2	0
Total	**2**	**2**	**0**

EVSE Deployment at UMass Chan Medical School

UMass Chan Medical School
Kortni Wroten
Kortni.Wroten@umassmed.edu

UMass Chan MEDICAL SCHOOL

UMass Chan's EVSE Journey

First Steps

- Campus demand
- Incentives

Next Steps

- Gained traction and popularity
- Donations from Tesla
- EV Charging tied to garage projects

76 Level-2 charging ports
40 for employee use
36 for patient-visitor

2014
- **West Garage**
- Two level-2 chargers
- Two level-1 outlets

2014-2015
- **West Garage**
- Two level-2
- Two Tesla wall chargers
- Two level-1 outlets

2015
- **Plantation Garage**
- Four level-2 dual head

2021
- **South Garage**
- 18 level-2 dual head ChargePoint
- Open to patient-visitor use

2023
- **West Garage**
- Eighteen level-2 dual head ChargePoint

UMass Chan MEDICAL SCHOOL

Key Takeaways

Incentives

State's Mass EVIP

Utility's Make Ready program

Alignment with construction projects

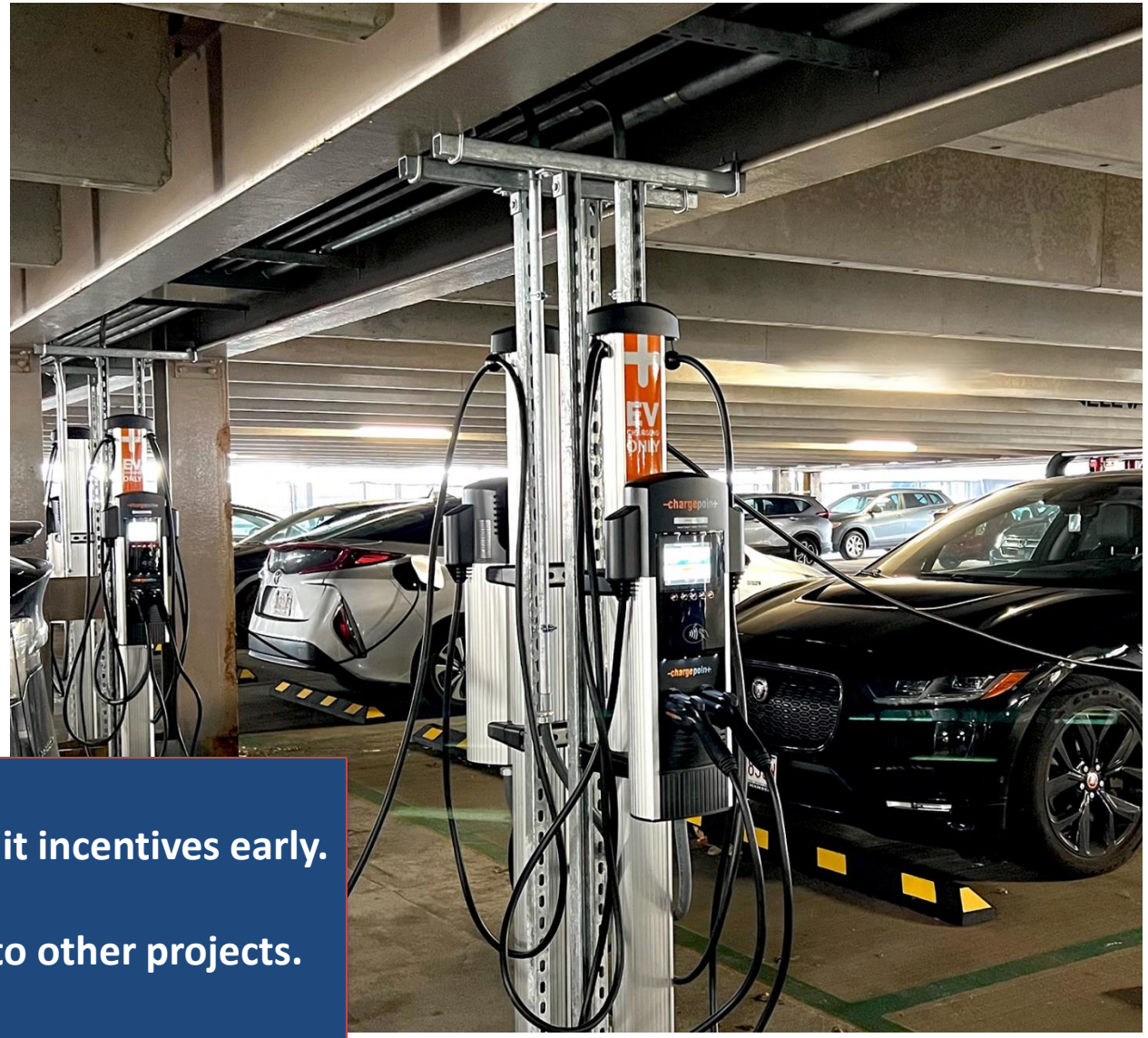
Leverage existing engineering and construction project management

Consistent infrastructure

Single point of contact for maintenance and services, tracking data, and eventual costs.

Campus demand

Improves the needs justification

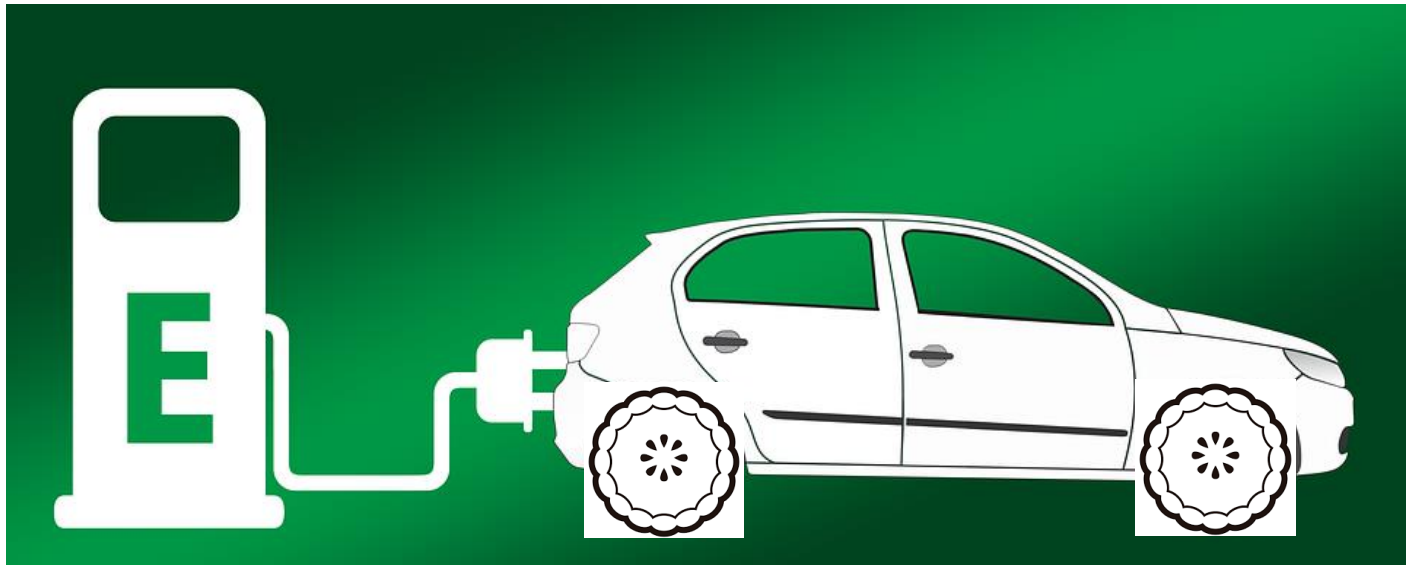


Submit incentives early.

Tie to other projects.

Use consistent equipment.

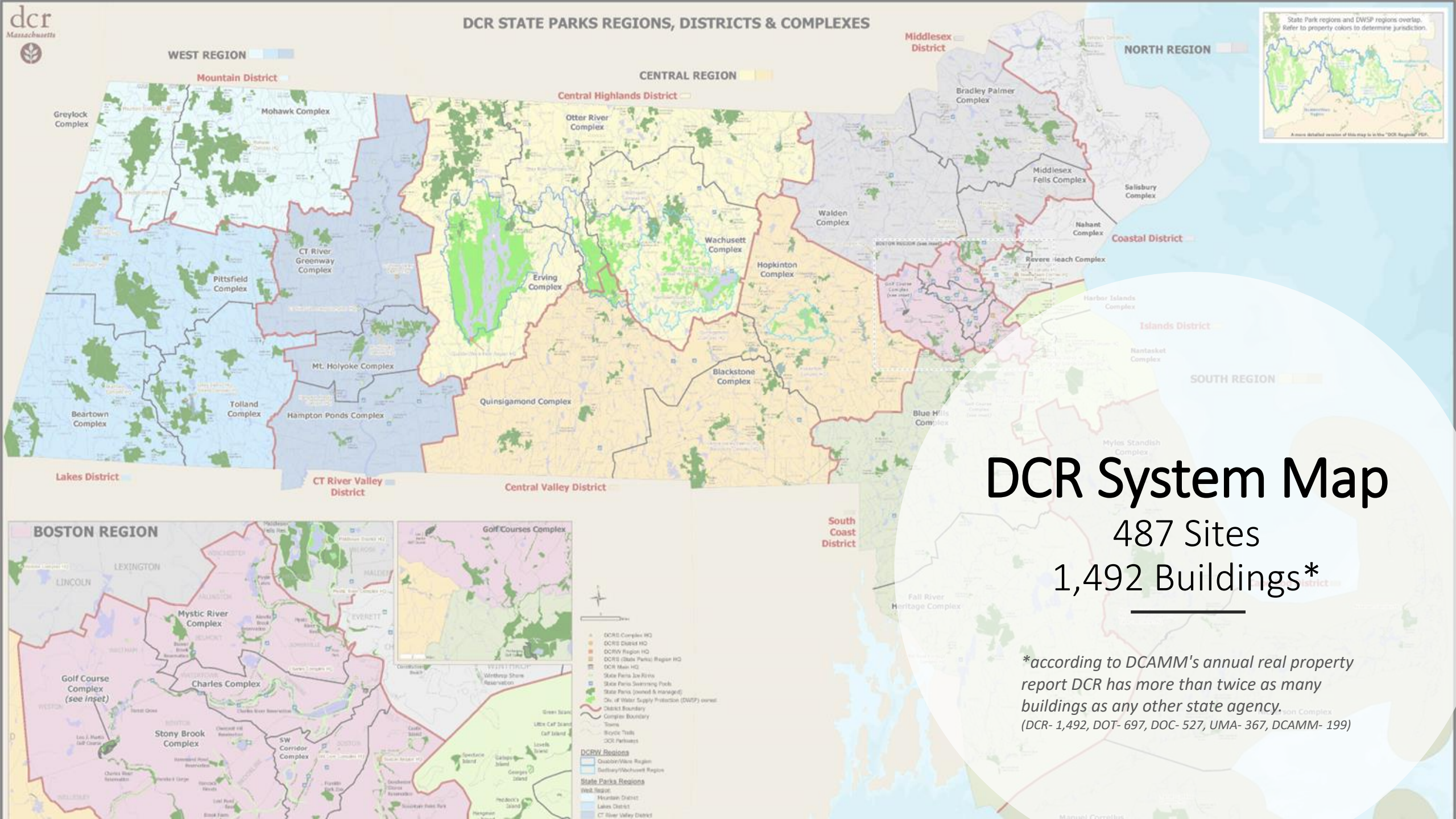
Questions?



DCR's Statewide Decarbonization Initiative

Dept of Conservation and Recreation

Sarah White



DCR System Map

487 Sites

1,492 Buildings*

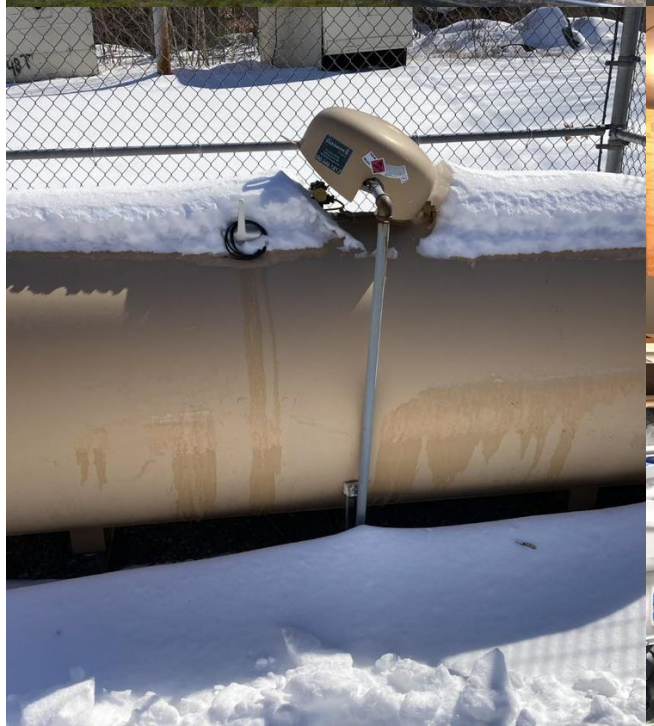
**according to DCAMM's annual real property report DCR has more than twice as many buildings as any other state agency.*

(DCR- 1,492, DOT- 697, DOC- 527, UMA- 367, DCAMM- 199)

Heating System Replacements

This project will accelerate heating system replacements and upgrades to reduce or eliminate DCR's burning of fossil fuels like gas, oil and propane which contribute to greenhouse gas emissions.

- Conducted comprehensive statewide heating system inventory
- Developed and utilized an application
- Heating related equipment: 585

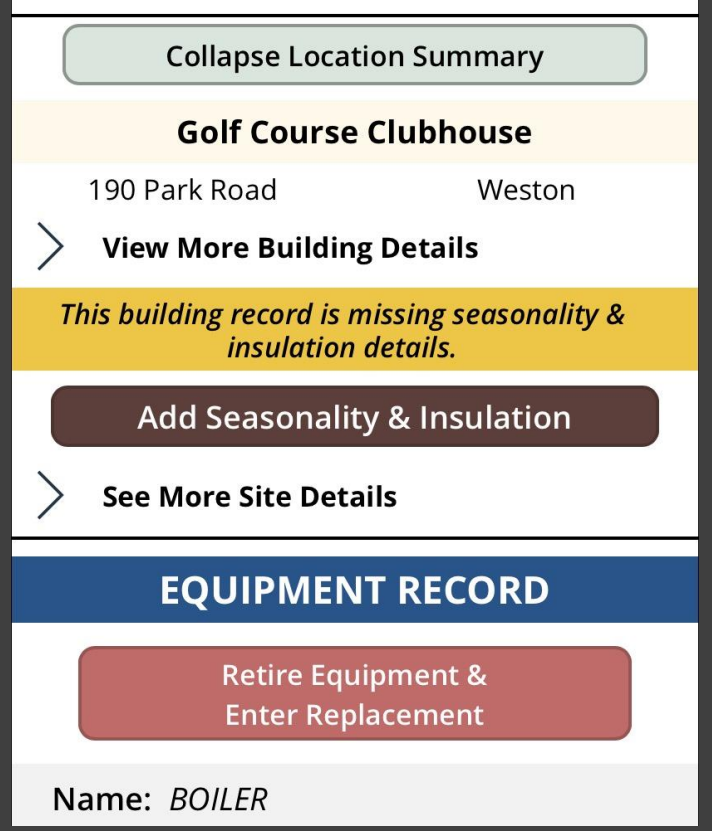


Statewide Decarbonization Initiative Priorities

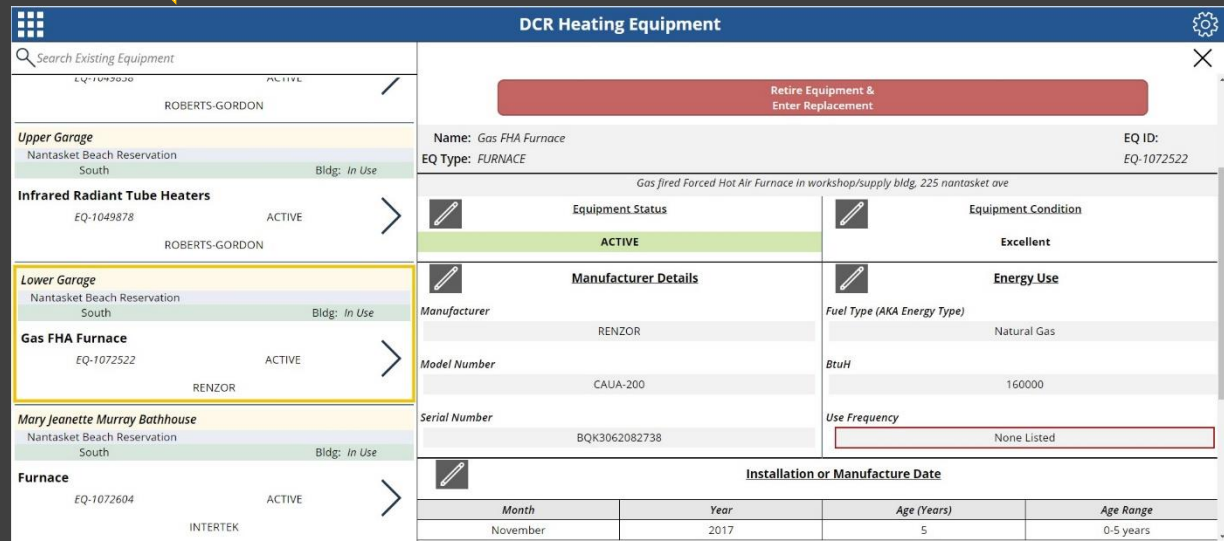
- Prioritized swap outs of inventory with following criteria
  - Major user (highest emissions)
  - Environment Justice Communities
  - System age, condition, performance
  - Building size and use
- Air source heat pumps are preferred, ease of install with in house technicians
- Ambitious DCR goal to replace 30 systems in FY23

Applications and Inventory

- Application allows for mobile updates on
  - Critical heating equipment details (fuel type, venting, pictures)
  - Identify retired equipment
  - Enter new equipment to streamline data for CAMIS updates
- Streamlines the process of data collection.
- The adaptive design through mobile devices.
- Timely and accessible process.
- Using inventory metrics to track and report progress.



Power App was created by Lauren O'Keefe (DCR)



UMass Carbon Zero
Our Pathway to 100% Renewable Energy

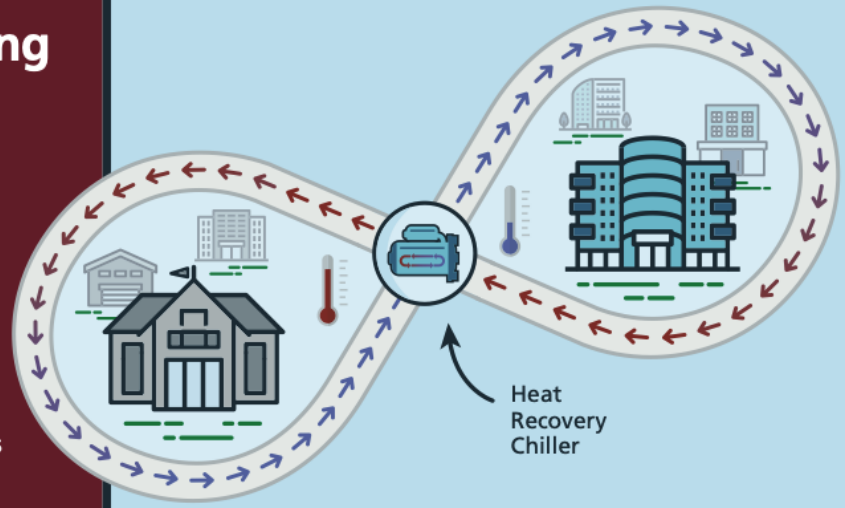
UMass Amherst

Ted Mendoza

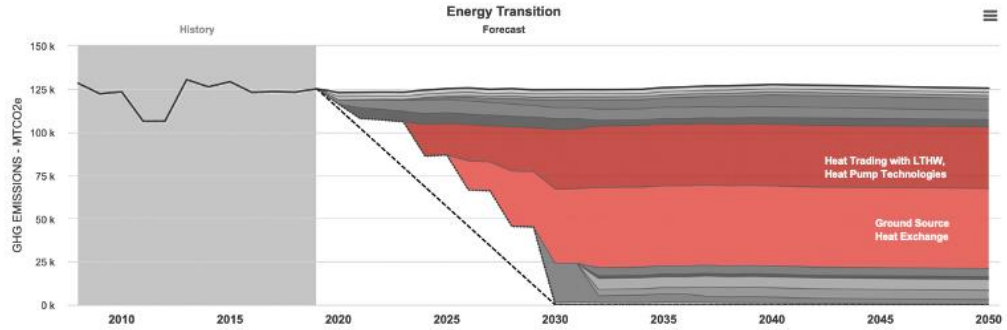
Heat Trading

Trading heat instead of making it twice

- NETWORK OF BUILDINGS
- 120-145°F LOW-TEMPERATURE HOT WATER
- SIMULTANEOUS HEATING AND COOLING



Energy Transition Recommendation



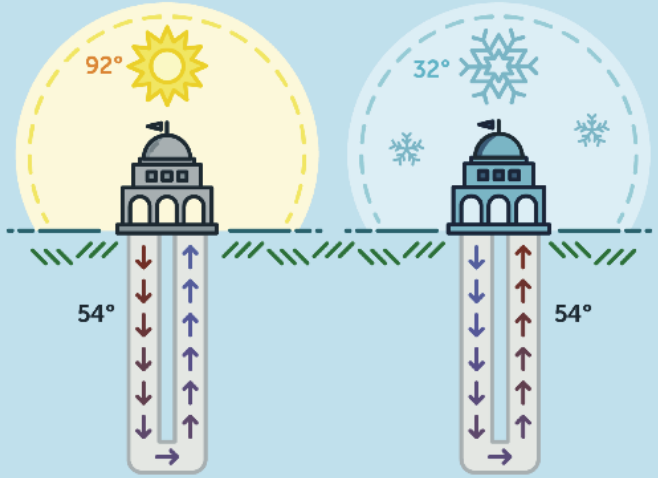
Geothermal Ground Source Heating and Cooling

Using the ground as a heat source (for heating) & heat sink (for cooling)

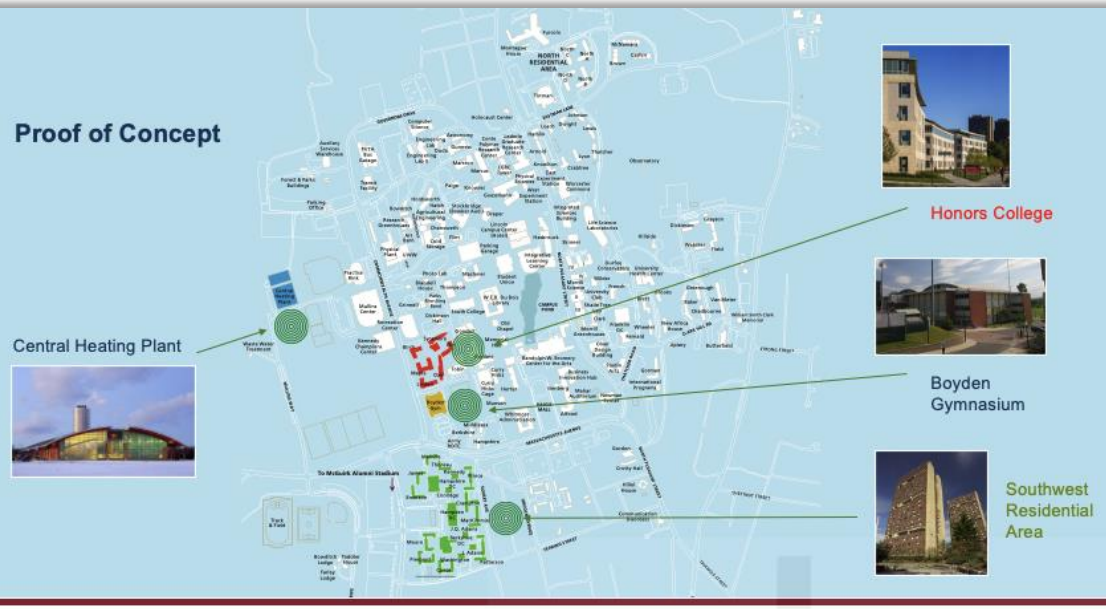
2 MAJOR TYPES

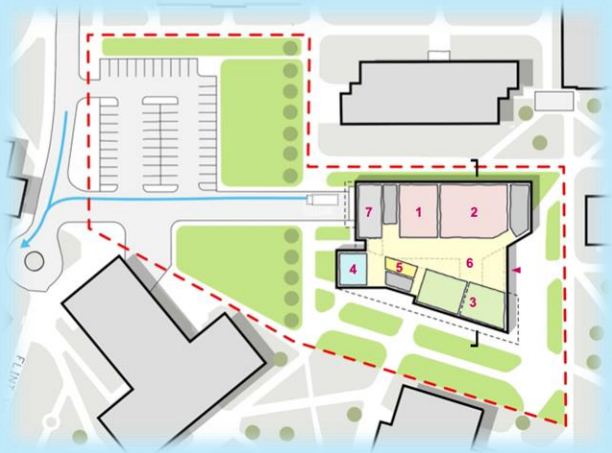
VERTICAL
Deep bore holes or wells

HORIZONTAL
Pipes buried 5+ feet under a field or open space



Proof of Concept





Sustainable Engineering Laboratories

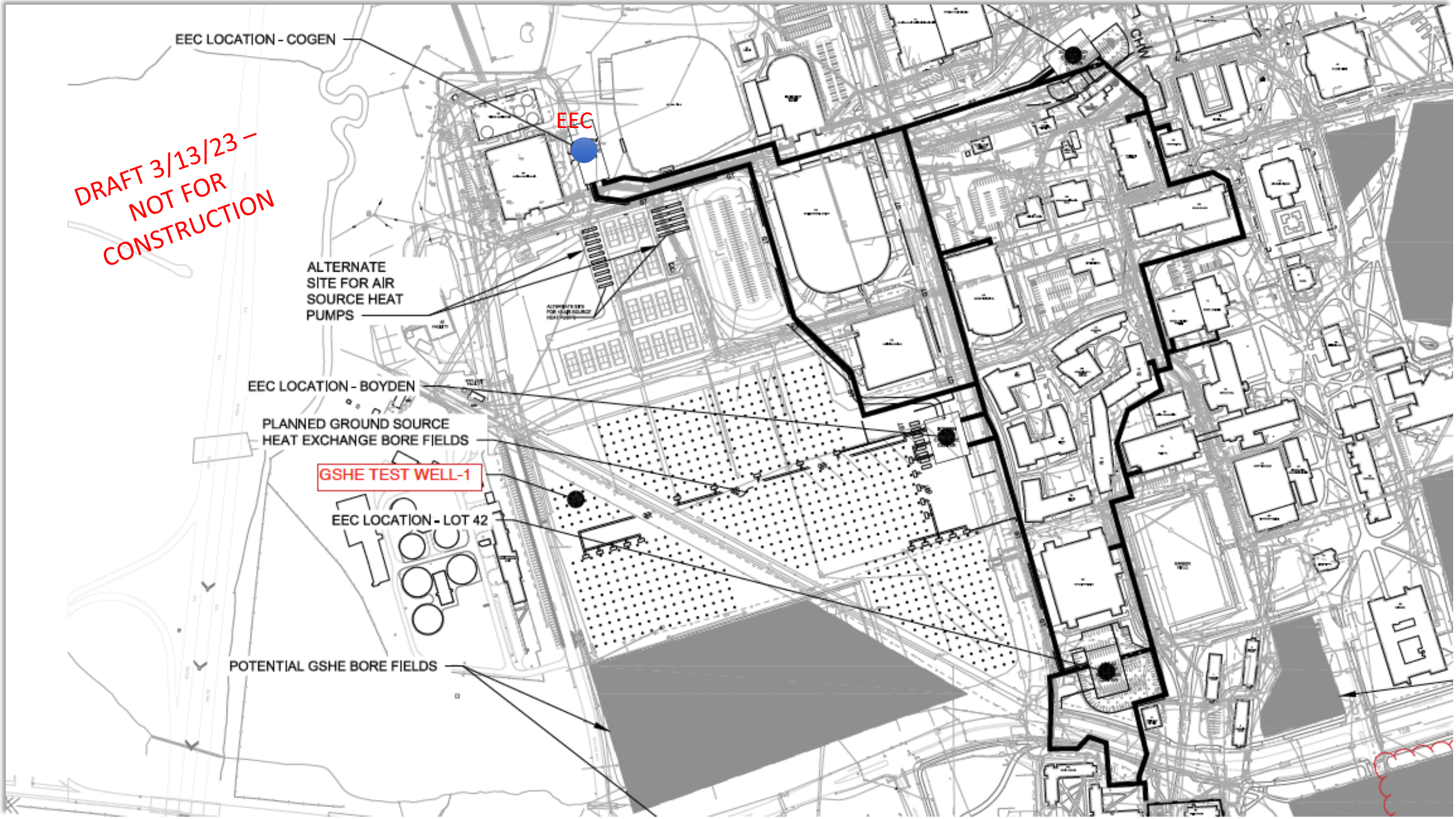
CSL

SEL

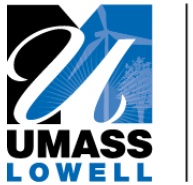
EEC

Computer Science Laboratories

University of Massachusetts Amherst


EEC LOCATION - COGEN
EEC
DRAFT 3/13/23 – NOT FOR CONSTRUCTION
ALTERNATE SITE FOR AIR SOURCE HEAT PUMPS
EEC LOCATION - BOYDEN
PLANNED GROUND SOURCE HEAT EXCHANGE BORE FIELDS
GSHE TEST WELL-1
EEC LOCATION - LOT 42
POTENTIAL GSHE BORE FIELDS
CHW

Incorporating decarbonization into capital projects

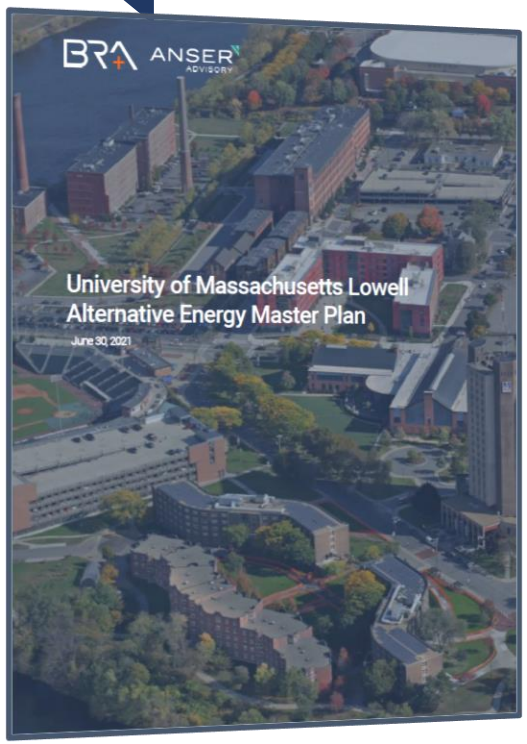


RIST INSTITUTE FOR SUSTAINABILITY & ENERGY

Craig Thomas

Director, Sustainability

UML Alternative Energy/Decarbonization Plan



- Significant success with low-hanging fruit (energy efficiency)
  - Largest accelerated energy project in the state when completed ($23.1 M, 2018/19)
- Buy-in needed for next steps to decarbonization
  - Difficulties include designer alignment, support for new systems
- Realities of UMass Lowell capital projects
  - Budgets restrictions require careful planning and, sometimes, tough choices
- Plan structure – good, better, best approach
- How are we implementing it today?

Project example – Olney Hall

- Major capital projects in design and construction
  - Ball Hall, Olney Hall, Olsen Hall, Weed Hall
- Olney Hall largest capital project in UML's history
  - Very complex addition to large building (205,000+ sqft)
- Plan guides project conversations today
  - Plan helps us work together on an integrated approach
  - Focus on utility corridors to allow for future expansion
  - Long-term planning for geothermal conversation of North Power Plant and opportunities at Olney
  - New proposal for changes to unique heating zone with mid-term solution

- Consensus building is necessary BEFORE getting in a room with designers
- Continue to reinforce your plan concepts in each meeting – new ideas are likely to keep coming up!

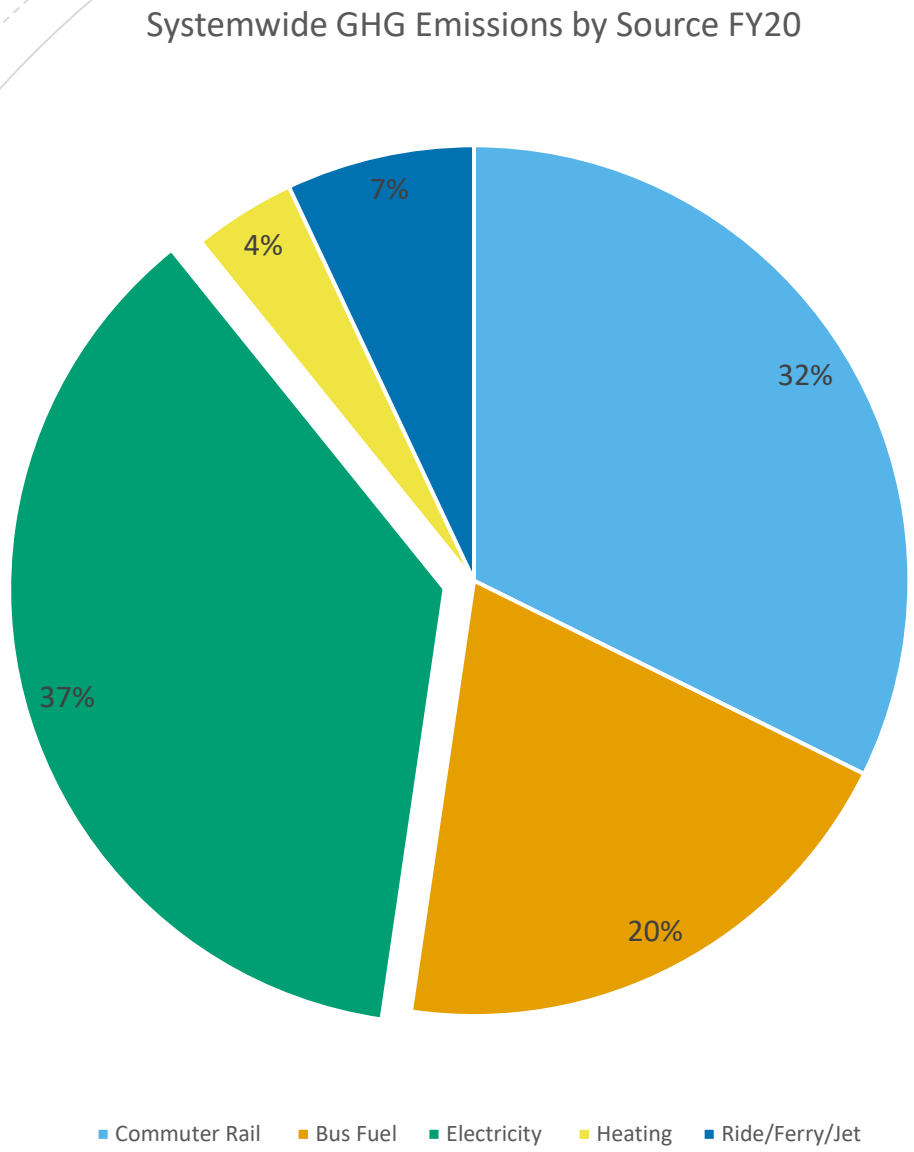
REC Purchases
How the MBTA eliminated it electrical footprint

MBTA

Sean Donaghy

What to do about electricity emissions?

- MBTA is Electrifying and Expanding
- Electricity Emissions Significant portion or portfolio
- MBTA is also a Utility

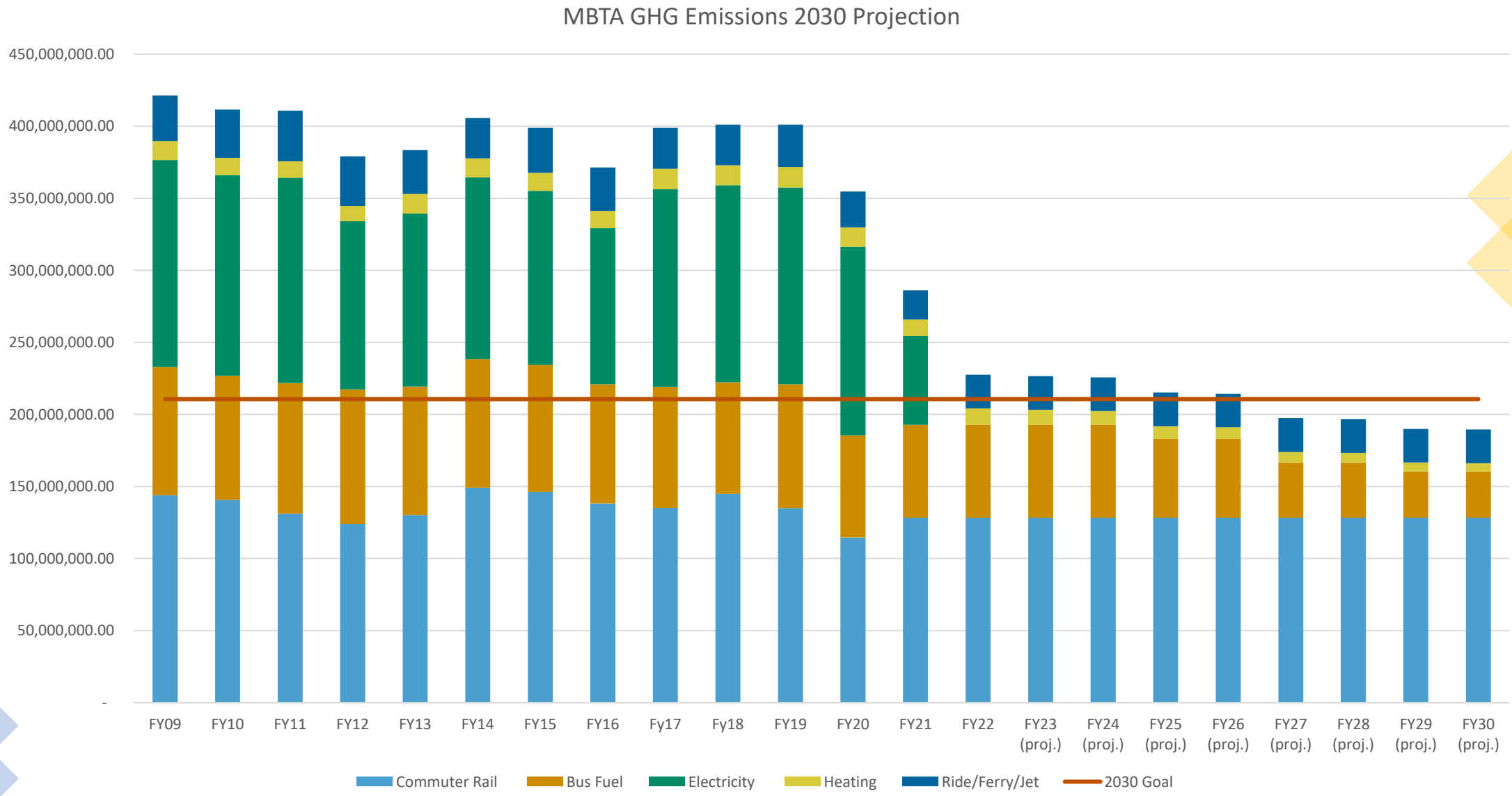

Systemwide GHG Emissions by Source FY20
32%
20%
37%
4%
7%
Commuter Rail
Bus Fuel
Electricity
Heating
Ride/Ferry/Jet

Purchase of Class 2 RECs

- Purchased Class 2 RECS from Maine as part of our power purchase agreement
- 427,000 RECs annually, offset 100% of electricity emissions
- $2/REC; $854,000 Annually; 2.3%+ in electrical cost
- Only requires on paper contractual agreement, No physical infrastructure

3 Step Plan

- Today: Purchasing Class 2 RECS from Maine
- Tomorrow: Increasing our Class 1 RECs and own Generation
- Future: VPPA for direct supply of MBTA load


MBTA GHG Emissions 2030 Projection
450,000,000.00
400,000,000.00
350,000,000.00
300,000,000.00
250,000,000.00
200,000,000.00
150,000,000.00
100,000,000.00
50,000,000.00
-
FY09
FY10
FY11
FY12
FY13
FY14
FY15
FY16
Fy17
Fy18
FY19
FY20
FY21
FY22
FY23 (proj.)
FY24 (proj.)
FY25 (proj.)
FY26 (proj.)
FY27 (proj.)
FY28 (proj.)
FY29 (proj.)
FY30 (proj.)
Commuter Rail
Bus Fuel
Electricity
Heating
Ride/Ferry/Jet
2030 Goal

Solar PV Rooftops and Canopies

Chris Drowne, ITIL v3
Project/Space Planning Manager
Division of Operations - Capital Planning
Bridgewater State University

Why BSU Went Solar

- Reduce BSU electric consumption
- Took advantage of fixed rates through the PPA (Power Purchase Agreement)
- Put unused space to use (Rooftops)
- Working towards the reduction of our carbon footprint
- Solar Arrays add cover within the parking lots

How We Did It

- Conducted comprehensive roof assessments
- Identified roofs on campus that were no older than 10yrs
- Prioritized sites that provided the best unobscured sunlight
- Work with a local electrical contractor to facilitate the construction
- Ensure your Facilities and IT Department are involved

Some Lessons Learned…

Get ready for challenges
- Cranes
- Material Delivery
- Pedestrian Traffic
- Noise

Project Management and Communication is important

Timelines around the project can be challenging

Get ready for delays with the Utility vendor (NGrid)

Don't forget the Snow Deflectors for parking Array projects

solectenergy
Power Your Tomorrow

Project Reference Manual

Bridgewater State Miles/DiNardo

SYSTEM LOCATION: **75 & 115A Burrill Ave, Bridgewater, MA 02324**

DC SYSTEM SIZE: **145.9 kW**

PERMISSION TO OPERATE: **1/3/23**

solectenergy
Power Your Tomorrow

Project Reference Manual

Bridgewater State - Weygand Hall

SYSTEM LOCATION: **351 Great Hill Drive, Bridgewater, MA 02324**

DC SYSTEM SIZE: **110.2 kW**

PERMISSION TO OPERATE: **1/3/23**

solectenergy
Power Your Tomorrow

Bridgewater State - Science & Math Center

Project Reference Manual

SYSTEM LOCATION: **24 Park Ave, Bridgewater, MA 02324**

DC SYSTEM SIZE: **137.7 kW**

PERMISSION TO OPERATE: **8/1/22**

solectenergy
Power Your Tomorrow

Bridgewater State – Operations Center

Project Reference Manual

SYSTEM LOCATION: **200 Great Hill Drive, Bridgewater, MA 02324**

DC SYSTEM SIZE: **136.0 kW**

PERMISSION TO OPERATE: **8/10/22**

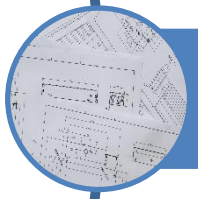
DOER
Massachusetts Department of Energy Resources

Highlighting State Entity Decarbonization Efforts

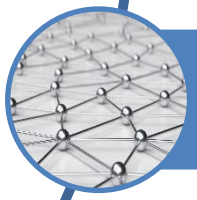
Coming soon: LBE Decarbonization Webpage

Context for decarbonizing state facilities (onsite fossil fuel emissions of state portfolio, EO 594, etc.)

State entity efforts and progress to date



Summaries and key findings from higher education campus decarbonization studies



Tools, toolkits, and resources

Related laws, policies, and programs (e.g., Net Zero by 2050, CECPs, Mass Save)

Interested in providing feedback before spring release?

Please reach out to Ryan.Kingston@mass.gov

Next LBE Council Meeting

Save the Date!

Tuesday, May 9th

10am-12pm

Tentative Upcoming Meeting Dates:
July 11th
August 8th