July 9th, 2024

DOER Leading by Example Council Meeting

Leading by Example Council Meeting Agenda

- **Welcome**
- **Climate News and Updates**
- **Small Group Discussions**

LBE Welcomes Huda Elhout!

Huda is interning with the LBE Team this summer; she is about to graduate with a Master's Degree in Sustainability Science from UMass Amherst

"I hope to combine my data analysis skills with my inclination for problem solving to better inform and move us towards a decarbonized future."

Climate News & Updates

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June Heat Wave in Massachusetts/Northern Hemisphere

- Due to June heat dome, people in the Midwest and Northeast saw a string of record-breaking hot temperatures
- The darkest reds indicate temperatures of more than 93 degrees Fahrenheit (34 degrees Celsius)
- Boston, Massachusetts, hit 98°F on June 19, 2024. Compared to previous record high of 96°F on June 19, 1923

Don't forget to take energy saving actions (i.e., load shed) over the summer, especially on potential peak days!

Sources: Boston smashes high temp record, 108 heat index, as 'dangerous heat' peaks in Massachusetts (msn.com); A Blast of Heat in the East (nasa.gov)

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New Energy Transformation Advisory Board

*The Healey-Driscoll administration has announced a **new Energy Transformation Advisory Board** that will explore solutions to shut down or convert existing fossil fuel power plants*

The Board has three primary priorities for accelerating the clean energy transition and reducing fossil fuels:

1) Transitioning away from the Everett Marine Terminal LNG (the region's only LNG facility)

2) Changing the way MA meets peak electricity demands

3) Finding creative ways to pay for the transition

For example, this might result in keeping ”peaker” plants but changing the power source to clean energy

- West Springfield facility (already decommissioned) exploring large battery storage system
- Offshore wind being considered for the Canal Station facility in Sandwich

Source: Healey administration charts a course beyond fossil fuels (bostonglobe.com)

Innovative Tech Spotlight

Floating Solar Panels

"Floatovoltaics" = the same photovoltaic technology and connections, except they float!

- Panels are set atop floating platforms, with tethers from the platform to the bottom or shoreline of lakes, reservoirs, or quarries
- Water provides cooling for photovoltaic panels, so they continue operating efficiently
- Panels can reduce water evaporation
- Eligible under SMART Program

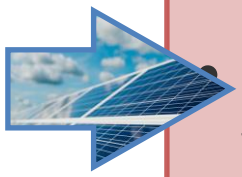
Pictured: Water treatment pond in Healdsburg, CA

Source: Coming soon to a lake near you: Floating solar panels | Grist

Straw Proposal: Opportunities for Learning & Input

July 10th @ 1–3 PM (**TOMORROW**!)

- Learn about proposed policy changes and ask questions during a presentation about SMART Straw Proposal



- **Recording of the webinar found here**

July 22nd and 23rd

- In-person technical session at Connolly Center in Boston
- 1 representative per stakeholder per session; deadline to register here is July 17th

July 29th

- Virtual technical session covering same content as in-person sessions
- Deadline to register here is July 24th

Note: The Straw Proposal will be posted to the DOER website ***after the webinar*** for review, along with a recording of the webinar.
Please contact doer.smart@mass.gov with any questions on the schedule.

Community Scale Geothermal Pilot in Framingham

- The country's first utility-run geothermal heating and cooling system underway in Framingham
- Eversource's networked geothermal pilot includes 24 homes, the Framingham public schools welcome center, a Gulf gas station, the fire department, and housing authority
- Participants can expect their electric bills to drop by 20% on average
- Eversource will evaluate system performance over two full heating and cooling seasons, examining technology performance, costs, environmental benefits, and customer acceptance

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Hurricane Beryl: Intense Start to Hurricane Season

- June 28-29 – rapidly intensifies into a Hurricane with winds from 35-75 mph; furthest east a hurricane has formed in the month of June
- June 30 – intensifies again into a category 4 hurricane, the first of its kind to form in June beating the previous earliest category 4 storm by 9 days
- July 2 – further intensifies into a category 5 hurricane, the earliest storm at this level by two weeks, becoming the strongest July storm on record with 165 mph winds
- Historically, major hurricanes develop *after* September 1st…
- Record ocean temps and low wind shear contributed to Beryl's explosive intensification

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MA Senate Passes Omnibus Climate Bill

If this bill becomes law, it could potentially…

Expand Clean Energy

- Reforming siting and permitting
- Rethinking clean energy procurements
- Promoting innovation

Reduce Building Emissions

- Prioritizing geothermal and transition from gas
- Examine gas infrastructure projects to accelerate transition to clean energy

Help Consumers

- Lower utility rates for low- and middle-income consumers
- Lower overall rates via more flexible state negotiation
- Ban competitive suppliers

Increase EVs and Charging

- Help cities, towns, and condo owners go electric
- Maximize state coordination on infrastructure
- Extend MOR-EV Program

Source: Mass Senate Fact Sheet - Office of Senate President Karen E. Spilka

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Breezy Milestone Reached for Vineyard Wind 1 Project

- Vineyard Wind 1 is now delivering **over 136 MW of clean energy** to the local grid, making it the largest operating offshore wind project in the US
  - The project currently operates ten turbines
- When fully operational, Vineyard Wind 1 will generate 806 MW of electricity, enough to power over 400,000 homes and businesses in Massachusetts

The Climate Debate: Glass Half Empty or Half Full?

The Good News

- Solar and wind power has become more affordable
- 2023 had a 23% jump in solar generation and 10% jump in wind generation
- Global fossil fuel production grew less than 1% in 2023
- Batteries are playing a bigger role in the grid

THE BAD NEWS

- CO_2 concentration reached an all-time high last year

Source: The New York Times

“Tree Campus” Program for Higher Education

Learn more at the Arbor Day Foundation

The Arbor Day Foundation has created a program that recognizes campuses that are dedicated to creating trees and green space.

Campuses can get recognized by meeting 5 standards:

- Establishing a campus tree advisory committee
- Showing evidence of a campus tree care plan
- Verifying the plan’s dedicated annual expenditures
- Observing Arbor Day
- Creating a service-learning project aimed at engaging the student body

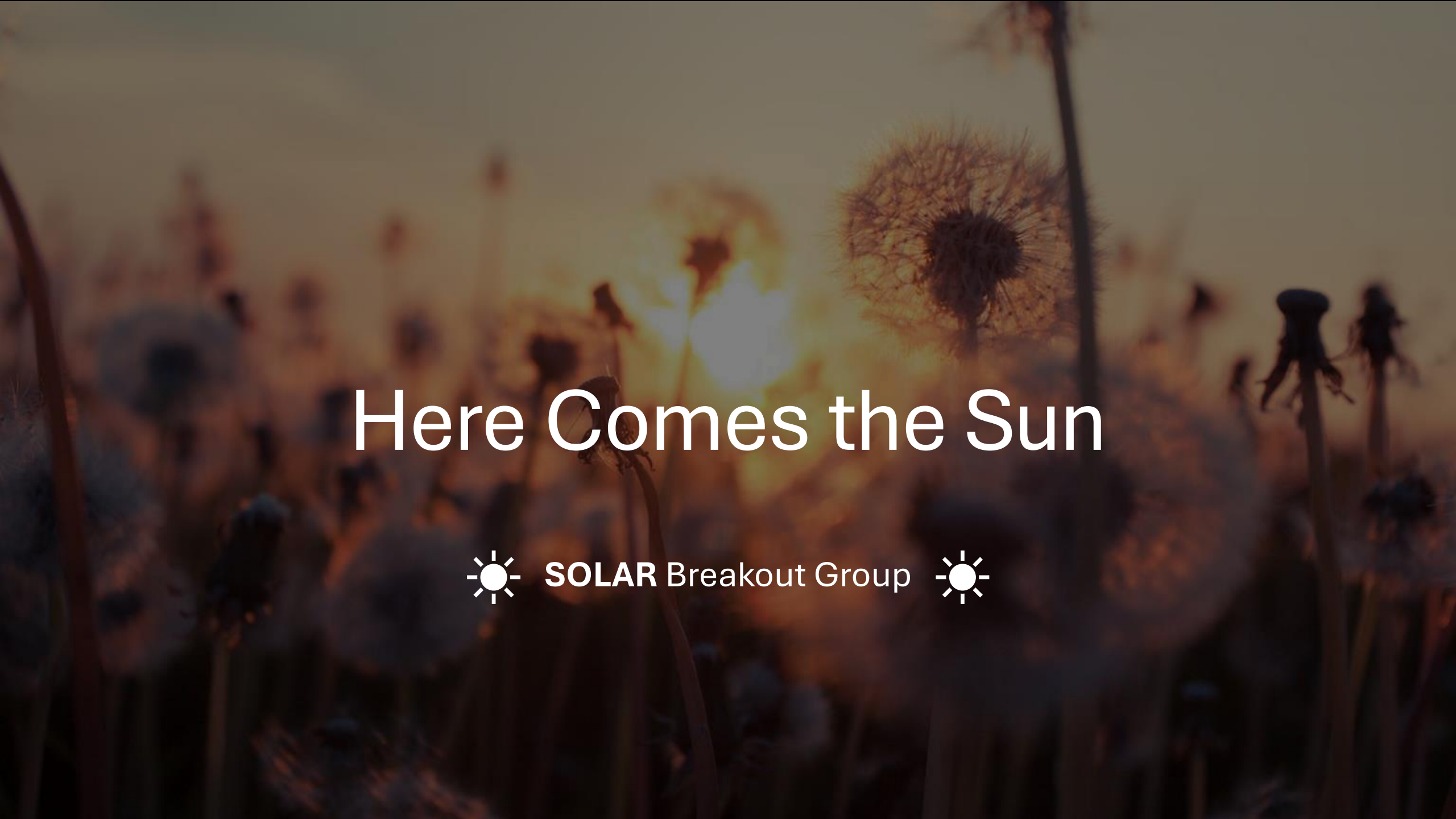
Poll Question

Would your higher ed institution be interested in becoming a Tree Campus?

Breakout Sessions: Small Group Discussions

- Leveraging energy data
- Solar deployment
- Electric vehicles and charging
- Embodied carbon
- Electric landscaping equipment & pollinator habitats
- Decarbonization roadmaps

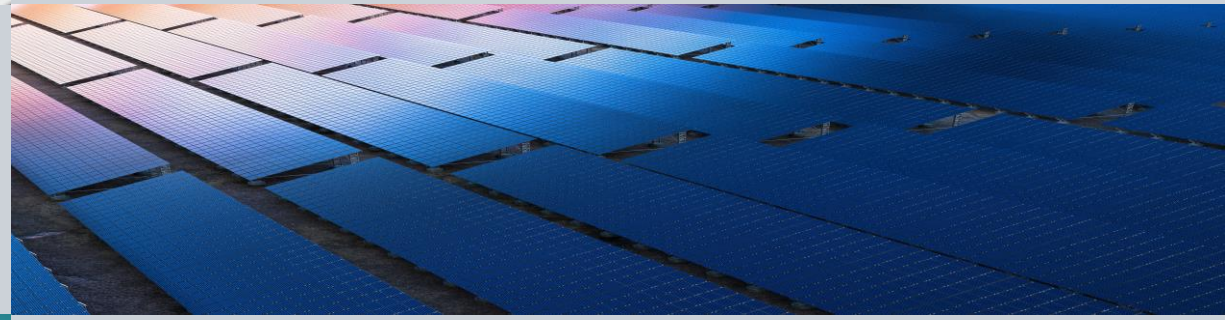
Breakout Session Slides & Resources


Here Comes the Sun
SOLAR Breakout Group

Solar panels are usually made from silicon, or another semiconductor material installed in a metal panel frame with a glass casing →

When this material is exposed to photons of sunlight (very small packets of energy) it releases electrons and produces an electric charge

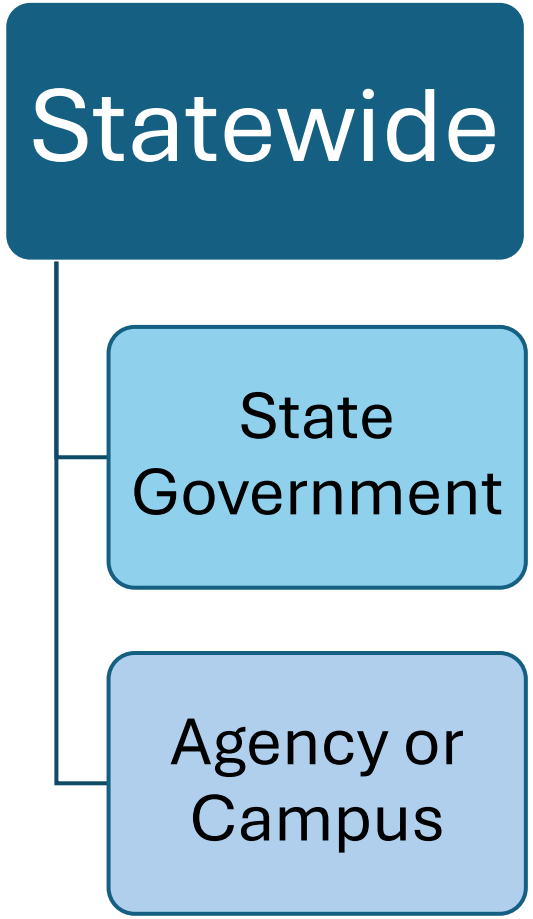
This PV charge creates an electric current (specifically, direct current or DC), which is captured by the wiring in solar panels



This DC electricity is then converted to alternating current (AC) by an inverter; AC is the type of electrical current used when you plug appliances into normal wall sockets

Source: https://www.nationalgrid.com/stories/energy-explained/how-does-solar-power-work

Examples of the Value of of Solar Generation



- Regional greening of the grid (e.g., Clean Energy & Climate Plan)
- Meeting economy-wide Net Zero Emissions by 2050
- Diverse renewable portfolio

Executive Order 594 directives:

- Onsite fossil fuel emissions reductions and integrated decarbonization
- Optimize onsite solar generation, especially with battery energy storage

- Potentially significant electricity cost and demand charge savings
- Cost certainty as grid electricity prices fluctuate
- Visual commitment to clean energy initiatives
- Ancillary benefits (e.g., reduced heat island effect)

Potential Siting Considerations

Rooftop

- Roof age <5 years
- Ideally flat or low-pitch
- Limited rooftop obstructions or equipment
- Minimal shading
- Building orientation relative to south
- Weight-bearing capacity

Ground-Mount

- Proximity to building(s) with onsite load
- Flat, clear ground
- No critical habitat or environmental protection status
- Access to electrical service
- Low flood risk
- Pollinator habitat opportunity

Canopy

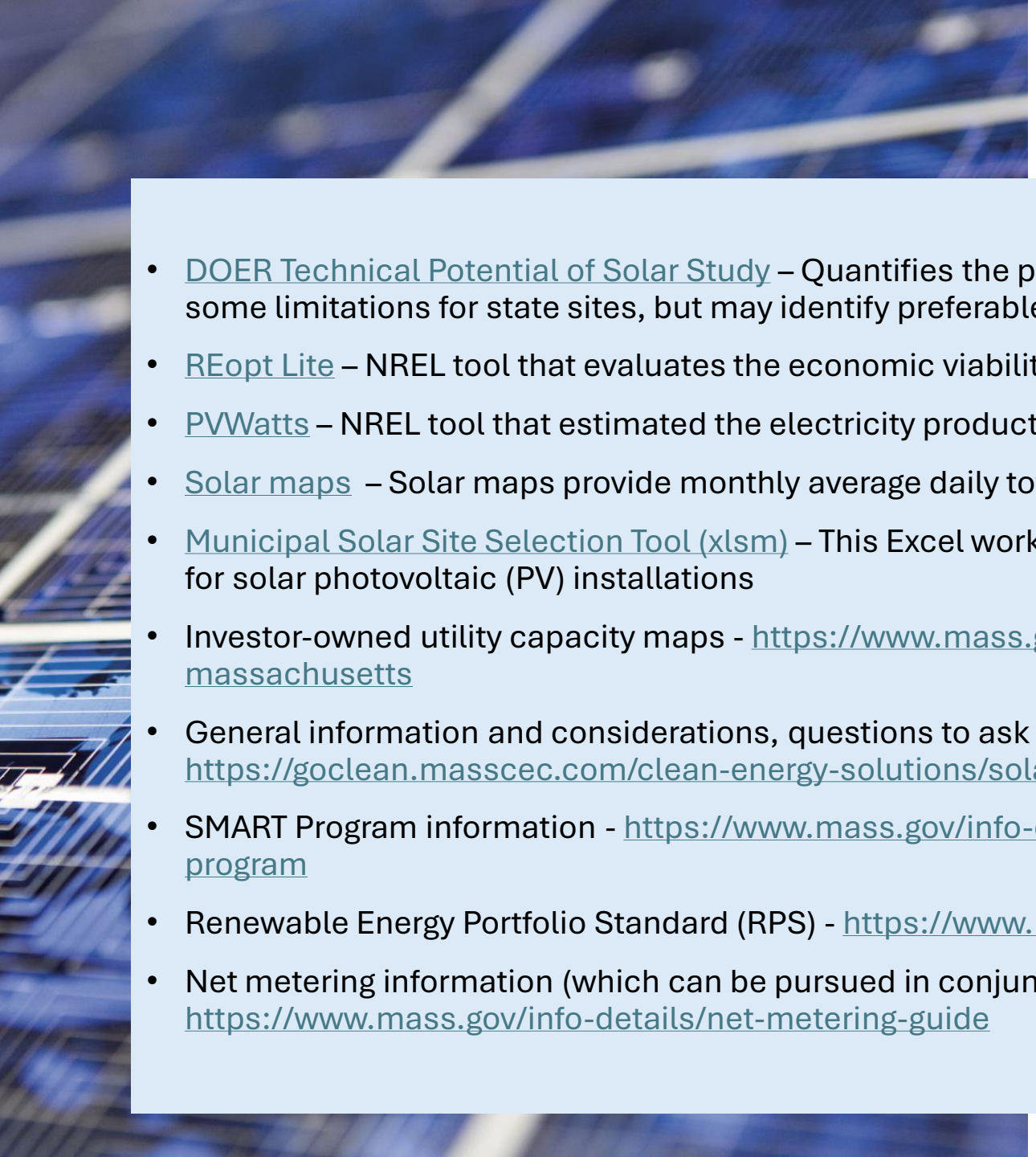
- Available space (e.g., parking lot size at least 3,000 square meters)
- Minimal shading or can be affixed to an existing structure that shades the lot
- Access to electrical service
- Low flood risk

Other Solar Applications

Solar Thermal Systems

Off-Grid EV Charging & Street Lighting

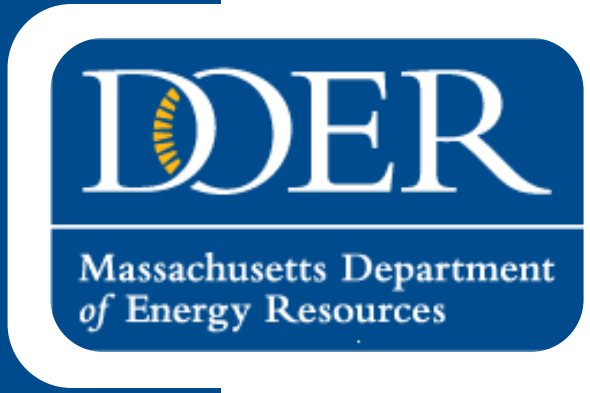
Floating Photovoltaics



Additional Resources

- DOER Technical Potential of Solar Study – Quantifies the potential for solar installations in a geospatial analysis; some limitations for state sites, but may identify preferable locations for solar
- REopt Lite – NREL tool that evaluates the economic viability of grid-connected systems
- PVWatts – NREL tool that estimated the electricity production for a grid-connected system
- Solar maps – Solar maps provide monthly average daily total solar resource information on grid cells
- Municipal Solar Site Selection Tool (xlsm) – This Excel workbook from RMI aids in efficiently identify promising sites for solar photovoltaic (PV) installations
- Investor-owned utility capacity maps - https://www.mass.gov/info-details/utility-interconnection-in-massachusetts
- General information and considerations, questions to ask developers, & installer resources https://goclean.masscec.com/clean-energy-solutions/solar-electricity/
- SMART Program information - https://www.mass.gov/info-details/solar-massachusetts-renewable-target-smart-program
- Renewable Energy Portfolio Standard (RPS) - https://www.mass.gov/info-details/program-summaries
- Net metering information (which can be pursued in conjunction with RPS or SMART participation) - https://www.mass.gov/info-details/net-metering-guide

Creating A Clean, Affordable, Equitable and Resilient Energy Future For the Commonwealth



COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENERGY RESOURCES
Elizabeth Mahony, Commissioner

LBE Council Meeting: Leveraging Your Data

July 9, 2024

Sophia Vitello, DOER Leading by Example Division
Sophia.vitello@mass.gov

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Why is data important?

How can we use data?

- Progress reporting
  - EO594, OCIR goals
- Inform electrification/decarbonization planning & prioritization
- Identify highest emitting/energy-consuming sites
- Fleet analysis for electrification transition planning & prioritization

LBE & DCAMM have much of the data already available to provide in helpful formats

Energy use & emissions analysis

- Site-level, campus/agency-level, secretariat-level
- Agency comparisons
- Site comparisons
- Energy use intensity (EUI)
- Individual building analysis & comparisons
- Real-time energy usage

Fleet & EVSE analysis

- DRVE tool

LBE Data Tracking and Progress Reporting

- Collect data for each entity in the LBE portfolio using a variety of resources, including:
  - Annual LBE entity tracking form
  - Online utility energy databases (MEI & CEI)
  - Fuel delivery vendor reports
  - CAMIS (sq. footage)
  - PTS (solar generation)
- Report annually on portfolio and agency/campus progress towards EO594 targets
- Publish progress dashboard annually

Entity Data Tracked for EO594 Reporting
Electricity consumption
Building fuel consumption
Vehicle & other fuel consumption
On-site and total GHG emissions
Square footage
Zero emission vehicles in fleet
EV charging station deployment

LBE Progress Dashboard

Click here to view & download the dashboard

Section 1: Overall Onsite Fossil Fuel Emissions

NEXT SECTION

	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20*	FY21*	FY22	FY25	FY30	FY40	FY50
Total Annual Emissions (MTCO2e)	######	653,162	615,221	######	######	617,496	######	591,354	526,471	542,741	######	555,093	522,825	543,033	561,013	554,867	512,505	513,058	524,069	526,615	427,875	263,307	32,913
Reduction from FY04 (% change)	0%	-1%	-7%	-8%	-10%	-6%	-12%	-10%	-20%	-18%	-13%	-16%	-21%	-18%	-15%	-16%	-22%	-22%	-20%	-20%	-35%	-60%	-95%
Reduction from FY04 (MTCO2e)	0	5,106	43,048	52,400	64,471	40,772	79,876	66,915	131,797	115,528	86,236	103,175	135,444	115,236	97,256	103,401	145,763	145,210	134,199	131,654	230,394	394,961	625,355

EO 594 Onsite Fossil Fuel Reduction Targets

* FY20 & FY21 onsite fossil fuel emissions progress includes impacts derived, in part, from COVID-19 related closures.

Chart 1: Annual Onsite Fossil Fuel Emissions Progress & Near-term Targets

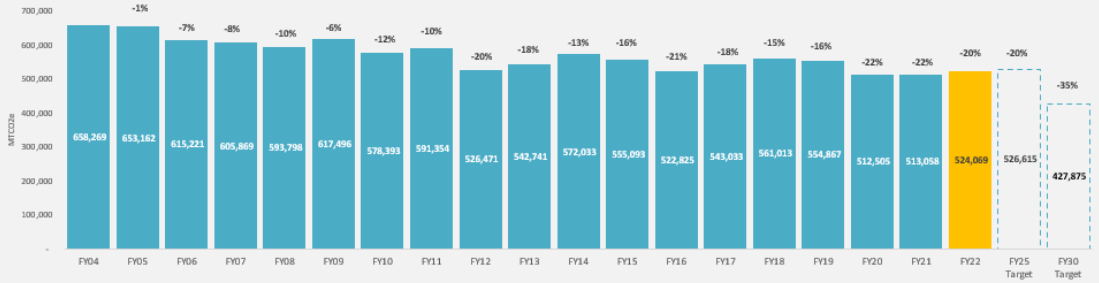
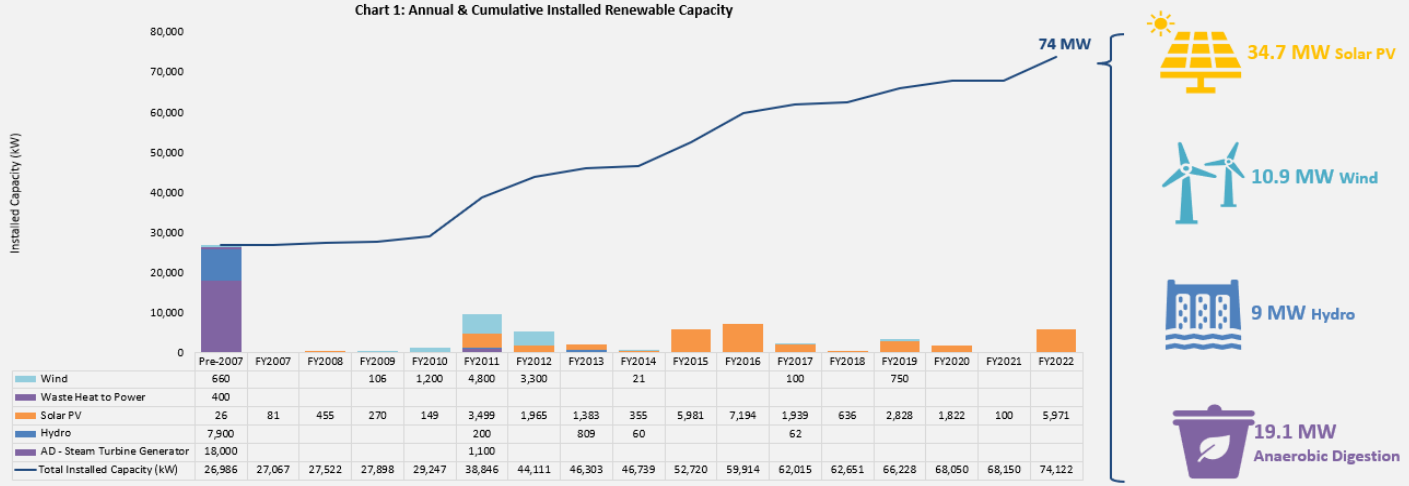


Chart 1: Since the FY04 LBE baseline, state government has reduced onsite fossil fuel emissions by 20%, avoiding more than 134,000 MTCO2e in FY22. Reductions have resulted from a variety of partner efforts including large scale energy projects, elimination of emission-intense fuels (such as coal and heavy fuel oil), and transition to cleaner fuel sources. FY20 & FY21 progress reflect impacts from partner efforts as well as reduced operations related to COVID-19 closures.

Section 1: Overall Installed Renewables

Chart 1: Annual & Cumulative Installed Renewable Capacity



	Pre-2007	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022
Wind	660			106	1,200	4,800	3,300		21			100		750			
Waste Heat to Power	400																
Solar PV	26	81	455	270	149	3,499	1,965	1,383	355	5,981	7,194	1,939	636	2,828	1,822	100	5,971
Hydro	7,900					200		809	60			62					
AD - Steam Turbine Generator	18,000					1,100											
Total Installed Capacity (kW)	26,986	27,067	27,522	27,898	29,247	38,846	44,111	46,303	46,739	52,720	59,914	62,015	62,651	66,228	68,050	68,150	74,122

Chart 1: As of FY2022, 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, secretariat-level, & agency/campus-level for:

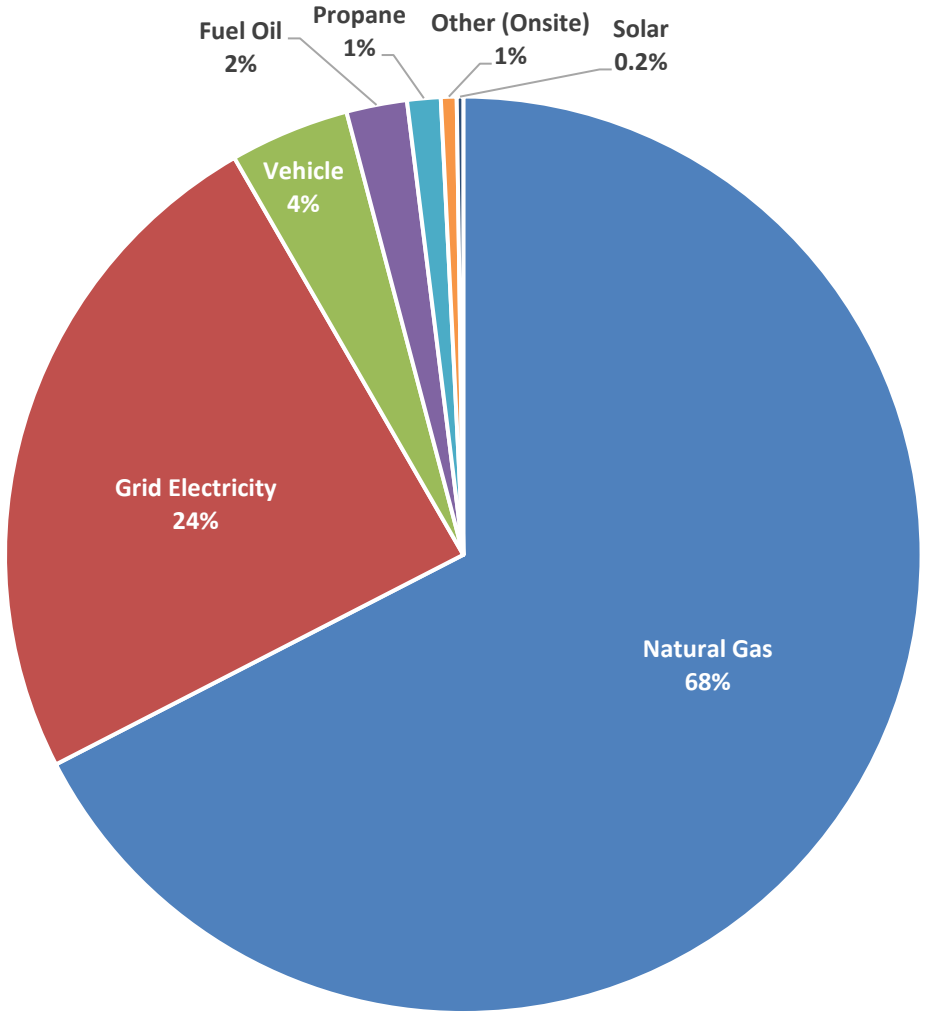
- ↑ Progress Toward EO594 Targets
- Onsite Fossil Fuel Emissions
- Fuel Consumption
- Energy Use Intensity
- State Fleet Composition & Electrification
- EV Charging Stations
- LEED Certified Buildings
- ☀ Installed Renewables
- Sustainable Landscaping
- $ LBE Grants
- Equity

Massachusetts Department of Energy Resources

Data Analysis Example

Energy Consumption Over Time – Secretariat Y

FY22 Secretariat Y Energy Usage by Fuel Type

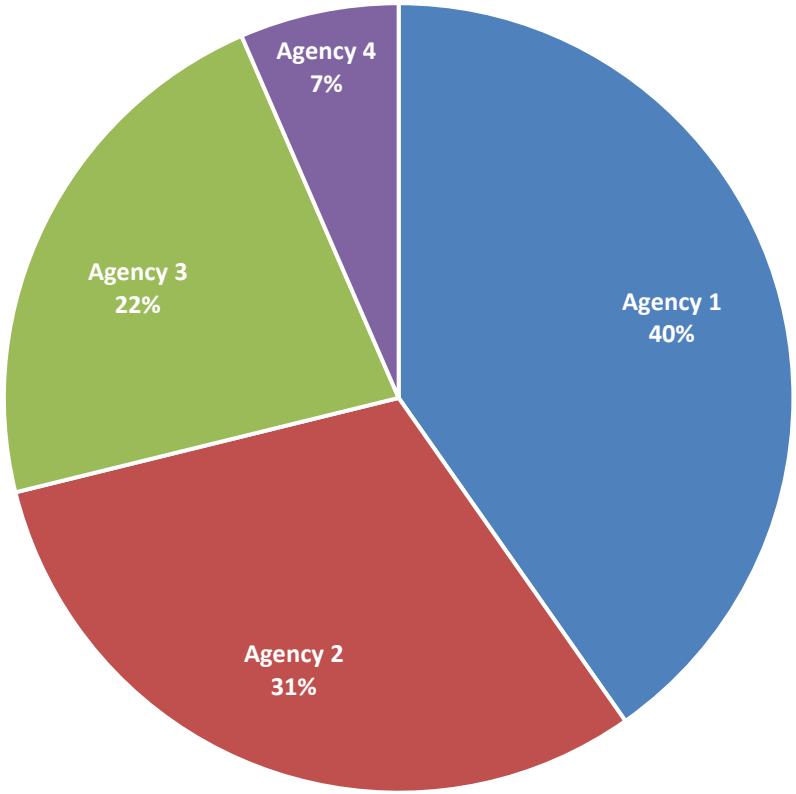


Secretariat Y	FY2004	FY2022	% change from FY04
Natural Gas	394,647,042	494,692,400	25%
Grid Electricity	258,359,001	177,776,071	-31%
Vehicle	82,507,288	33,062,177	-60%
Fuel Oil	927,447,615	15,690,497	-98%
Propane	7,626,879	8,660,464	14%
Other (Onsite)	1,929,895	4,077,611	111%
Solar	0	1,685,475	---
Total kBtus	**1,672,517,720**	**735,644,694**	**-56%**

- Total energy consumption for Secretariat Y has declined by 56% from FY04 to FY22
- Biggest declines have occurred in fuel oil use and vehicle fuels, although both of those fuels make up a small portion of total energy use (6% of FY22 total)
- Natural gas consumption accounts for largest share of current Secretariat Y energy use (68% in FY22)

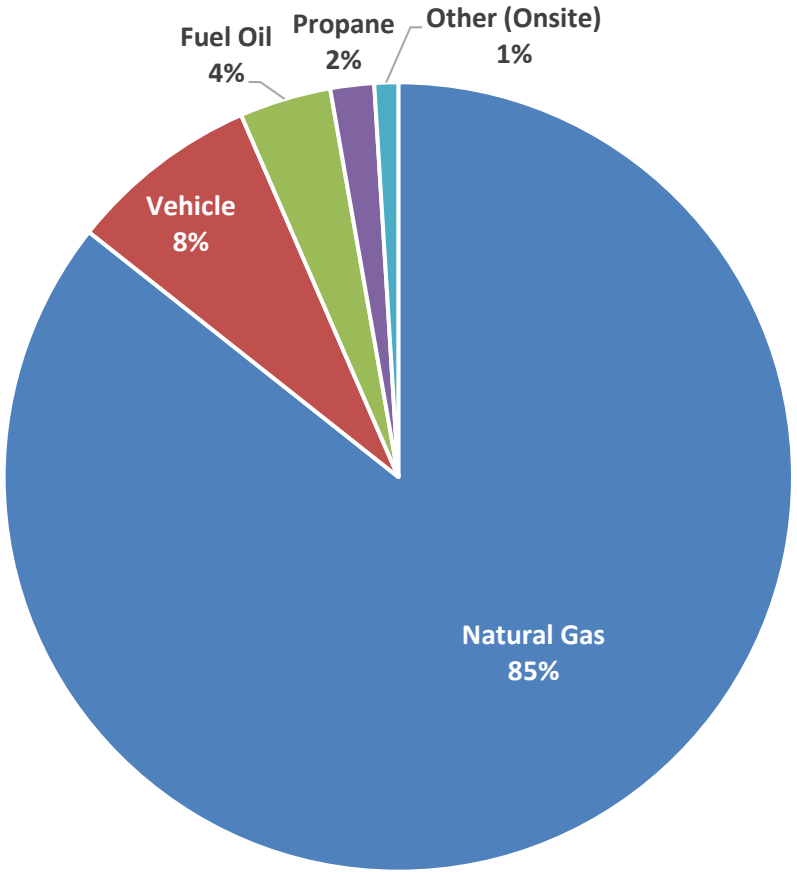
FY22 Onsite Fossil Fuel Emissions Contribution by Agency & by Fuel

FY22 Onsite Fossil Fuel Emissions by Agency



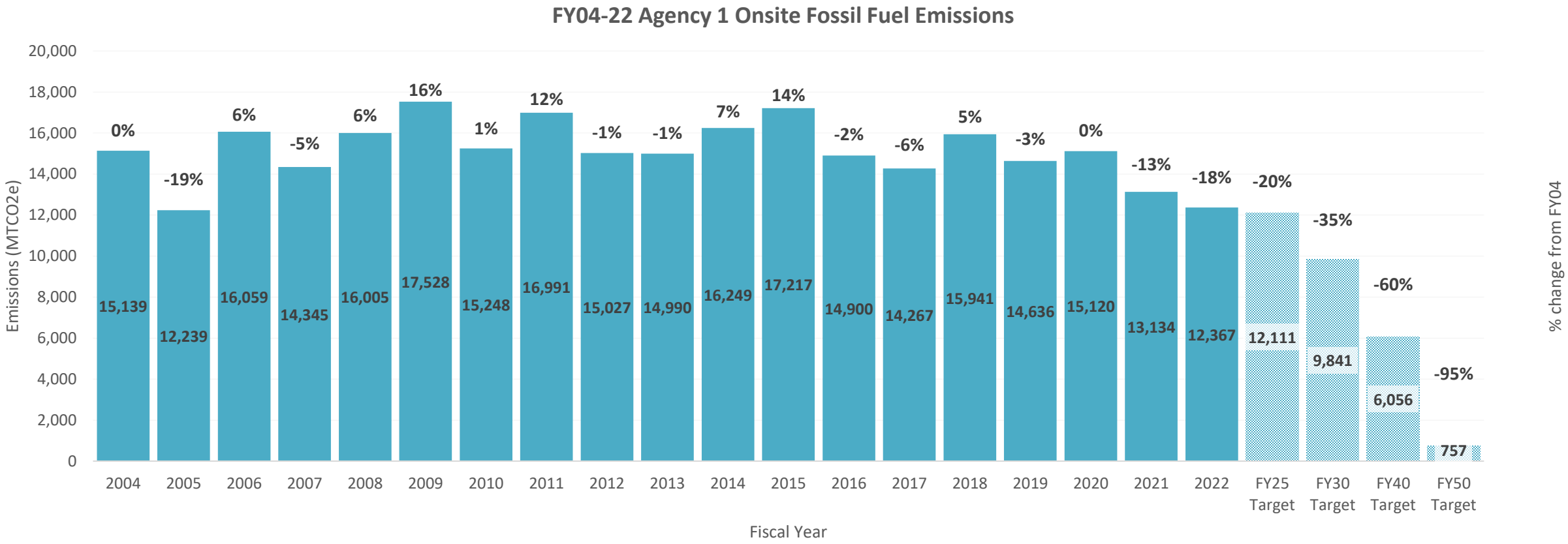
Agency 1 & Agency 2 make up the largest share (71%) of onsite fossil fuel emissions among the major Secretariat Y agencies

FY22 Onsite Fossil Fuel Emissions by Fuel Type



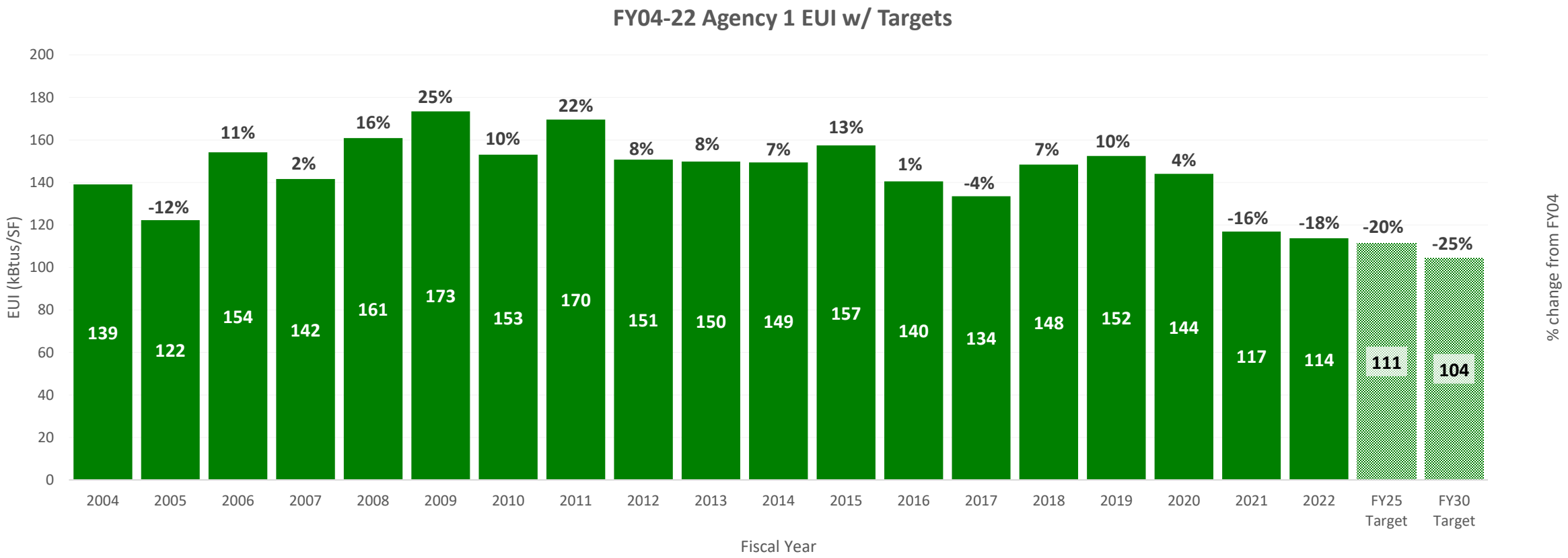
Natural gas emissions make up the largest share (85%) of onsite fossil fuel emissions among the onsite fuels

Agency 1 Onsite Fossil Fuel Emissions



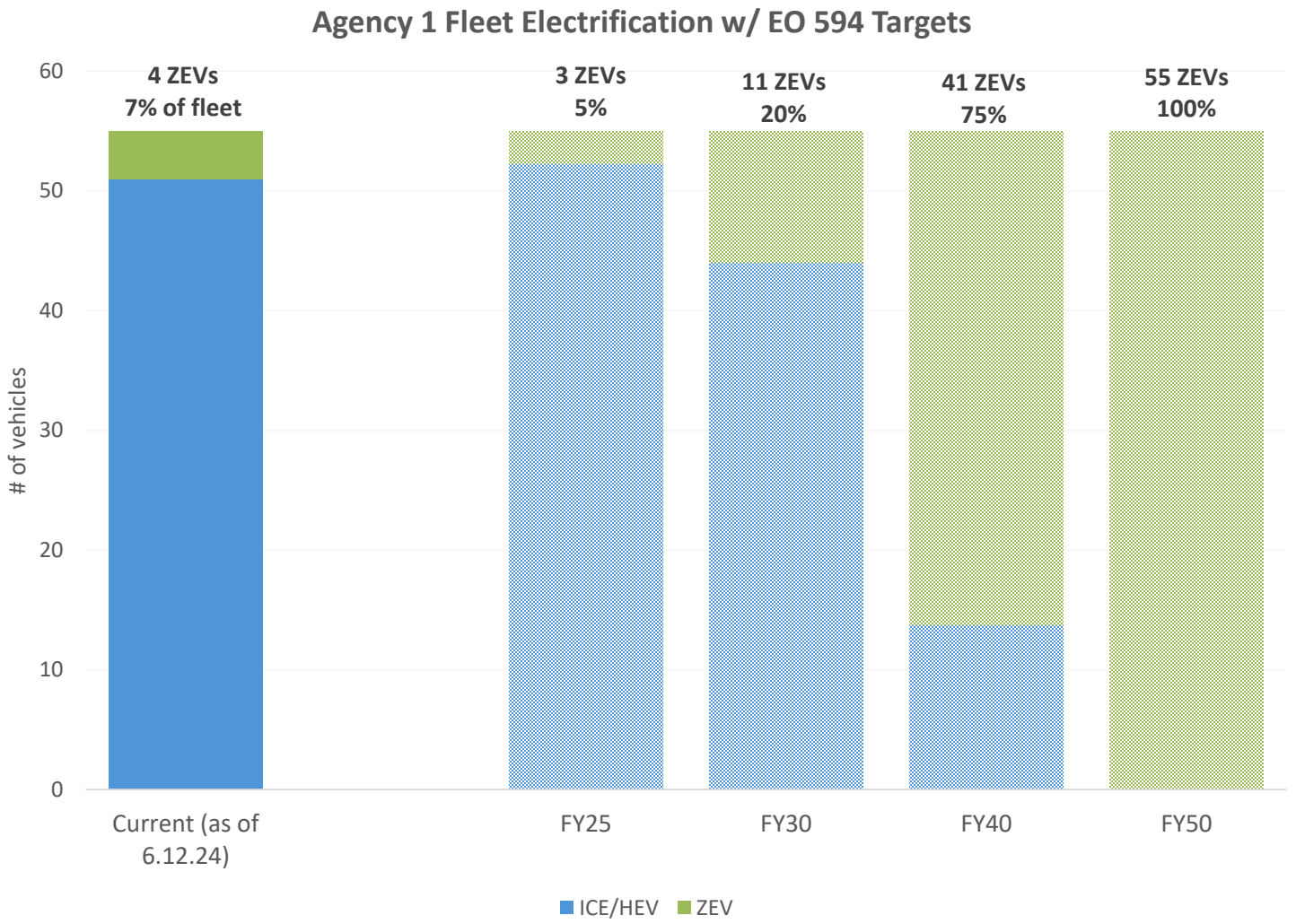
- As of FY22, Agency 1 has reduced onsite fossil fuel emissions by 18% from the FY04 baseline, close to the 20% reduction needed to meet the FY25 target in EO594

Agency 1 Energy Use Intensity (EUI)



- As of FY22, Agency 1 has an EUI of 114 kBtus/SF, an 18% reduction from the FY04 baseline
- EUI has dropped significantly between FY20 and FY21 – FY22. In FY21 & FY22, natural gas consumption at one of the Agency 1 sites dropped greatly, likely due in part to:
  - A campus-wide energy project that has been in progress for about 2-3 years that involved closing certain buildings
  - Reduced occupancy of some buildings

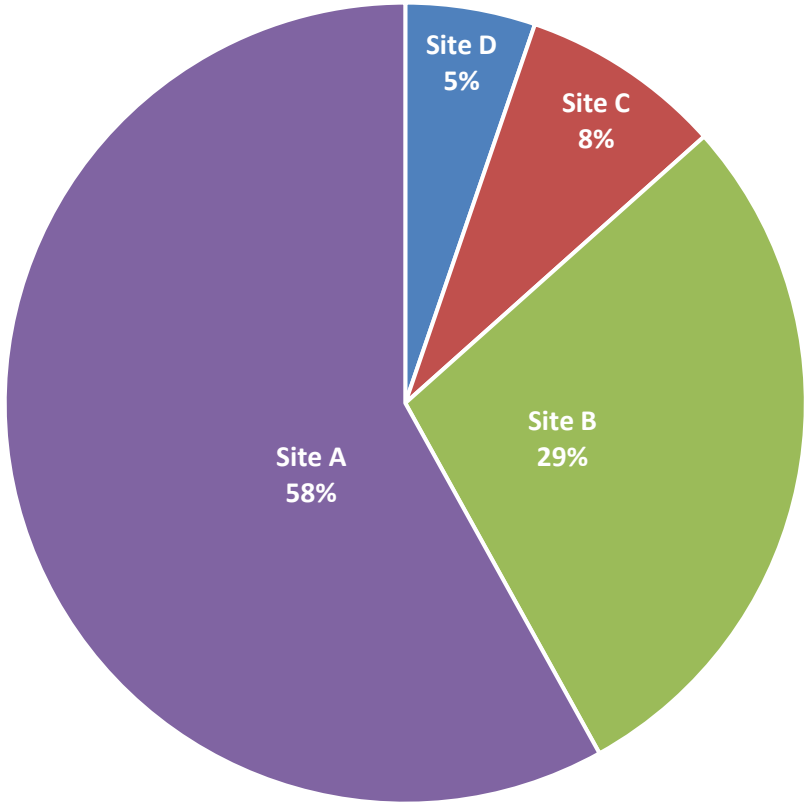
Agency 1 Fleet w/ EO Targets



- **Total fleet size: 55**
- Fleet is primarily pickup trucks & vans with sedans & a few SUVs making up the remainder
- Agency 1 currently has 4 electric vehicles (7% of fleet)
  - Currently have met FY25 goal
- To meet the FY30 goal of the Executive Order, at least 7 zero-emission vehicles (ZEVs) need to be acquired by FY30
- Fleet charging infrastructure would be required to support electric vehicles

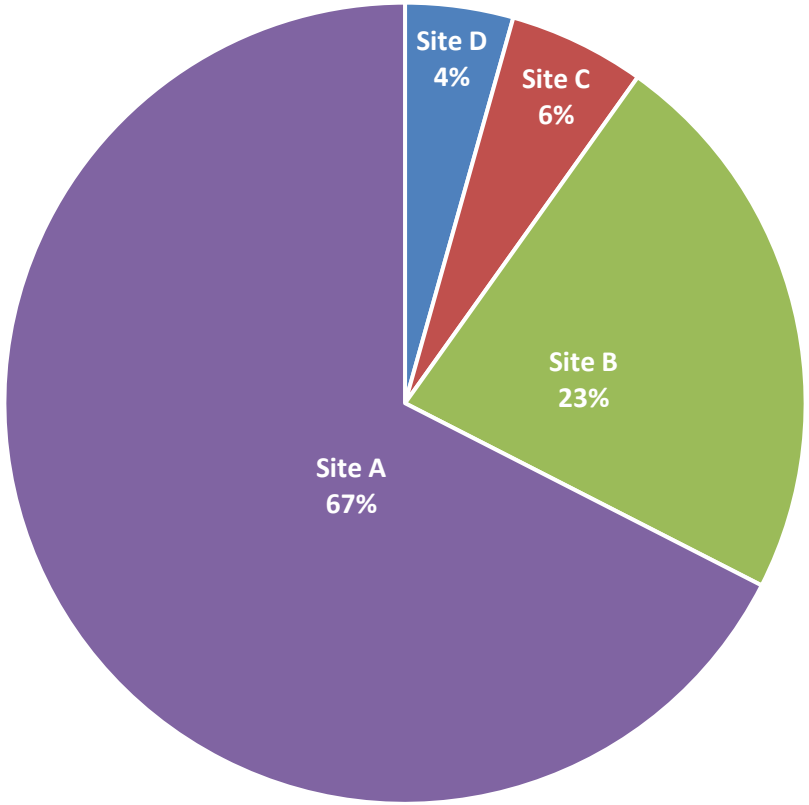
FY22 GHG Emissions by Agency 1 Site

Total GHG Emissions



Note: Chart includes emissions (MTCO2e) from grid electricity, natural gas, and fuel oils

Onsite Fossil Fuel Emissions



Note: Chart includes emissions (MTCO2e) from natural gas and fuel oils – excludes grid electricity

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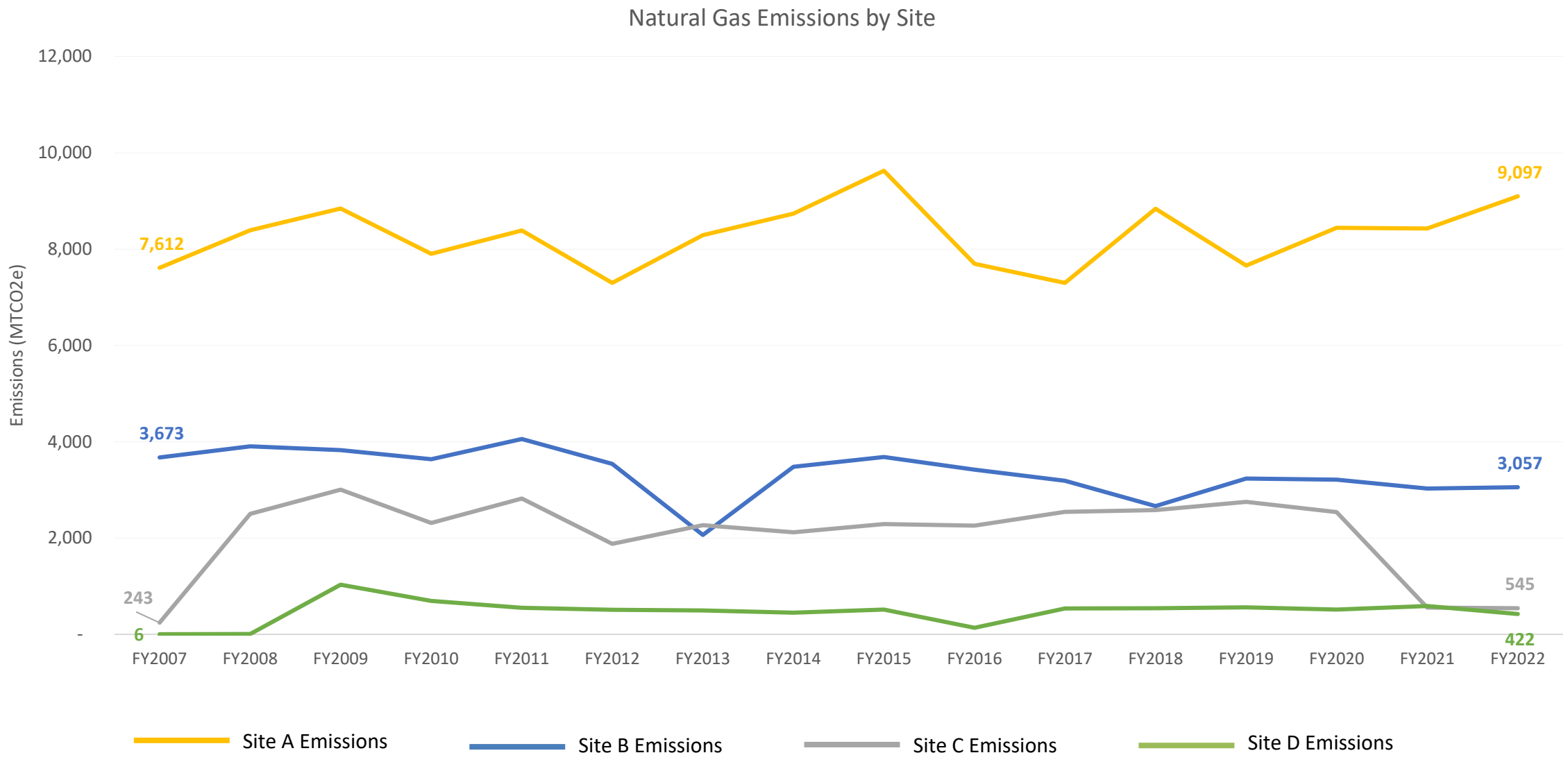
FY07-22 Natural Gas Emissions by Site



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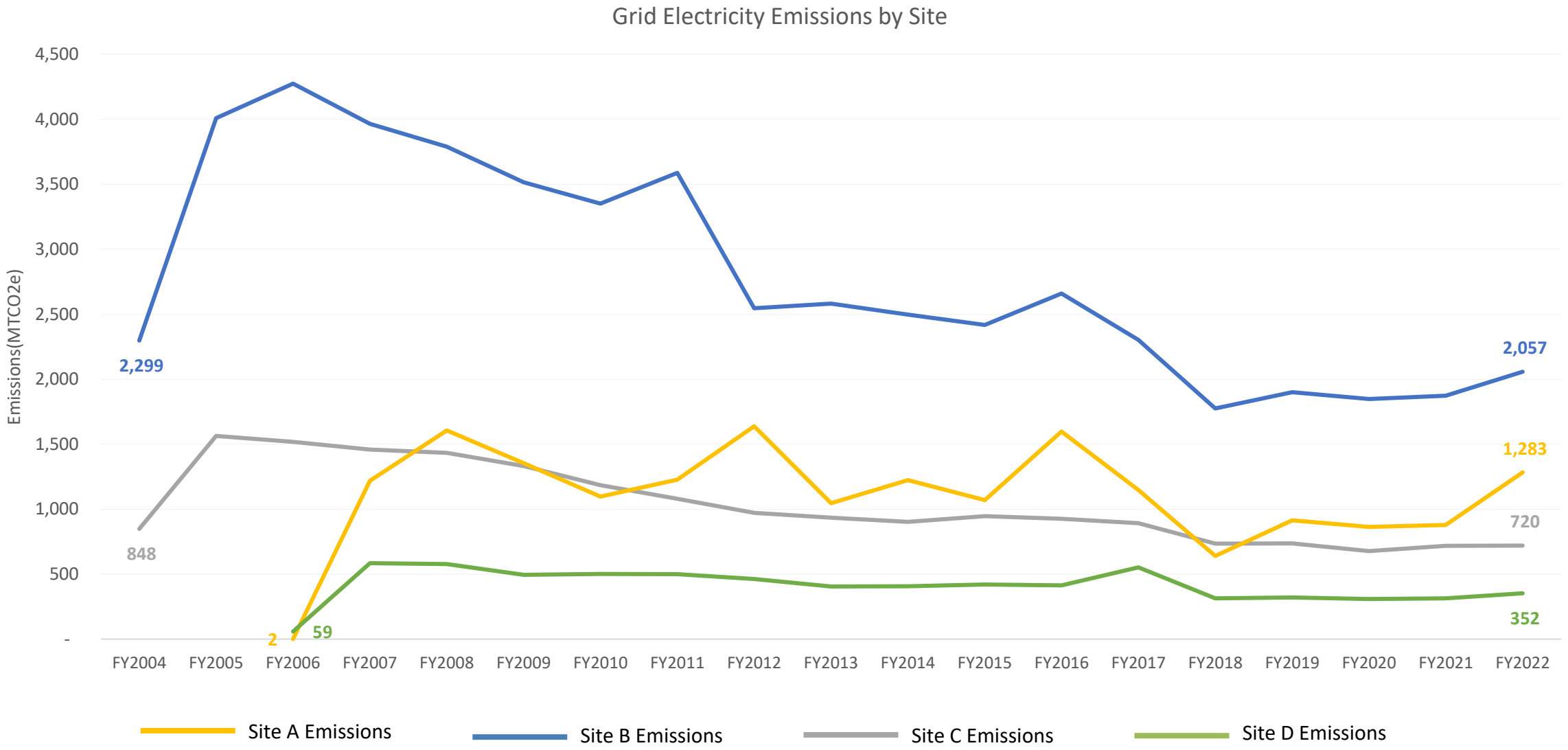
FY04-22 Electricity Emissions by Site



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Extra Slides

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Examples of data analysis used in action

- DCR Net Zero Taskforce presentation to DCR Commissioner
- DCR identification of priority sites for site electrification planning & implementation
- Secretariat & agency reporting to OCIR
- Annual Environmentally Preferable Products Report -- fuel & emissions savings
- Annual external reporting (i.e., BERDO, DOE Better Buildings Challenge)

Massachusetts Department of Energy Resources

Leveraging Your Data

Tim Spencer, DCAMM

INTRODUCTION

How energy data can make life easier

Why we need energy data:

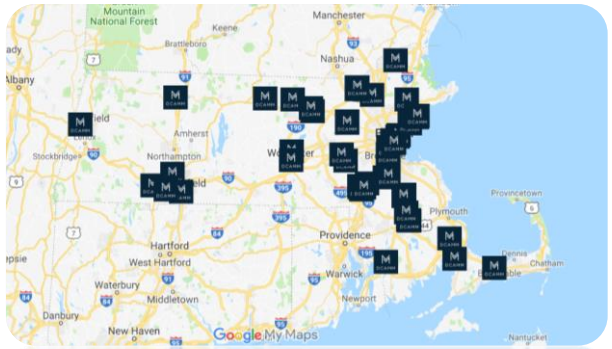
1. See how a building is using energy in real time
2. See how changes to equipment operation affect energy use
3. Identify equipment that is malfunctioning
4. Compare buildings to one another
5. Find maintenance issues that affect water use

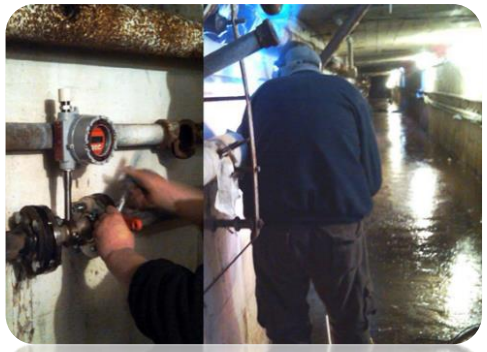
INTRODUCTION

Commonwealth Energy Intelligence (CEI)

What is the CEI program?

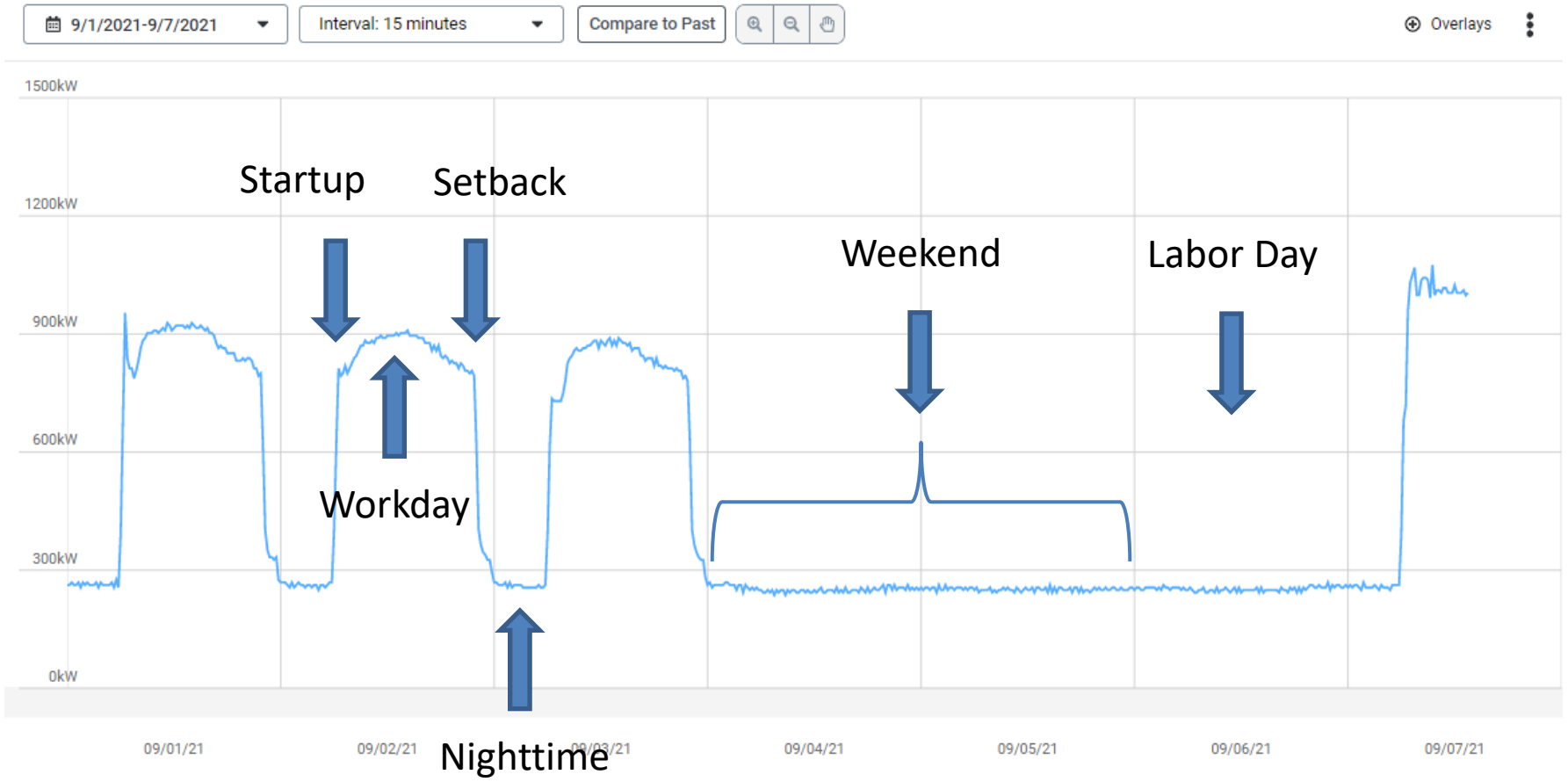
- Records 5-minute interval data for electricity, natural gas, water, steam, hot and chilled water, and oil usage
- 495 buildings are metered (32 million SF)
- Tracking utility bills for 482 accounts across 42 sites
- Includes state hospitals, prisons, universities, community colleges, trial courts, office buildings.





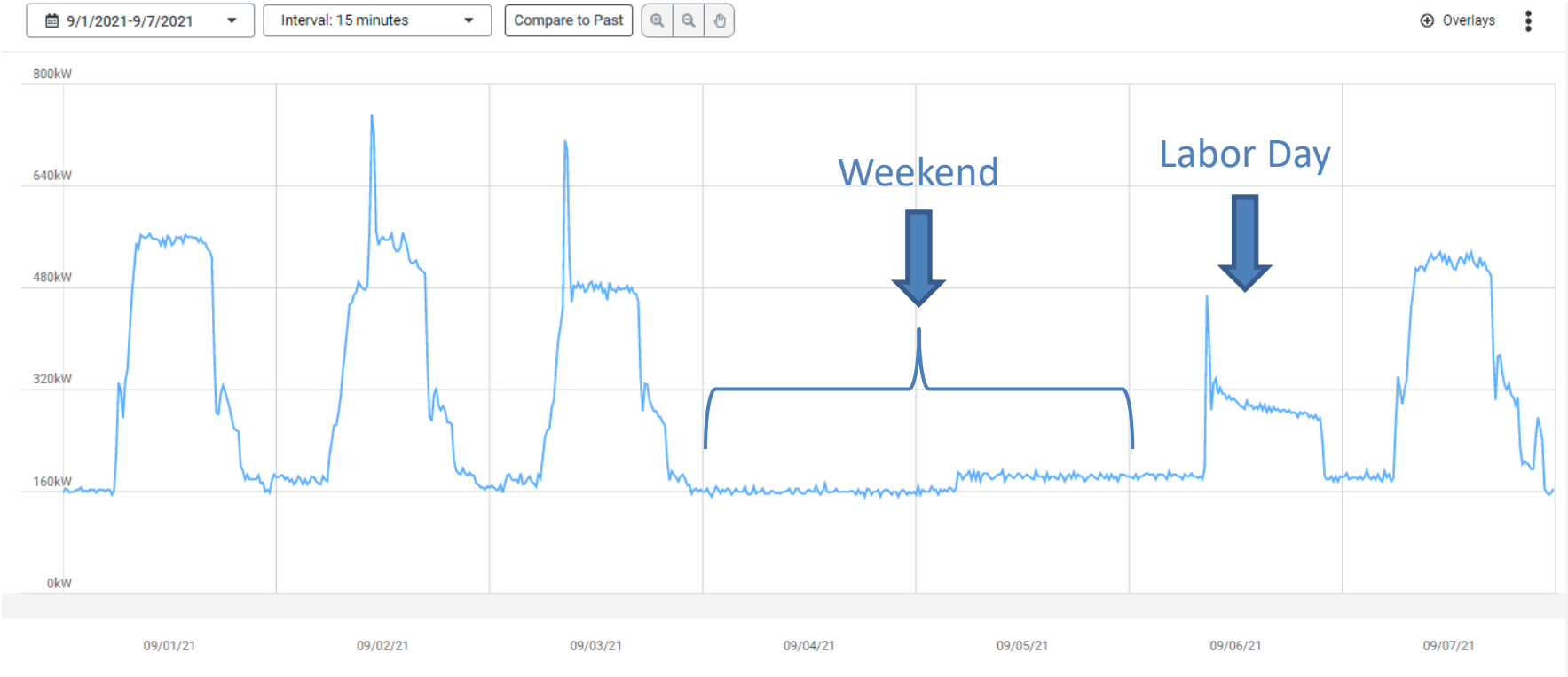
INTERVAL DATA

An example of how building electricity data should look.



HOLIDAY OPERATION

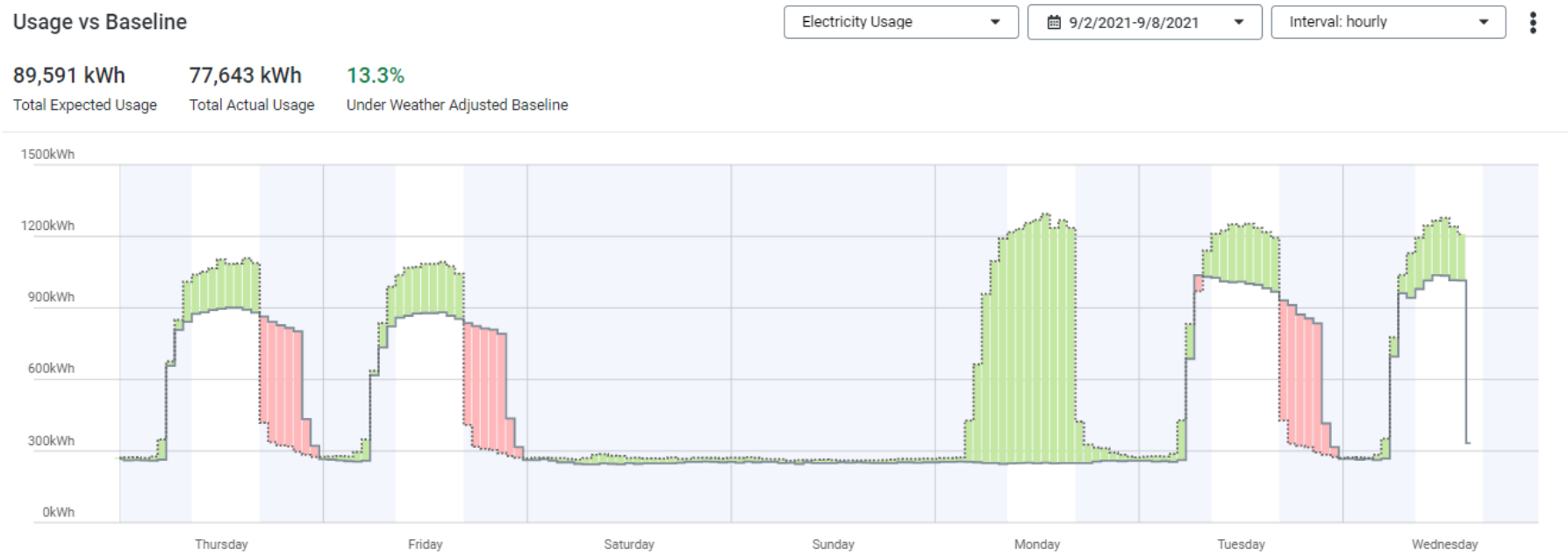
Everything's on but nobody's home



Strategy: Make sure the building doesn't run on holidays

WEATHER ADJUSTED BASELINE

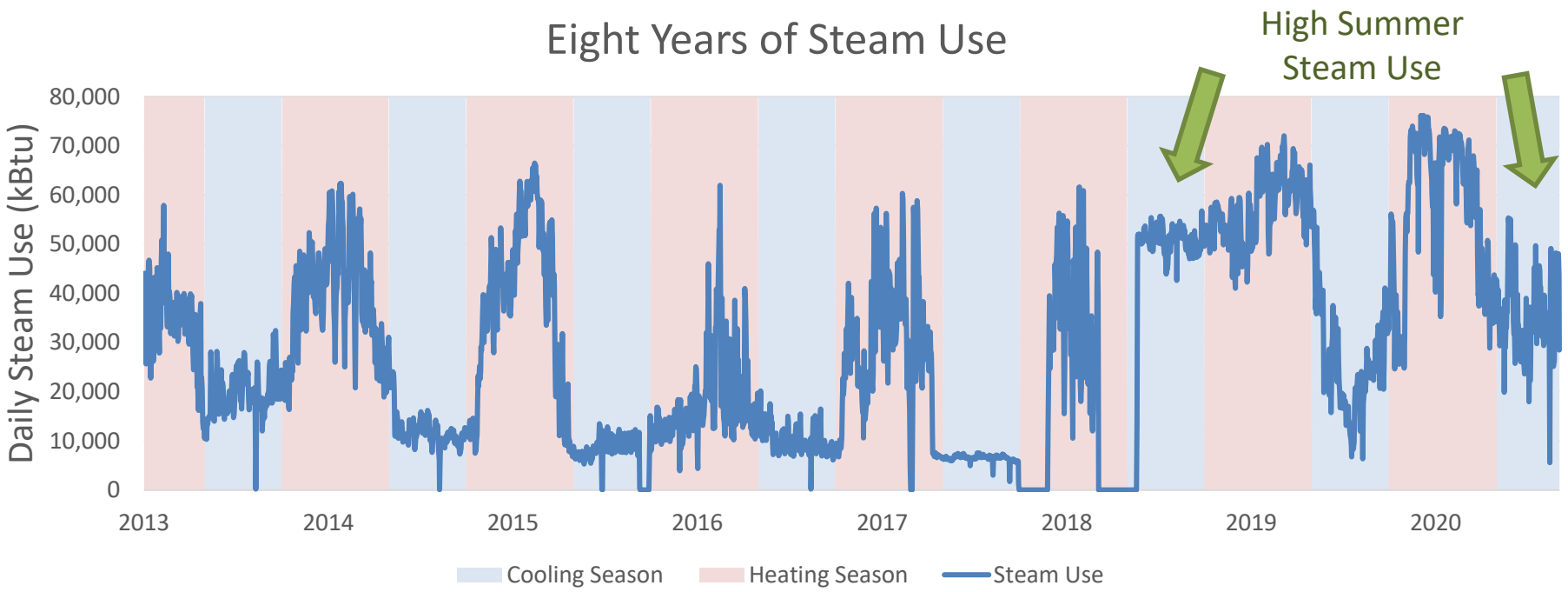
Shows changes in operation over time



- A weather-adjusted baseline is what would have happened if building operations had remained the same.
- Graph shows changes to building schedule versus a weather adjusted baseline

MULTI-YEAR DATA

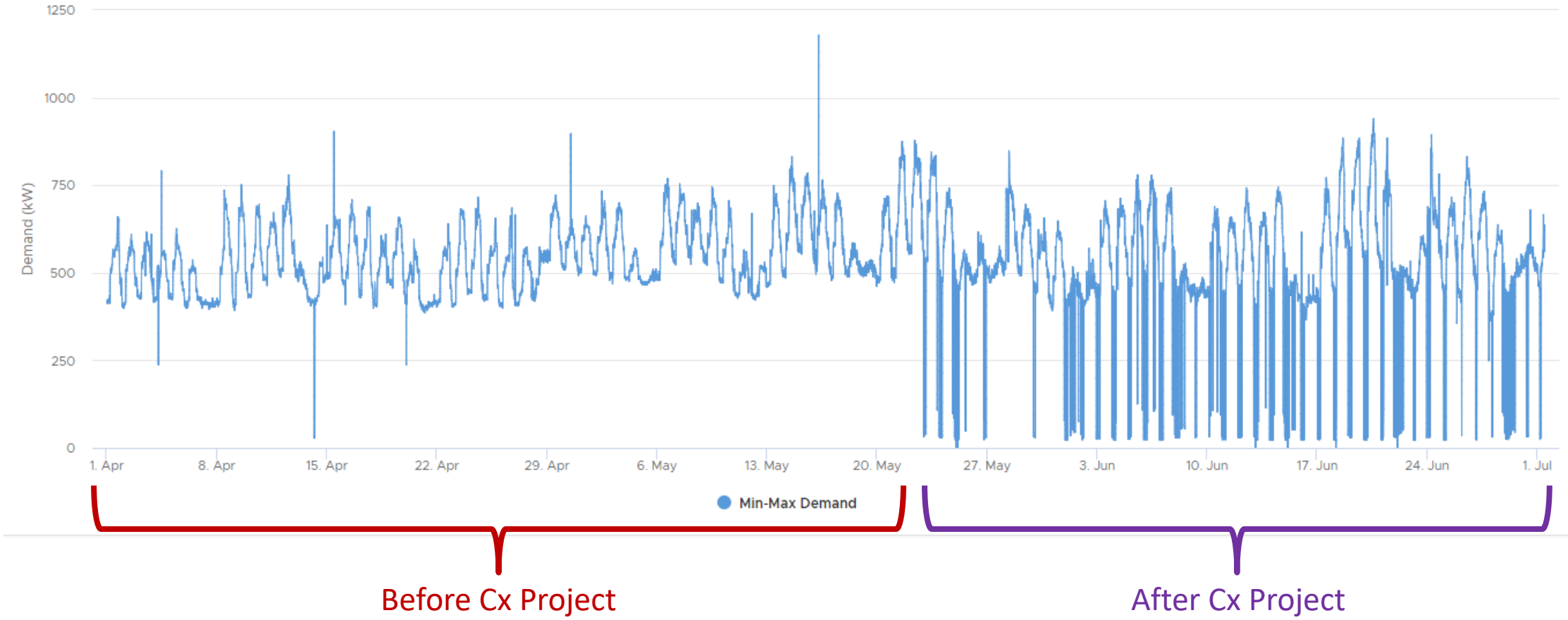
Find changes in building energy use year over year



Changes to the building increased summer steam use

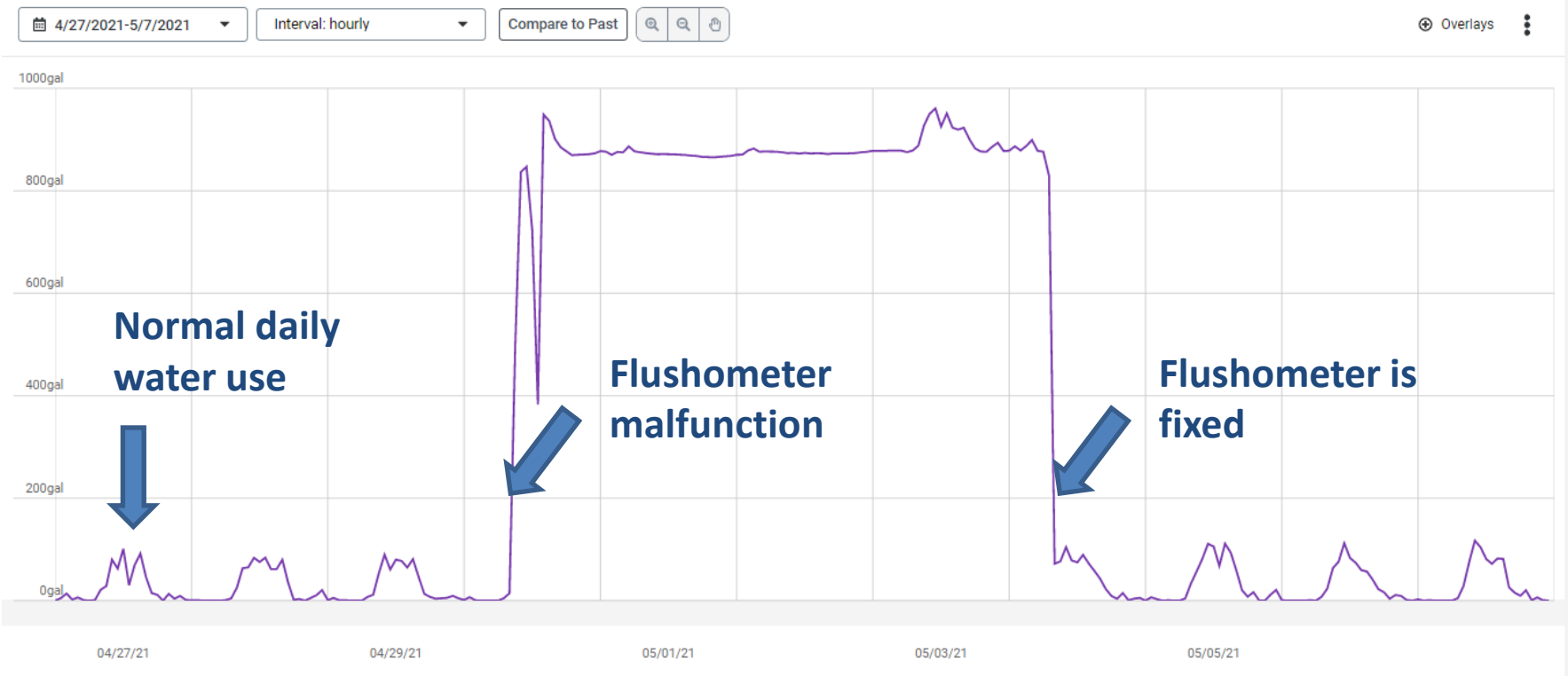
MEASUREMENT AND VERIFICATION

See realized savings from existing building commissioning.



WATER USAGE

Example: Flushometer malfunction – a toilet ran over the weekend.



Strategy: Set up an alert to identify this problem early on

Embodied Carbon

The "Upfront" Carbon From Building Materials

MASSACHUSETTS CLEAN ENERGY CENTER®

Embodied Carbon Context in Massachusetts

- Executive Order 594 states; "To maximize the potential GHG emissions reductions, all new construction and substantial renovations, where possible and cost-effective, shall: … Evaluate and implement strategies to reduce embodied carbon contained in building materials."
  - LBE, DCAMM, MassCEC & others, to support agency compliance with the provisions of this Order
- OCIR Recommendation #12 from 'Recommendations of Climate Chief' report in 2023; "institutes process to ensure buy clean initiative is implemented."
  - MA became signatory to federal Buy Clean Initatitive, to reduce GHG emissions economy-wide, on March 8th, 2023
  - LBE, DCAMM, MassDOT & MassCEC in consultation with OCIR are leading the Buy Clean Initiative "to prioritize the Commonwealth's purchase and use of lower embodied carbon, made-in-America construction materials, such as concrete and steel." [2]

[1] No. 594: Leading By Example: Decarbonizing and Minimizing Environmental Impacts of State Government | Mass.gov
[2] mass.gov/doc/recommendations-of-the-climate-chief-october-25-2023/download

What is Embodied Carbon

‘Upfront’ Embodied Carbon

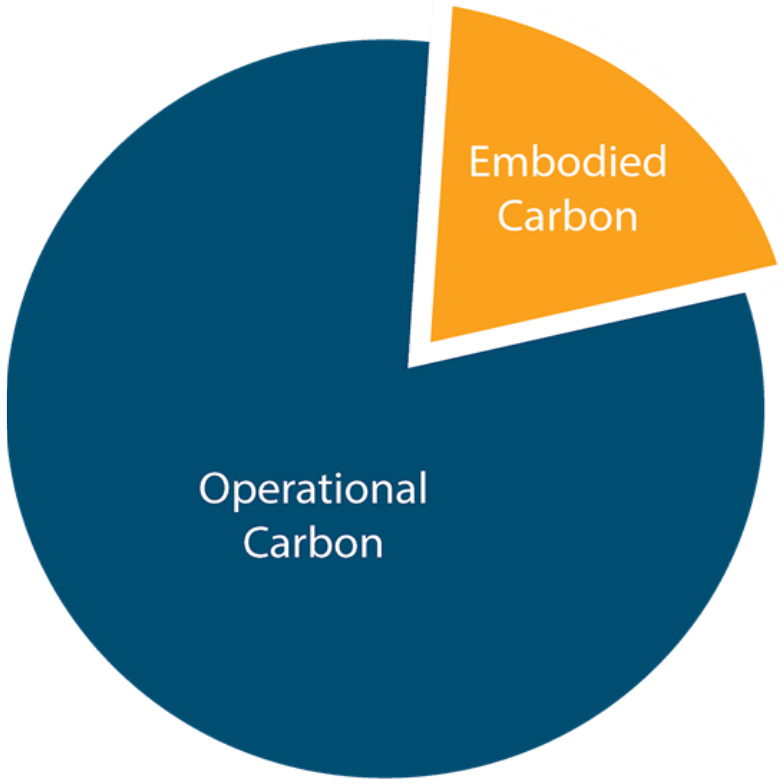
Manufacturing, transportation, and installation of construction materials

Operational Carbon

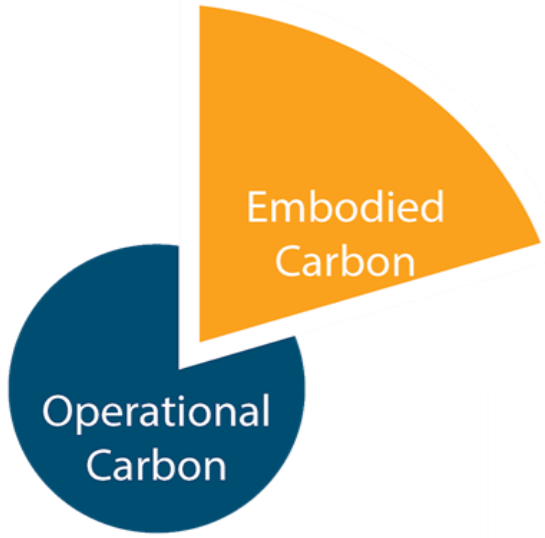
Building energy consumption

EMBODIED CARBON REDUCTION CHALLENGE

Energy efficiency and grid decarbonization efforts will decrease operational carbon over time.



Building as Usual



High Performance Buildings

Image Source: *Carbon Leadership Forum, 2020*

Buy Clean Concrete State Procurement

Concrete – By Weight

Credit: Walter P Moore

Concrete – By Embodied CO_2

Credit: Walter P Moore

Federal GSA Buy Clean Concrete – won't buy worst concrete mixes

	Maximum Global Warming Potential Limits for GSA Low Embodied Carbon Concrete (kilograms of carbon dioxide equivalent per cubic meter - CO_2e kg/m^3)		
Specified compressive strength (f'c in PSI)	**Standard Mix**	**High Early Strength**	**Lightweight**
up to 2499	**242**	**326**	**462**
2500-3499	**306**	**413**	**462**
3500-4499	**346**	**466**	**501**
4500-5499	**385**	**519**	**540**
5500-6499	**404**	**546**	**N/A**
6500 and up	**414**	**544**	**N/A**

The targets in GSA's March 2022 "Low Embodied Carbon Concrete Standards" reflect a 20 percent reduction from the GWP (CO2e) limits the New Buildings Institute proposes in "Lifecycle GHG Impacts in Building Codes" (January 2022). Chart: General Services Adminstration

CLF New England Recommendations for MA Buy Clean Concrete

125% OF THE EASTERN REGION AVERAGE GLOBAL WARMING POTENTIAL FIGURES FROM THE NATIONAL READY MIX CONCRETE ASSOCIATION (NRMCA)

NORMAL WEIGHT CONCRETE		
Specified Compressive Strength (f'c in psi)	NRMCA Eastern Benchmark (kg CO_2e/m^3)	125% of NRMCA Benchmark (kg CO_2e/m^3)
0-2500	240	300
2501-3000	264	330
3001-4000	314	393
4001-5000	378	473
5001-6000	399	499
6001-8000	472	590

LIGHT WEIGHT CONCRETE		
Specified Compressive Strength (f'c in psi)	NRMCA Eastern Benchmark (kg CO_2e/m^3)	125% of NRMCA Benchmark (kg CO_2e/m^3)
0-3000	517	646
3001-4000	573	716
4001-5000	628	785

These numbers are 125% of the Eastern Region average GWP figures from the National Ready Mix Concrete Associations' "A Cradle-to-Gate Life Cycle Assessment of Ready-Mixed Concrete Manufactured by NRMCA Members, Version 3.2," (July 2022), pg. 65

Concrete Environmental Product Declarations

READY-MIX CONCRETE PLANTS WITH EPD CAPABILITY FOR ALL MIXES

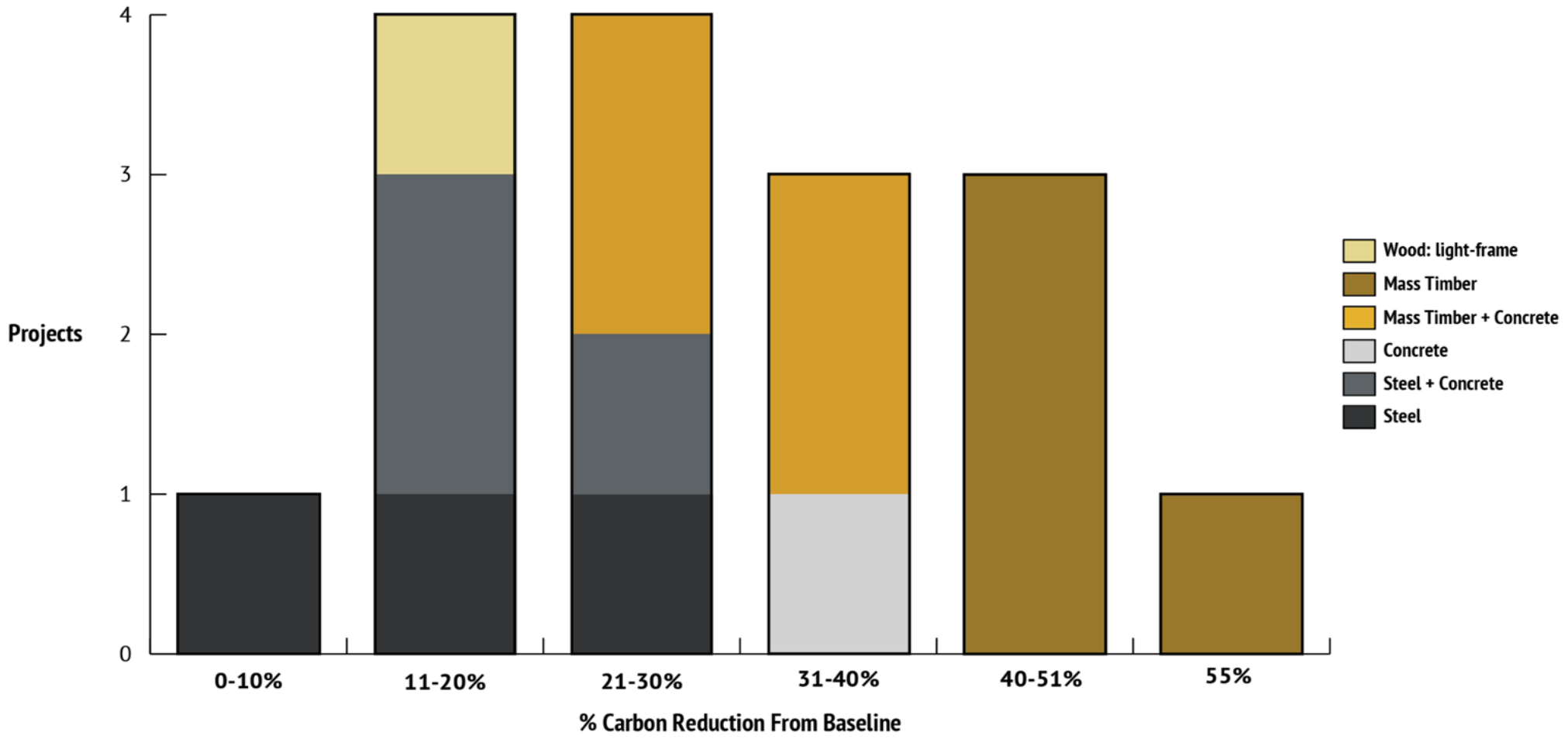
Company	# of plants	Location
Sterling Concrete	2	Oxford, Sterling
Holcim NE/Aggregate	3	Waltham, Everett, Saugus
J. G. Maclellan Concrete Co	3	Lowell, Worcester, Luneburg
Construction Service	2	Springfield, Northampton
Boston Sand and Gravel Co.	3	Charlestown, Walpole, Waymouth
Cape Cod Ready Mix	4	Brewster, South Dennis, Sandwich, Carver
Dauphinais Concrete	3	Douglas, Bellingham, Taunton
Tresca Brothers	1	Millis
Berkshire Concrete/Unistress	1	Pittsfield (In Progress)
Jandris Block		

QR CODE FOR ACCESS TO READY-MIX COMPANIES WITH EPDS

Reducing Whole Building Embodied Carbon

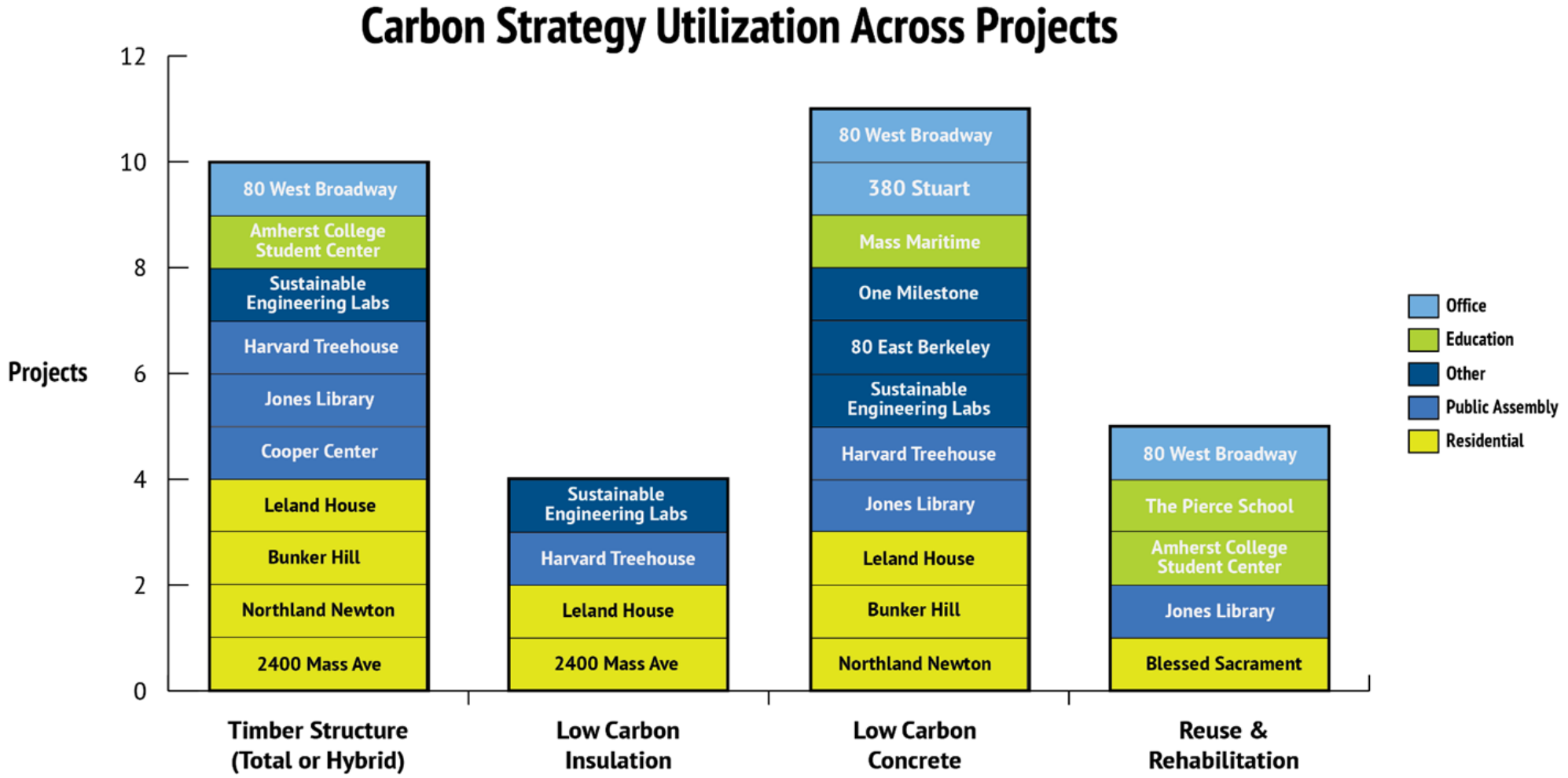
EMBODIED CARBON
REDUCTION CHALLENGE

Most projects reduced Embodied Carbon by 20-30%



EMBODIED CARBON REDUCTION CHALLENGE

STATS



EMBODIED CARBON
REDUCTION CHALLENGE

Embodied Carbon Challenge - Lessons Learned

16 SUBMISSIONS, 12 AWARDEES - OVER 25K METRIC TONS REDUCED

✓ Early Design Focus, Big Wins
- Set embodied carbon reduction goals at the beginning of projects

✓ Use Less
- Both grand prize winners focused on reducing embodied carbon by building less with dual use spaces or better design to minimize sq. Ft. built
- Reuse – existing underground parking garage structure; rehab and addition instead of all new

✓ Change to Lower Impact Materials
- Low carbon concrete, mass timber/cross laminated timber, biogenic insulation etc.

EMBODIED CARBON
REDUCTION CHALLENGE

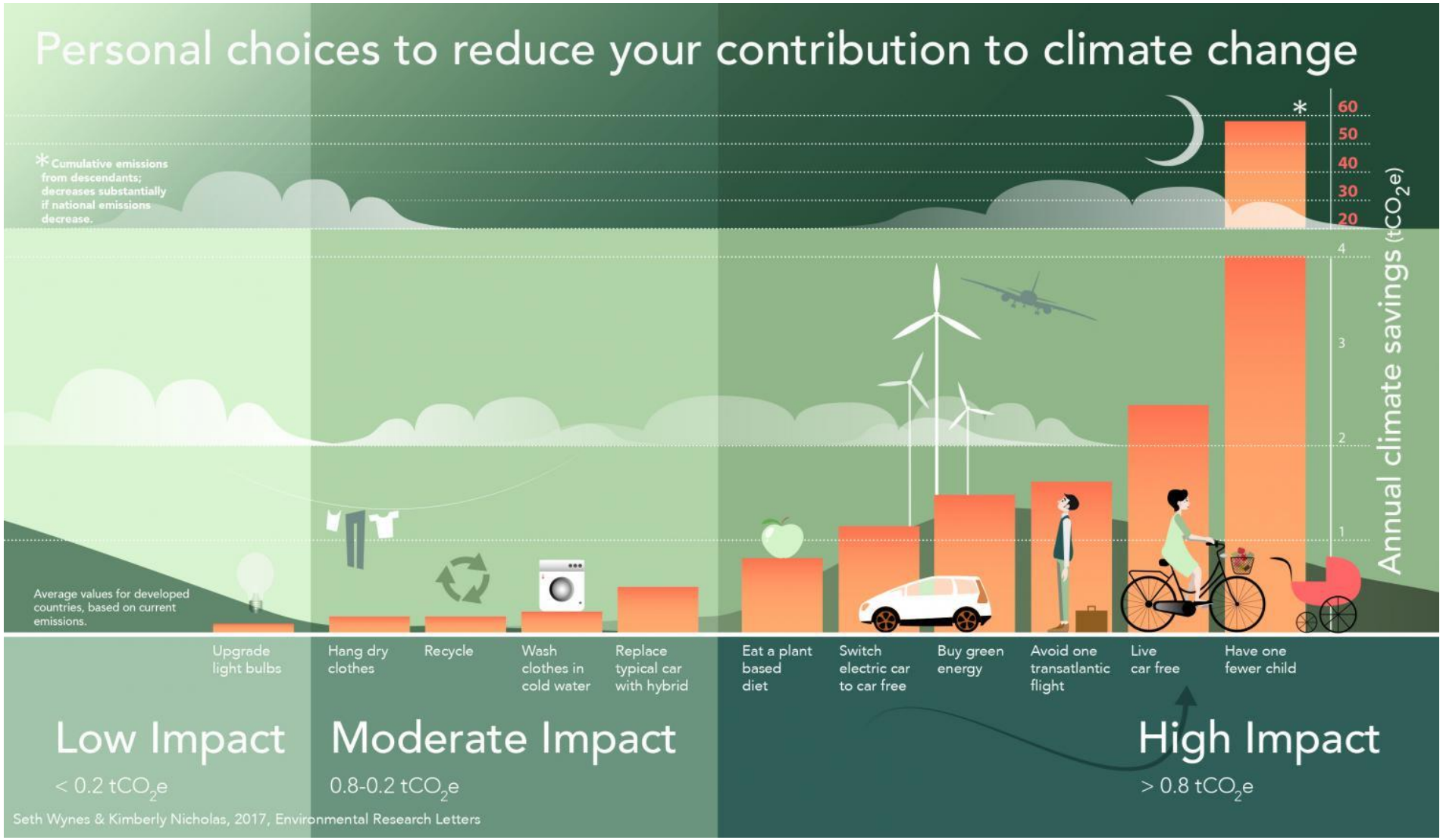
505
ATTENDEES AT TRAININGS

450 REPLAYS
OF RECORDED EDUCATION SESSIONS

16
PROJECTS SUBMITTED

25k MTCO2e
OF EMISSIONS AVOIDED

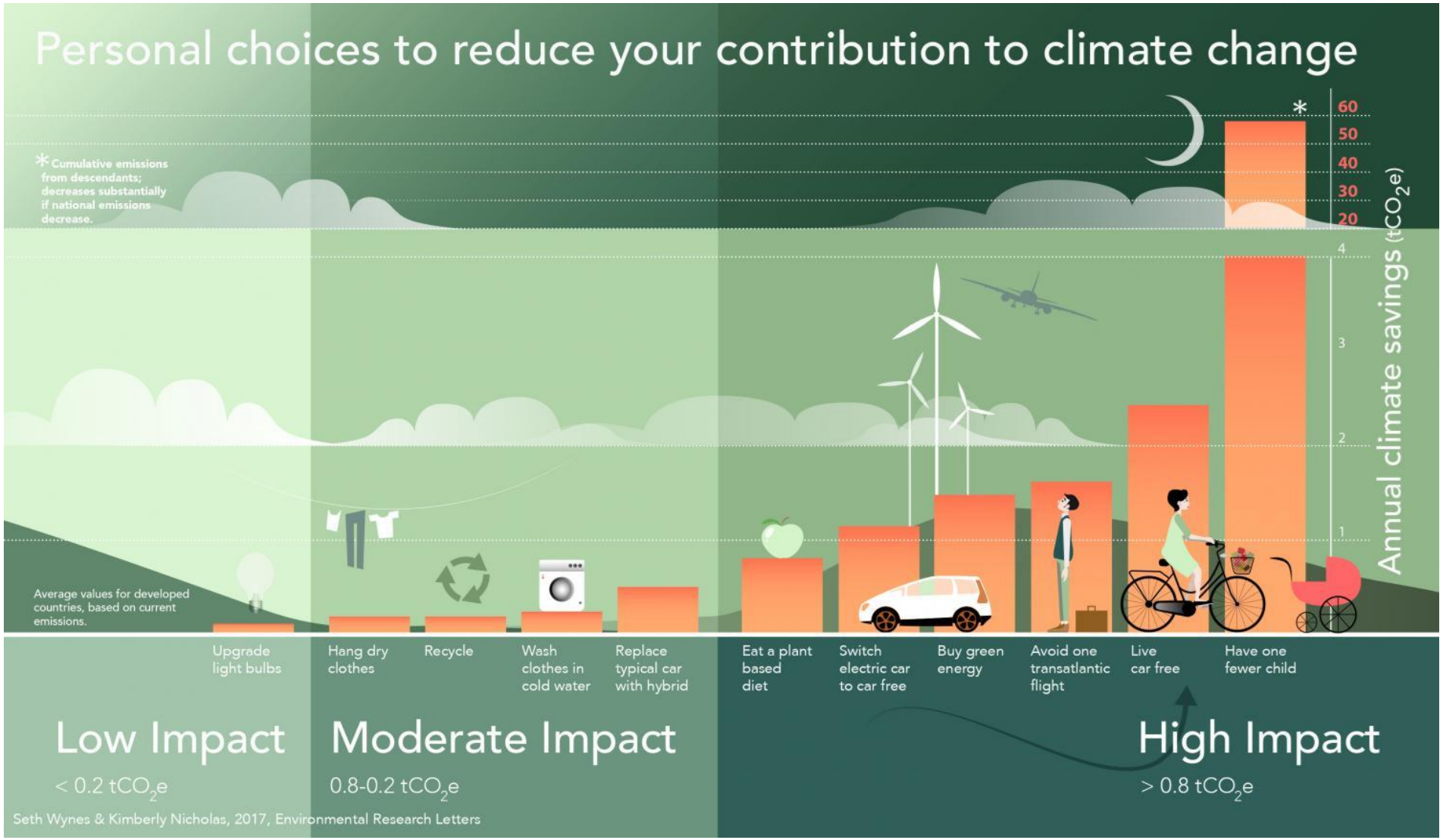
Equivalent to the carbon sequestered in 413,377 tree seedlings grown for 10 years



Save 15 cubic yards of concrete:

4.2 $tCO_{2,e}$

Reduce large Boston commercial building EC by 1%

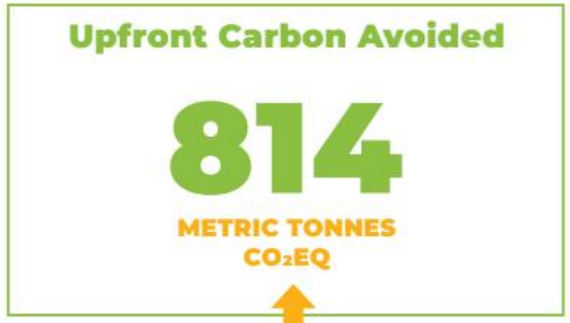


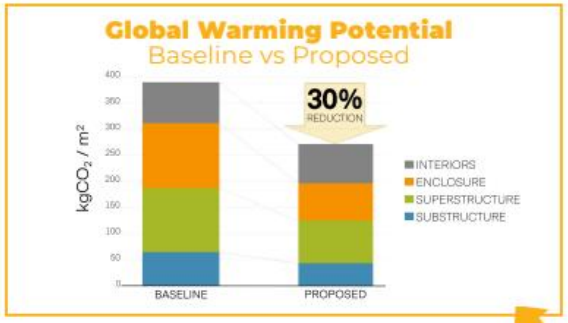
100+ $tCO_{2,e}$

Resources

- Building-transparency.org (buildingtransparency.org)
- Resource Library - Carbon Leadership Forum

GRAND PRIZE: RENOVATION





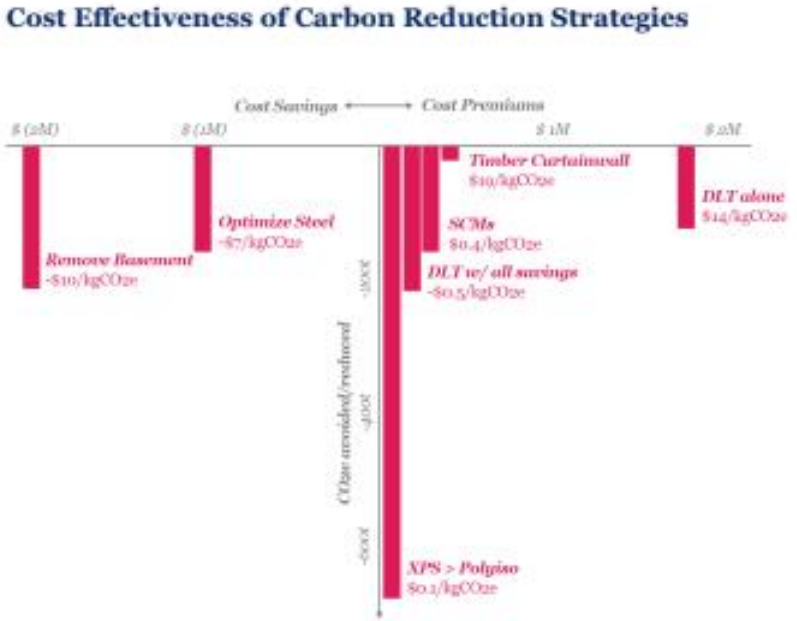
Jones Library

Finegold Alexander Architects

Location: 43 Amity Street, Amherst, MA, 01002
Anticipated Completion Date: April 2026

1ST WHOLE BUILDING LIFE CYCLE ASSESSMENT

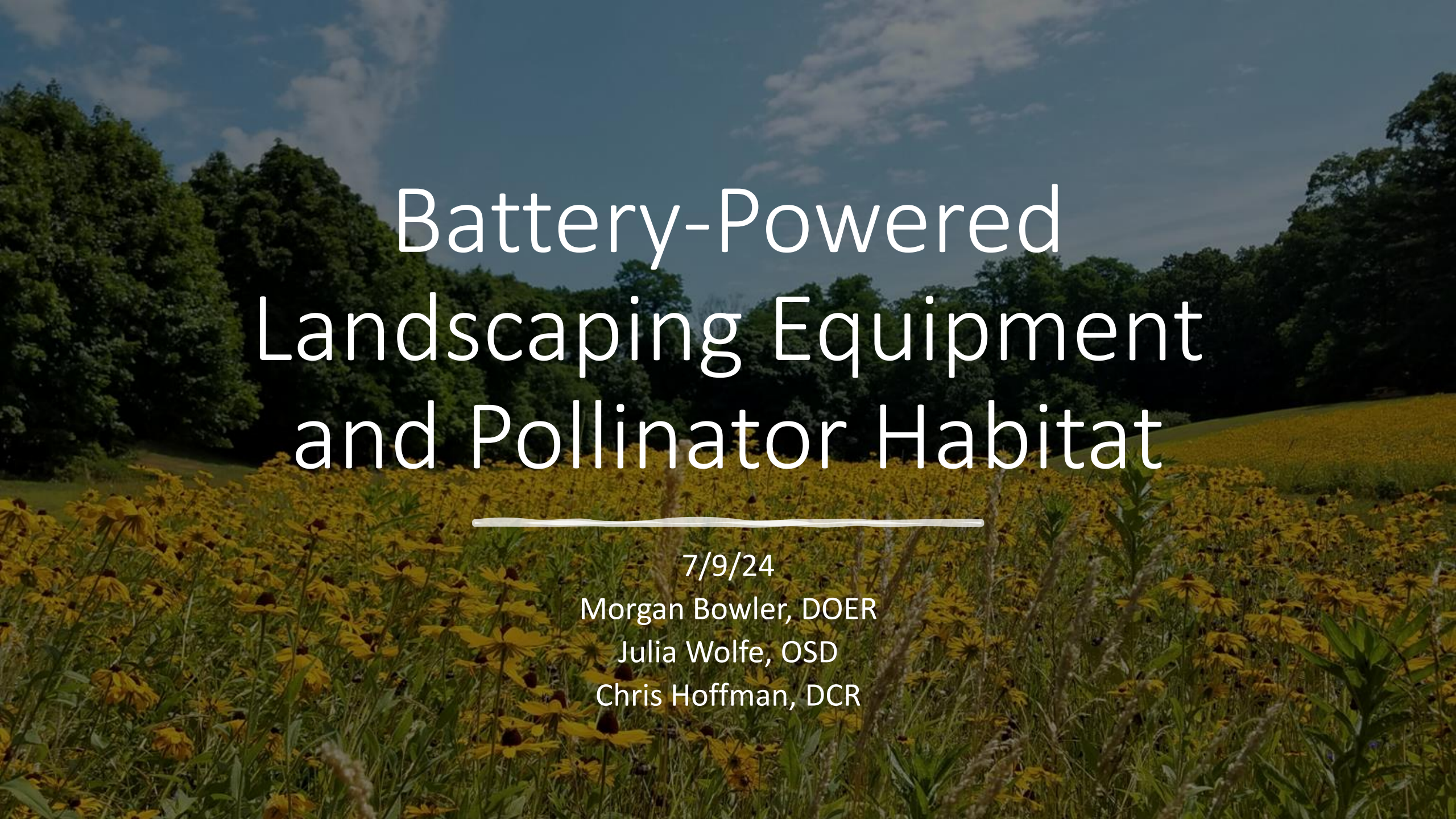
GRAND PRIZE: NEW CONSTRUCTION



Sustainable Engineering Laboratories - UMassAmherst

Payette

Location: 141 Holdsworth Way, Amherst, MA 01003
Anticipated Completion Date: August 2026



Battery-Powered Landscaping Equipment and Pollinator Habitat

7/9/24

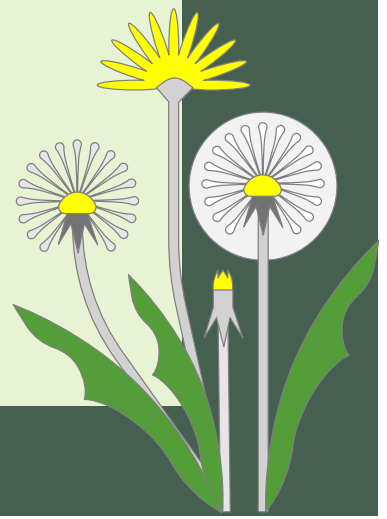
Morgan Bowler, DOER
Julia Wolfe, OSD
Chris Hoffman, DCR

Directive to State Entities

Per LBE Executive Order 594…

Executive branch agencies and public institutions of higher education should incorporate sustainable landscaping practices through:

- Planting of native plant species
- Reducing use of pesticides
- Utilizing zero emission (battery-powered) landscaping equipment



Why is BPLE Important?

It was estimated that 614,932 tons of carbon dioxide were emitted from lawn and garden equipment in Massachusetts in 2020. This is equivalent to 1.43 billion miles driven in a typical car. (Source: Lawn Care Goes Electric (publicinterestnetwork.org))

The same study also identified the top 100 counties for carbon dioxide emissions from lawn and garden equipment in 2020. There were two Massachusetts counties within the top 100.

County	Place out of 100	CO2 Emissions	Car Equivalent
Middlesex	28	153,480	33,787
Essex	93	70,771	15,580

Why is Pollinator Habitat Important?

In Massachusetts, over 45% of agricultural commodities rely on pollinators for pollination.

A study published in 2024 stated that there were five main drivers of pollinator decline:

- Climate Change
- Pesticides
- Pollution
- Pests and Pathogens
- Habitat Loss

Source: What are the main reasons for the worldwide decline in pollinator populations? (cabidigitallibrary.org)

The Triple Bottom Line

Environmental

- Decarbonization
- Zero pollutants
- Cleaner air
- No chemical spill clean ups

Human Health

- Quieter
- Smoother
- Cleaner air

Financial

- Reduced fuel costs
- Reduced maintenance costs

Battery-Powered Landscaping Equipment (BPLE)

- Instead of using gas or diesel, BPLE uses battery packs and charge as needed
- Efficient electric alternatives to fossil fuel-based models include ↓

- Handheld equipment: chainsaws, leaf blowers, string trimmers, hedge trimmers, etc.
- Mowers: push mowers, ride-on mowers, stand-on mowers
- Utility vehicles

Photo Credit

Photo Credit

Photo Credit

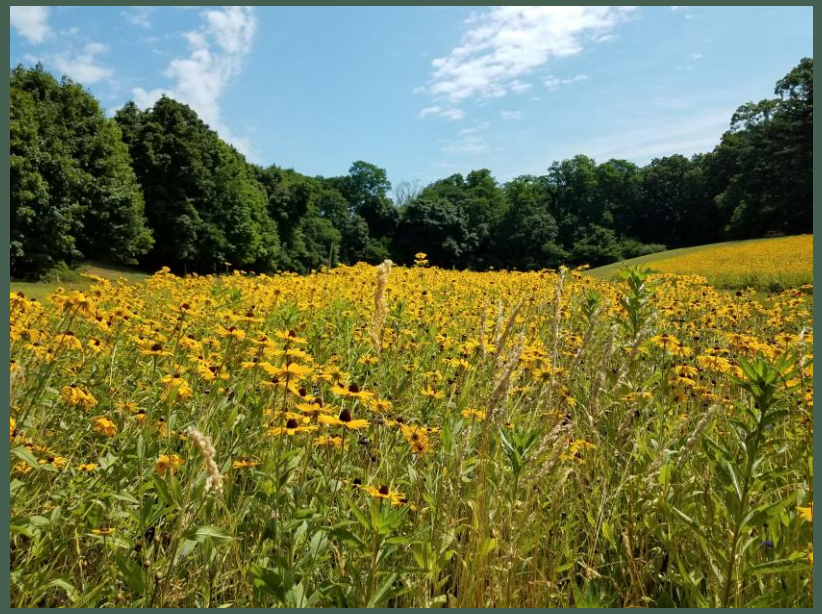
Pollinator Habitat

- Areas of land set aside to provide habitat and resources to pollinators
- Uses native plantings
- Can come in different varieties ↓

Low or No Mow Zones

Massasoit Community College

Meadowland/Grassland



Taunton State Hospital

Manicured Gardens

DCR Waquoit Bay

Sites Doing the Work!

370+ Acres of Pollinator Habitat!!!

BPLE

- DCR
- Fitchburg State
- Framingham State
- Massasoit CC
- NSCC
- STCC
- UMA
- UML
- Worcester State
- MassBay CC
- MassDOT
- MWRA
- DOC

170+ battery powered landscaping equipment!!!

Pollinator Habitat

- Bristol CC
- DCR
- DOC
- DMH
- MSP
- DFW
- Framingham State
- Greenfield CC
- MassBay CC
- MCLA
- MWRA
- Massasoit CC
- MassDOT
- NSCC
- Salem State
- UMA
- UMB
- UMD
- UML
- Westfield State

Resources

Keep an eye out for information on a "Show and Mow!"

Funding

- Leading by Example Public Entity Decarbonization Grant
- Mass Save Commercial BPLE Rebates

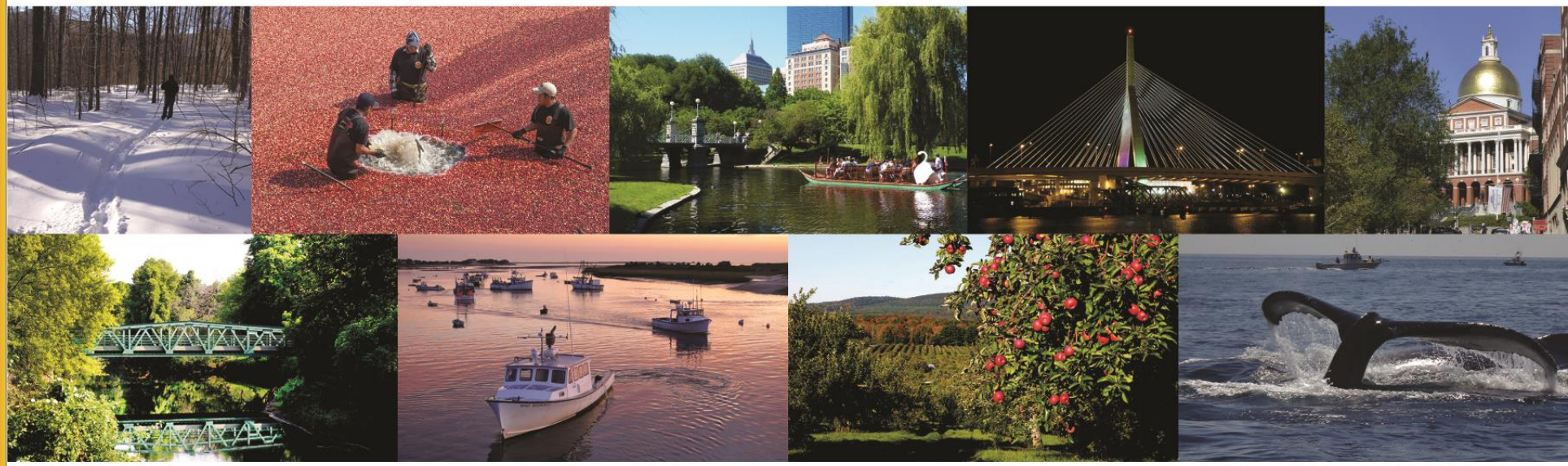
Procurement

- LBE Lawn to Pollinator Habitat Savings Calculator
- LBE Commercial BPLE Savings Calculator
- MAFMA Tool Barn
- FAC116 Statewide Contract

STATEWIDE CONTRACTS

FAC116: Lawns and Grounds Equipment, Parts and Service

Julia Wolfe
Director, Environmental Purchasing
Operational Services Division



FAC116: Lawns & Grounds Equipment, Parts and Services

- **47 Vendors Total – manufacturer and independent dealer representation**
- **Nine Contract Categories**
  - Category 1: Agricultural Tractors, Loaders and Related Accessories
  - Category 2: Lawnmowers and Related Accessories
  - **Category 3: Utility Vehicles, Golf Carts, Snowmobiles and Related Accessories**
  - Category 4: 2 Cycle/4 Cycle Handheld Power Equipment
  - Category 5: Snow Blowers and Related Accessories
  - Category 6: Specialty Wheeled (and Towed) Power Equipment
  - Category 7: Utility Trailers and Related Accessories
  - **Category 8: Commercial Grade Battery Electric Lawn Equipment:**
    - **Lawnmowers (including ride on), blowers, trimmers, chainsaws & more**
  - **Category 9: Equipment Leasing for Categories 1-8**
- **FAC116 Contract Terms**
  - ✓ Term: May 1, 2021 – April 30, 2027
- **Competitive Pricing and Discounts**
  - ✓ Volume Discounts
  - ✓ Dock Delivery
  - ✓ Prompt Pay Discounts
- **OSD Climate Initiative**
  - ✓ Green Communities Program
  - ✓ EO594: Decarbonizing and Minimizing Environmental Impacts of State Government
  - ✓ Executive Order 604 – Establishing the Office of Climate Innovation and Resilience Within the Office of the Governor

Battery-Powered Equipment includes…

- Category 3: Electrify your fleet with a range of golf carts, shuttles, and utility vehicles





- Category 8: Ride-on and stand-on mowers





- Category 8: Handheld equipment and push mowers

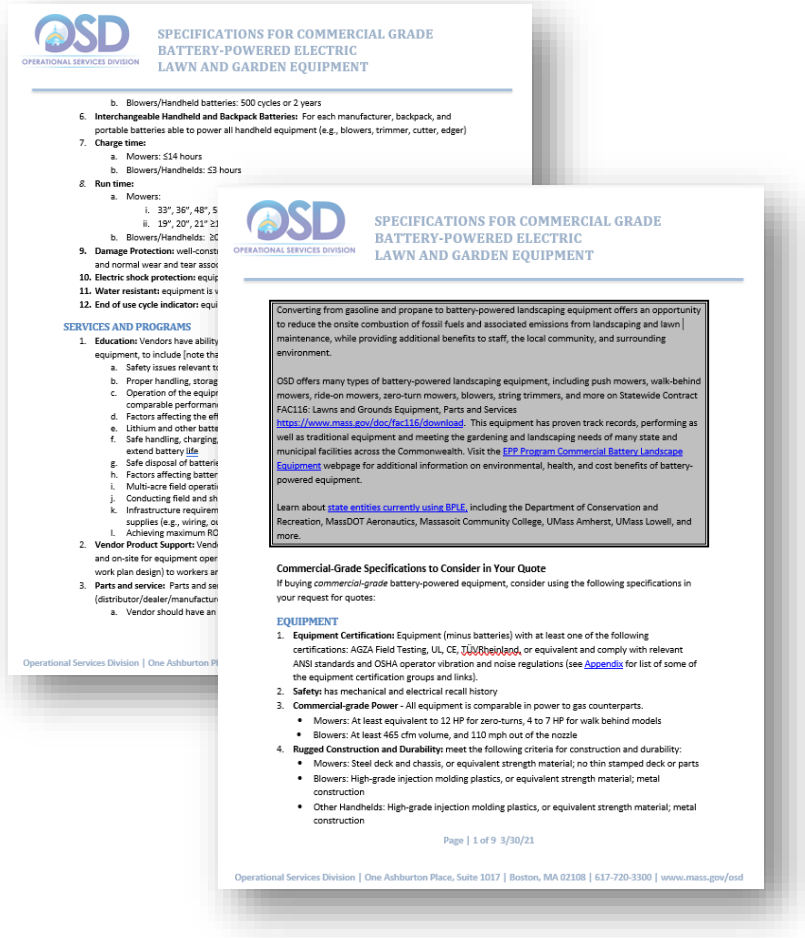




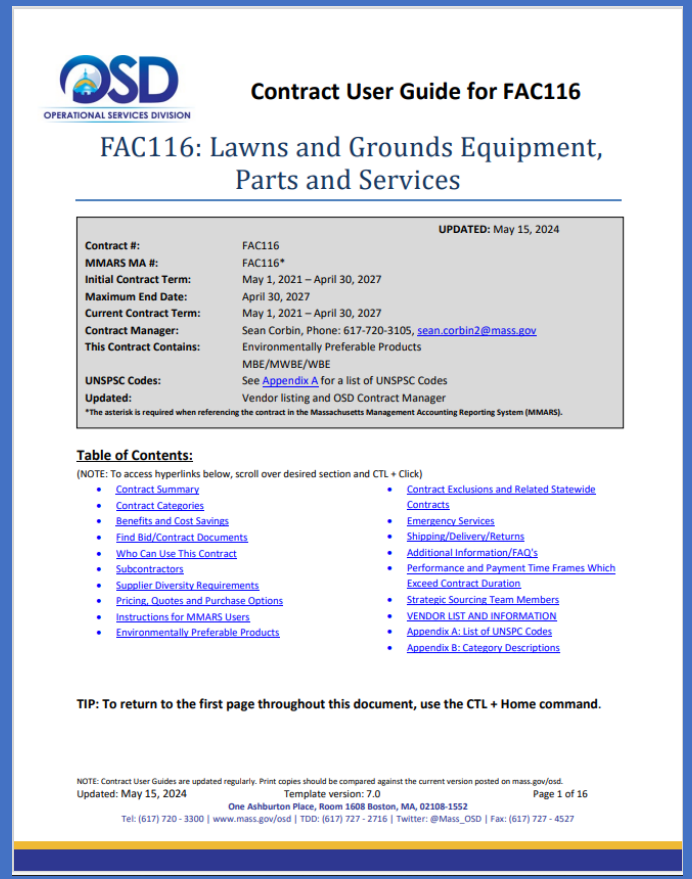
Specs for Commercial-Grade Equipment

If buying *commercial-grade* battery-powered equipment, consider using Commercial Grade Battery Powered Landscape Equipment Specifications developed by OSD, including:

- Commercial-grade power (e.g. 12 HP for zero-turn mowers, 465 CFM for blowers)
- Low-noise
- Light-weight backpack batteries
- Minimum battery run times (e.g., 4+ hours for large mowers, 1.5+ hours for smaller mowers, 30+ minutes for handhelds)
- Warranties: 2 years for equipment and batteries
- Vendor product support, including networks of parts and services and customer support
- Battery take back and recycling program
- Those with *third-party certifications or accreditation entities for BPLE*



Contract User Guide



OPERATIONAL SERVICES DIVISION

Contract User Guide for FAC116

FAC116: Lawns and Grounds Equipment, Parts and Services

UPDATED: May 15, 2024

Contract #:	FAC116
MMARS MA #:	FAC116*
Initial Contract Term:	May 1, 2021 – April 30, 2027
Maximum End Date:	April 30, 2027
Current Contract Term:	May 1, 2021 – April 30, 2027
Contract Manager:	Sean Corbin, Phone: 617-720-3105, sean.corbin2@mass.gov
This Contract Contains:	Environmentally Preferable Products MBE/MWBE/WBE
UNSPSC Codes:	See Appendix A for a list of UNSPSC Codes
Updated:	Vendor listing and OSD Contract Manager

*The asterisk is required when referencing the contract in the Massachusetts Management Accounting Reporting System (MMARS).

Table of Contents:

(NOTE: To access hyperlinks below, scroll over desired section and CTL + Click)

- Contract Summary
- Contract Categories
- Benefits and Cost Savings
- Find Bid/Contract Documents
- Who Can Use This Contract
- Subcontractors
- Supplier Diversity Requirements
- Pricing, Quotes and Purchase Options
- Instructions for MMARS Users
- Environmentally Preferable Products
- Contract Exclusions and Related Statewide Contracts
- Emergency Services
- Shipping/Delivery/Returns
- Additional Information/FAQ's
- Performance and Payment Time Frames Which Exceed Contract Duration
- Strategic Sourcing Team Members
- VENDOR LIST AND INFORMATION
- Appendix A: List of UNSPC Codes
- Appendix B: Category Descriptions

TIP: To return to the first page throughout this document, use the CTL + Home command.

NOTE: Contract User Guides are updated regularly. Print copies should be compared against the current version posted on mass.gov/osd.

Updated: May 15, 2024 Template version: 7.0 Page 1 of 16

One Ashburton Place, Room 1608 Boston, MA, 02108-1552

Tel: (617) 720 - 3300 | www.mass.gov/osd | TDD: (617) 727 - 2716 | Twitter: @Mass_OSD | Fax: (617) 727 - 4527

Learn More About the Contract – Review the FAC116 Contract User Guide:

- Contract Coverage
- How to Purchase: *solicit quotes*
- Contract Exclusions
- Pricing and Quote Requirements: *Discount off MSRP or Vendor Catalog*
- Shipping/Delivery/Returns
- Link to commercial-grade specifications

For more information:

- OSD Helpdesk - OSDHelpDesk@mass.gov or call 1-888-627-8283 or 617-720-3197
- OSD Contract Manager: **Sean.Corbin2@mass.gov**

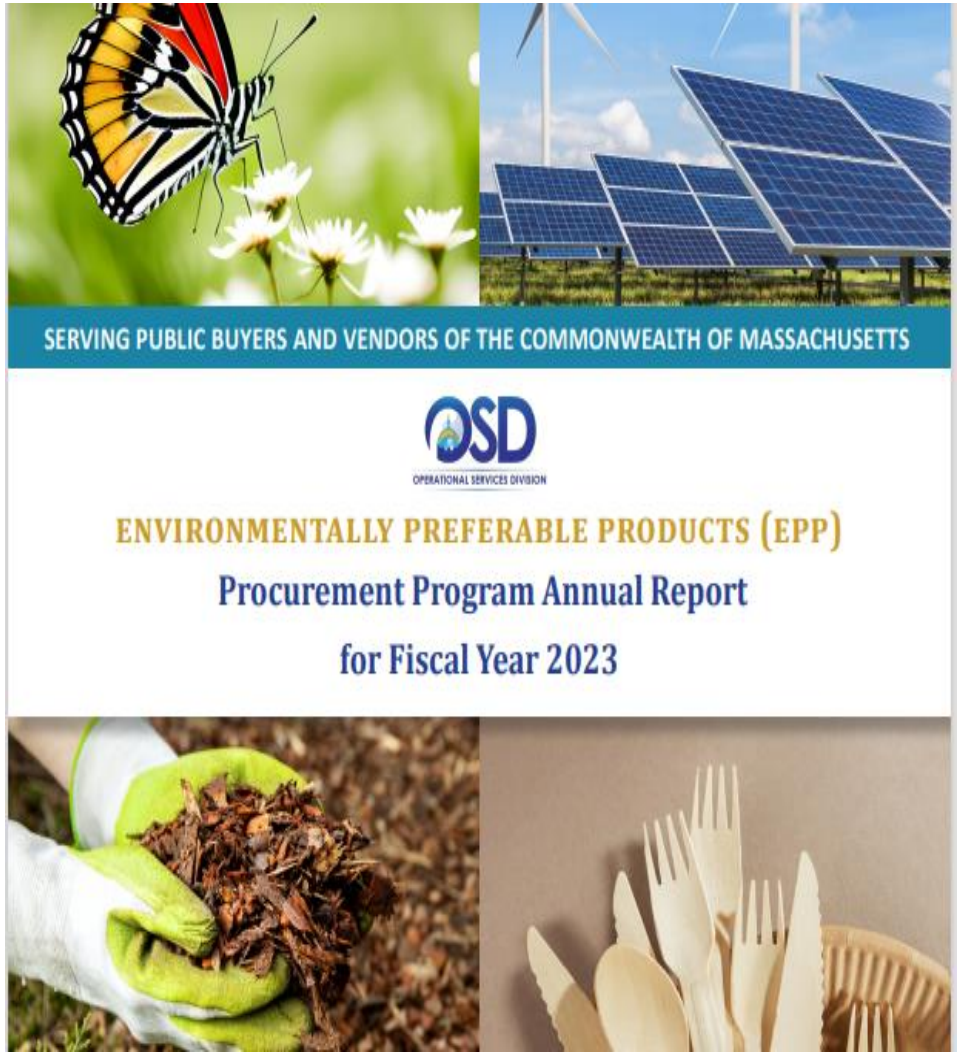
Awarded Contractor Information – including links to their information in COMMBUYS

Vendor List and Information*

Vendor	Master Blanket Purchase Order #	Contact Person	Phone #	Email	Categories	Regions	Prompt Payment Discount	SDO Certification Type	SDP Commitment Percentage
**[Conversion Vendor] [Master MBPO] (All contract documents)	PO-21-1080-OSD03-SRC3-21990	Sean Corbin	617-720-3105	sean.corbin2@mass.gov	N/A	N/A	N/A	N/A	N/A
***Solicitation Enabled	PO-21-1080-OSD03-SRC3-21997	Sean Corbin	617-720-3105	sean.corbin2@mass.gov	N/A	N/A	N/A	N/A	N/A
Able Tool and Equipment	PO-21-1080-OSD03-SRC3-21845	Derek Bauer	860-289-2020	derek@abletool.net	1,4,6,7,8,9	1&2	10 days - 1% 15 days - 1% 20 days - 1% 30 days - 1%		1%
Aebi New England, LLC	PO-21-1080-OSD03-SRC3-21850	Doug Beach	603-835-2600	doug.beach@aebi-ne.com	2	All			9.67%
Ahearn Equipment Inc.	PO-21-1080-OSD03-SRC3-21860	Josh Ahearn	508-885-7085	JTAhearn@ahearnequipment.com	1,2,3	All	10 days - 1%	WBE	5%
ARIENS COMPANY	PO-21-1080-OSD03-SRC3-21908	Tyler Walimaa	920-756-4665	twalimaa@ariensco.com	2,3,5,8	All	10 days - 2%		1%
Bacher Corporation	PO-21-1080-OSD03-SRC3-21857	Jean DeSousa	860-627-5924	bacherofficemgr@sbcglobal.net	1,2,3,4,5,6,8	All	10 days - 1%		1%
Bobcat of Connecticut, Inc.	PO-21-1080-OSD03-SRC3-21832	Matt Stack	413.221.1200	matts@bobcatct.com	1,2,3,4,6,7,8,9	All	10 days - 2%		10%
The Boston Lawnmower Company, Inc.	PO-21-1080-OSD03-SRC3-21833	David Kennedy	508-898-3500 ext. 218	dkennedy@bostonlawnmower.com	2,3,4,5,6 & 8	All	10 days - 1% 15 days - .5% 20 days - .25%		1%
C & J Equipment,Inc	PO-21-1080-OSD03-SRC3-21856	Charles Hannoosh	978-658-2022	channoosh@cjequip.com	1,2,3,4,5,6,7,8	All	10 days - 2% 20 days - 1%		1%
C.N. Wood Enviro, LLC	PO-21-1080-OSD03-SRC3-21849	Tom Fiore	781-935-1919	tfiore@cn-wood.com	1,2,5,6	All	10 days - 1% 15 days - .75% 20 days - .5% 30 days - .25%		1%

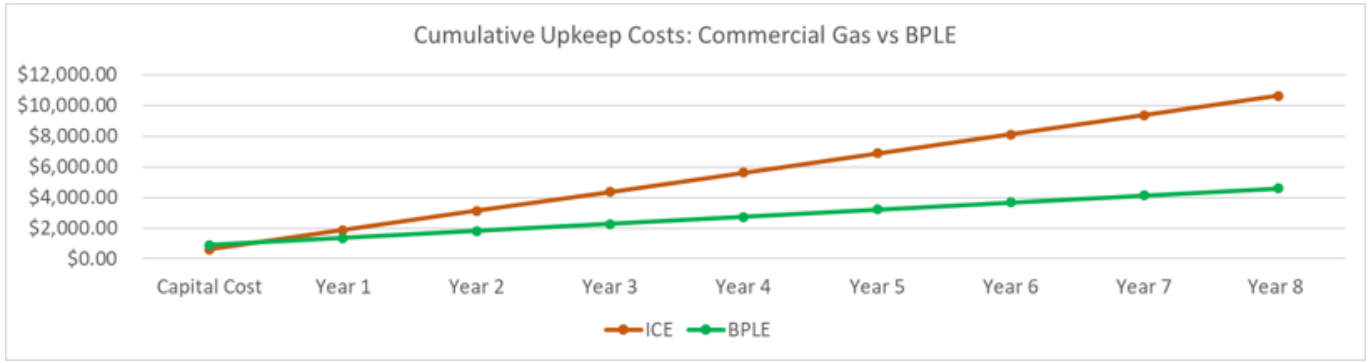
As Reported in the EPP Program Annual Report for FY23 on Purchases of BLPL….

"FAC116 sales of this type of equipment have increased from $272,000 in FY22 to more than $1.7M in FY23, a 525% increase."



Other Benefits – From BPLE Ride And Drive Slides August 2023

- BPLE is reaching (or has reached) cost-parity with gas landscaping equipment



Husqvarna T540 XP® II

Stihl MSA 160 C-B

- Real-world analysis found handheld BPLE has break-even point with gas equipment in <1-3 years; mowers closer to 2,500 hours (Turf Magazine)
- Cost-savings go beyond fuel-use reduction
  - Fewer moving parts = less maintenance
  - No gas cans
  - No chemicals needed for spill cleanups
- Incentives are available! Mass Save Rebates and LBE!

*Graph created using LBE-OSD Gas to BPLE Savings Calculator

Additional Information:

- ***OSD Commercial Battery Powered Equipment Webpage***
- ***LBE Sustainable Landscaping Page***
- ***MAFMA Tool Barn***
- Training: American Green Zone Alliance Service Pro Certification: ***https://www.sustainablelandcare.org/***

OSD Resources

- **Sign up for Communications:** bit.ly/OSDsignup
- **OSD:** www.mass.gov/osd
- **COMMBUYS:** www.commbuys.com
- **OSD Help Desk:** 1-888-627-8283 or OSDHelpDesk@mass.gov
- **OSD Blog:** www.mass.gov/collections/procurement-insights

Follow Us!

@Mass_OSD

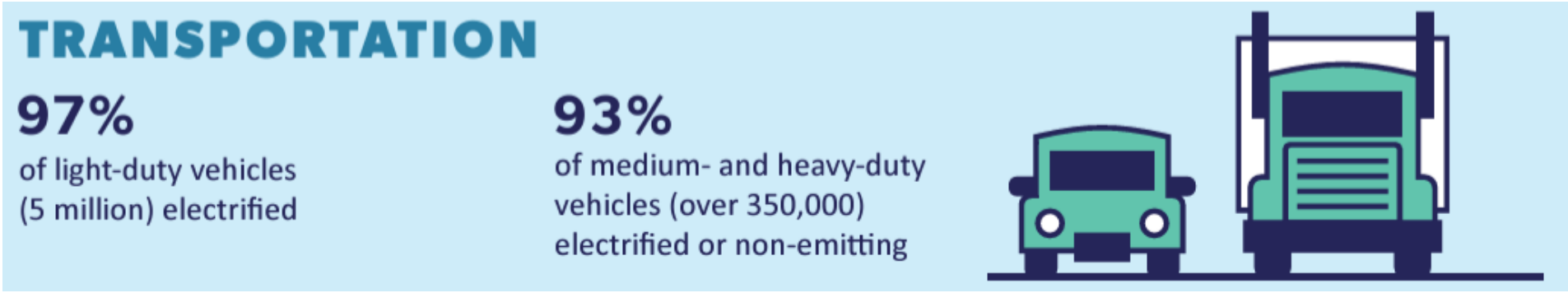
TESTIMONIAL

Chris Hoffman
DCR: Mystics

DISCUSSION

Statewide Targets for Electrification

- Massachusetts has adopted a statewide GHG emissions limit and sector-specific sub-limits for 2050
- The 2050 Clean Energy & Climate Plan (CECP) highlights a broad suite of specific goals, strategies, policies, and actions by sector
- MA is orienting applicable policy and programmatic decisions around the CECP sub-limit for transportation
- Two of the CECP's key benchmarks for 2050:



Executive Order 594 Fleet Electrification and EVSE Requirements for State Entities

OSD, in collaboration with the Green Fleet Committee, shall also develop and/or enforce fleet acquisition and management policies that support the goals of this Order. Agencies shall comply with policies that outline procedures necessary to reduce vehicle fossil fuel use to the greatest extent feasible. These policies shall address the following:

Vehicles:

- Acquiring zero emission vehicles;
- Acquiring new vehicles that are sized appropriately...
- Acquiring the most fuel-efficient vehicle models...
- Conducting fleet optimization evaluations...to identify vehicles for removal or replacement;
- Identifying opportunities to reduce vehicle miles traveled...
- Educating employees on efficient driving practices...

Charging:

- Agencies shall also support the installation of...electric vehicle charging stations, at state facilities for state vehicles, employee-owned vehicles, and those driven by the public, where such installations are appropriate...
- Agencies shall work with all appropriate funding, contracting and oversight agencies to identify locations and strategies for deployment...
- Agencies shall ensure that EVSE stations are considered and prioritized during relevant construction

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Electric Vehicle Planning and Acquisition for State Fleets

OSD has created an Electric Vehicle Planning and Acquisition Policy (revised May 2024) for Executive Branch fleets that parallels EO594 EV Acquisition Guidelines that also applies public higher education campuses and the MBTA non-revenue fleet. Executive Branch agencies under the purview of OSD/OVM which is an agency of EOAF, are hereby required to develop Electric Vehicle (EV) Plans by January 31, 2025.

Required Vehicle Acquisition Hierarchy

1. Battery Electric Vehicle (BEV) / Fuel Cell Electric Vehicle (FCEV)
2. Plug in Hybrid Vehicle (PHEV)
3. Hybrid Electric Vehicle (HEV), Alternative Fuel Vehicle (AFV), or other innovative tech
4. Internal Combustion Engine Vehicle (ICE) that is the most efficient in its class

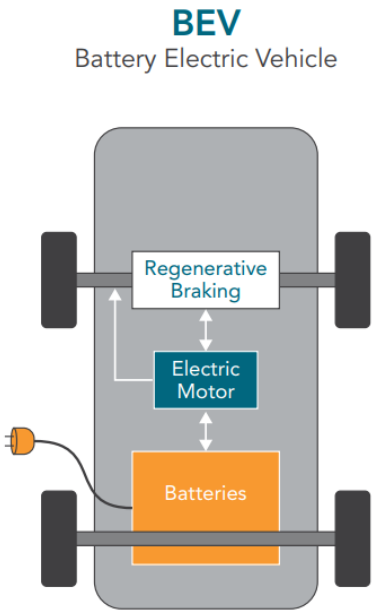
Statewide contracts for vehicle procurement: **VEH110** and **VEH111**

Electric Vehicle Basics

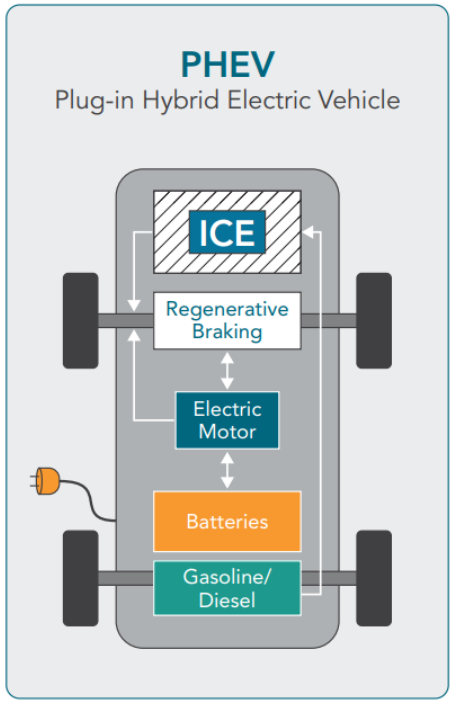
There are two types of plug-in electric vehicles (PEVs) - that have a battery charged from the grid:

1. **Battery electrics (BEVs) which run on electricity only** (typical range of 250-300+ miles)
2. **Plug-in hybrid electrics (PHEVs)**

- can first run entirely on battery for short distances (daily commute, local errands, etc.)
- seamlessly switch to gasoline to power the vehicle and maintain battery level



vs.



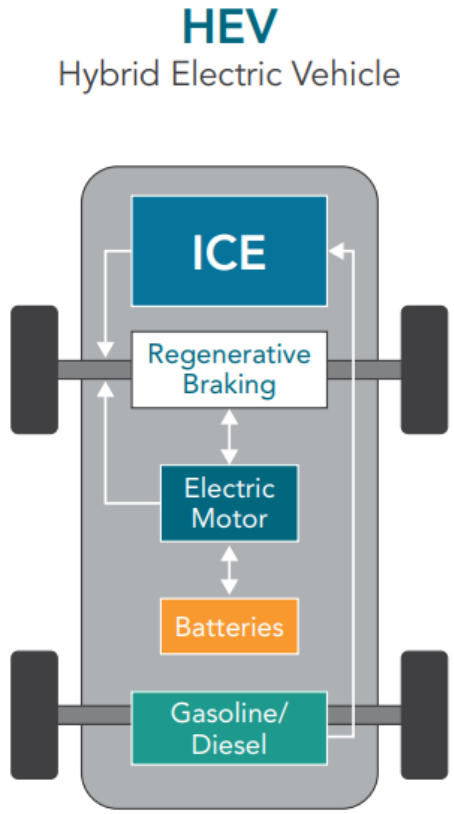
Curious about the latest new electric cars as well? For an interactive online guide of new EV models, visit Plug in America's PlugStar "Browse Electric Cars" tool.

Electric Vehicle Basics – Hybrids ("HEV")

What is the difference between a hybrid and a plug-in electric vehicle?

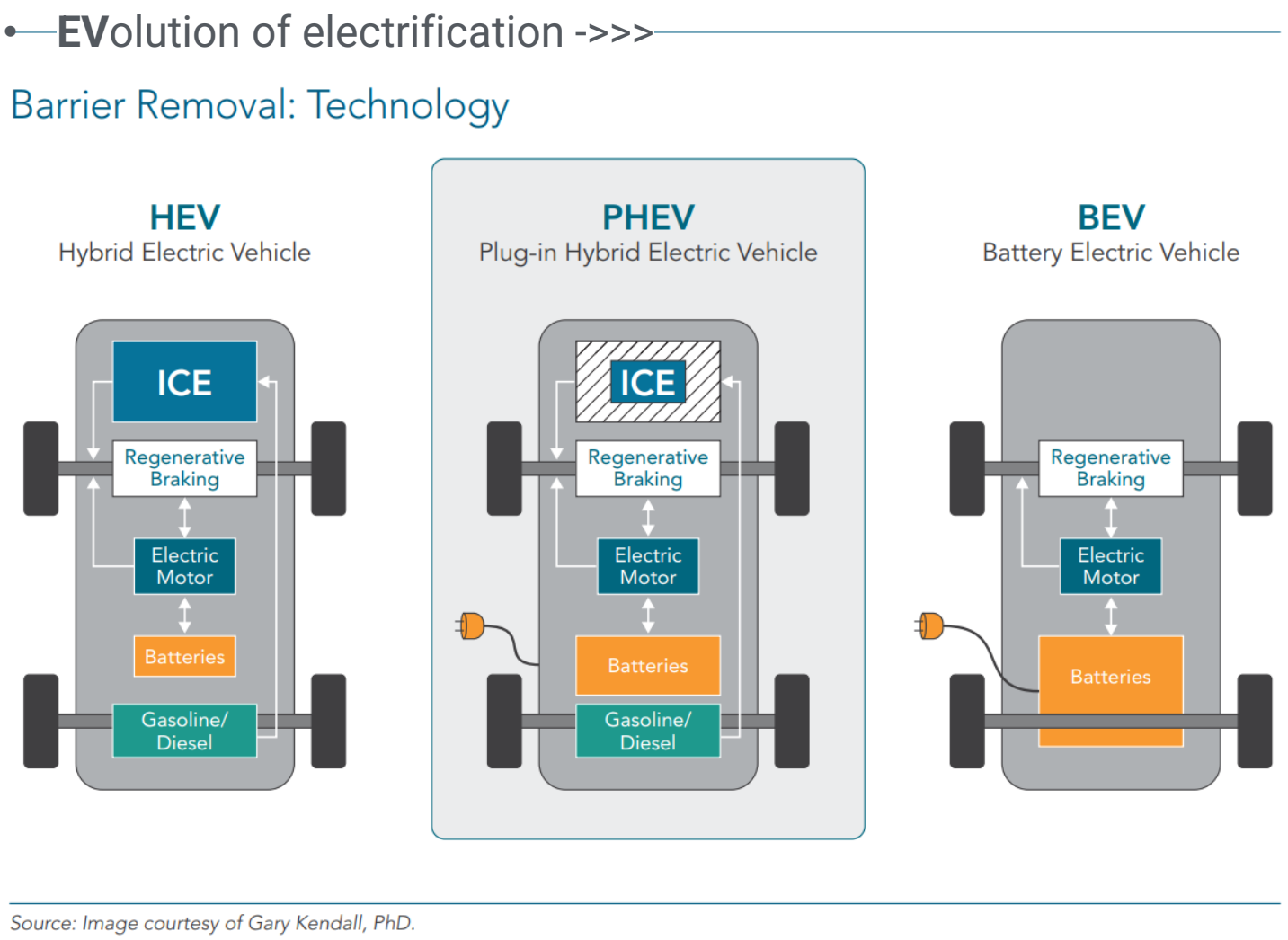
- A hybrid electric vehicle (HEV) does not have an external plug.
- It derives some of its driving power from a conventional gasoline engine and some from an electric motor powered by a small battery pack.
- **All its energy (=its emissions) is sourced from gasoline combustion.**
- However, unlike a non-hybrid vehicle, some of this energy is recovered and re-used by recharging the batteries through regenerative braking.*

*Plug-in electric vehicles also use regenerative braking to improve efficiency.



Electric Vehicle Basics – In Summary

- Today's BEVs have more range than 90% of commuters and others drive daily (many over 300 miles).
- PHEVs will always have the range you need and can be
  - charged any time it's convenient
  - driven and fueled just like any gasoline only vehicle
- Some models are available in either BEV, PHEV and/or hybrid.
- A hybrid (HEV) should not be considered or referred to as an Electric Vehicle (EV).



Source: Image courtesy of Gary Kendall, PhD.

Electric Vehicle Basics: Fact vs Fiction

RANGE:

- EPA estimate vs reality
- The 3 Ts: Technique, Terrain, Temp.

CHARGING:

- Parking = Charging Opportunity
- ~~Range~~ Charge Anxiety is real: Reliability #1!*
- Your "home base" station is key

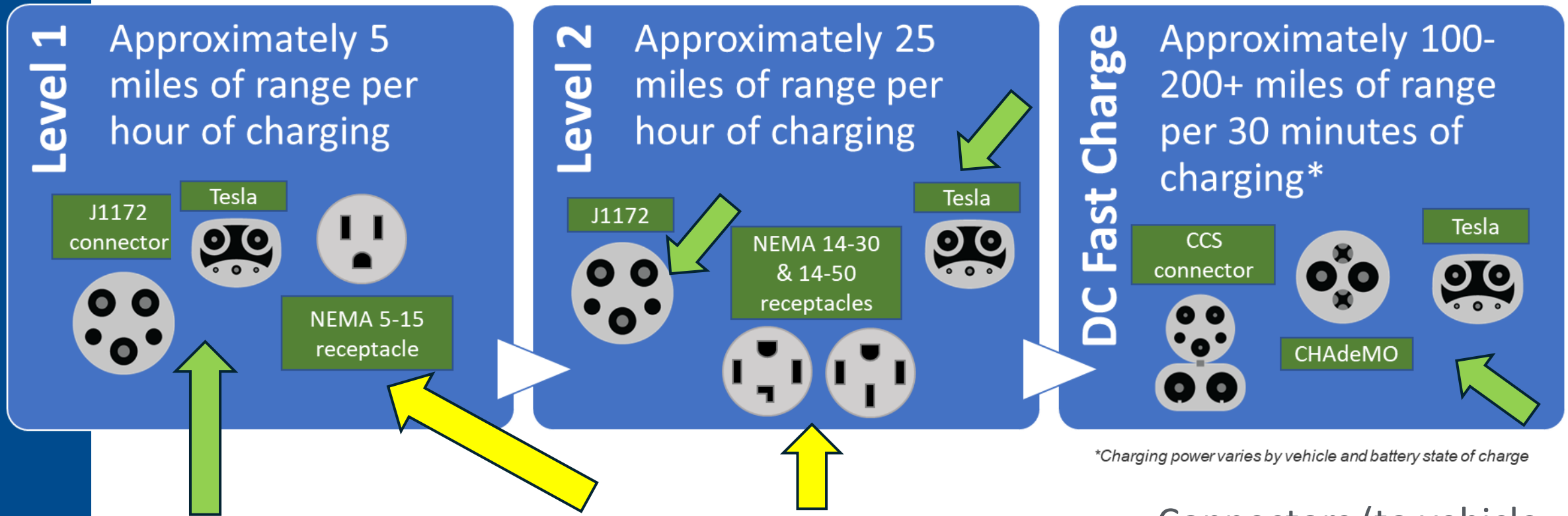
CLIMATE/ENERGY:

- All the energy is from the battery (+/-)
- Summer vs Winter variation
- Heated seats, pre-condition

"An exercise in energy management..."

*of both vehicles and charging stations

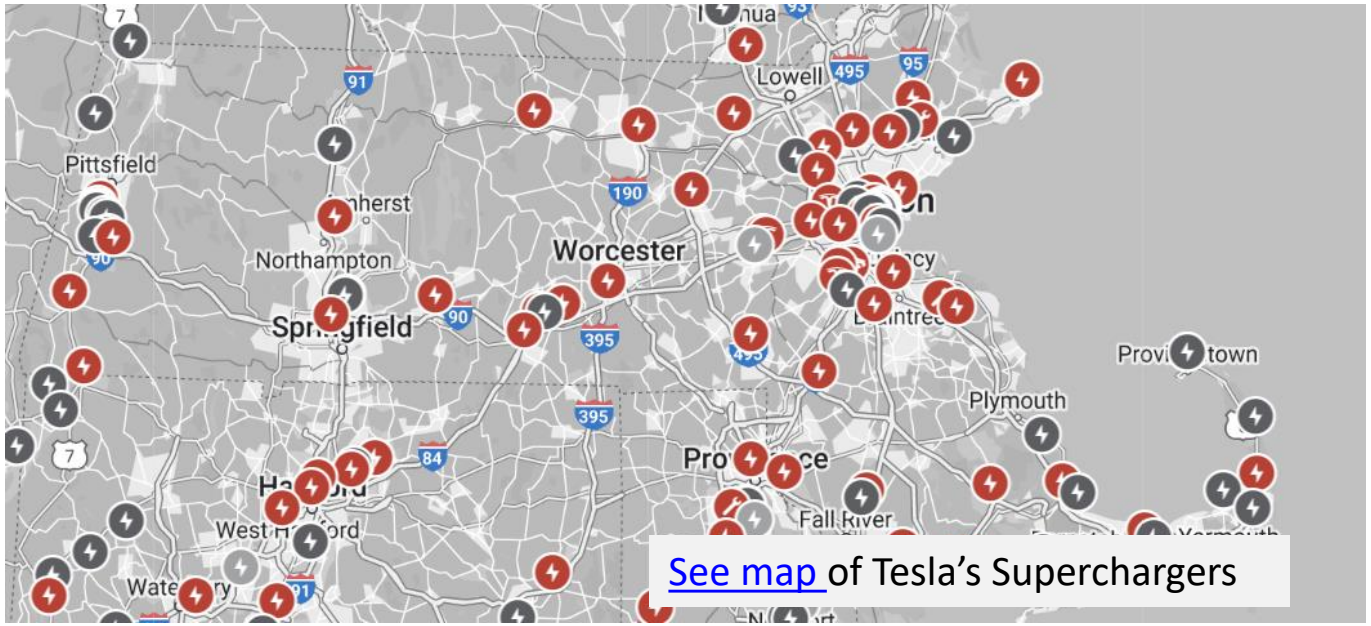
EV Charging Types: Range and Charging Ports

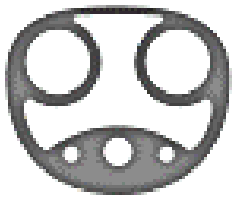


EV Charging: Industry DCFC Shift from CCS to NACS

Starting in 2024-2025, GM, Ford, Volvo, Mercedes Benz, Polestar, and Rivian EVs will come with the **North American Charging Standard (NACS)** connector instead of the current industry-standard CCS

GM and Ford struck deals with Tesla to access Tesla fast chargers across the U.S. and will offer an NACS adapter for their vehicles



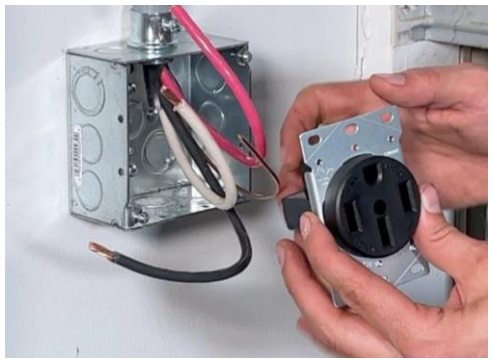


Breaking news: Five (5) Supercharger sites in MA now have CCS adapters ("Magic Dock")

Sources: CNBC, electrek

EV Charging Types: Installation Complexity

EV charging options range from simple plugs to fast-chargers that require significant electrical upgrades. Eligible entities may use VEH102 for installation services.



Level 1 and Level 2 Plugs
(AC power)

- 120V-240V; may require upgrade for 240V
- Outlets can be installed by a licensed electrician

Level 2 Charging Stations
(AC power)

- 208V-240V plus heavier amperage
- Electrical upgrades and/or trenching may be required

Most state fleets

DC Fast Charging Stations
(DC power)

- 400V-900V commercial-grade three phase connections
- Usually involve an electric utility for installation
- Only recommended for fleets in very specific circumstances

Overview of EV & EVSE Funding Opportunities

Electric Vehicles

Battery electric (BEV), plug-in hybrid (PHEV) and fuel cell electric vehicles (FCEVs).

MassEVIP Fleets

Rebates of up to $7,500 for BEVs and $5,000 for PHEVs.

MOR-EV Trucks

Rebates starting at $7,500 for medium- and heavy-duty BEVs and FCEVs for public fleets.

Federal EV Tax Credits: The Commonwealth is working on a process by which Direct pay federal tax incentives can be made availbale for public entities. More guidance is forthcoming.

EV Charging

Level 1, Level 2, and DC fast charging (DCFC).

MassEVIP Charging

60-100% of infrastructure and equipment costs for Level 1 and Level 2 public access, workplace, fleet, multi-unit dwelling and educational campus charging.

LBE Fleet EVSE Deployment Grant

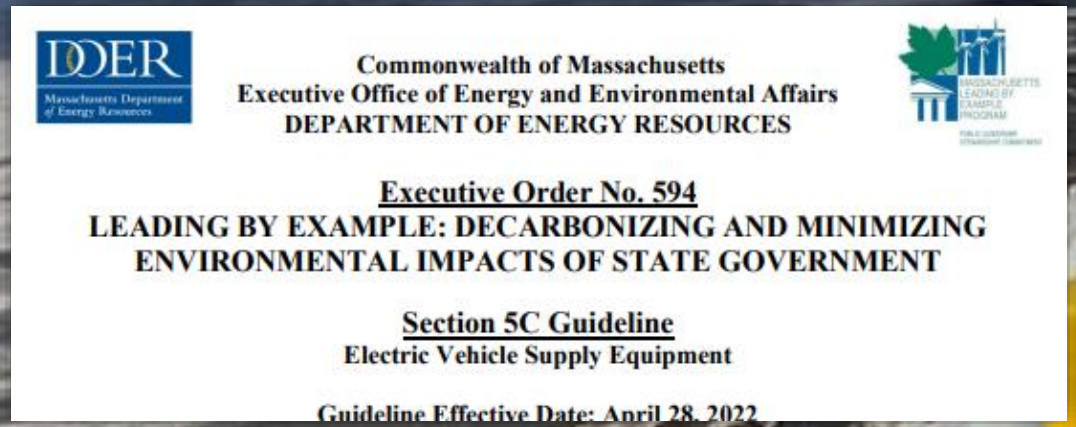
Up to 100% of infrastructure, equipment, and ongoing service costs for primarily Level 1 and Level 2 state fleet charging.

Utility Programs

50-100% of infrastructure and equipment costs for public, workplace, and fleet Level 1, Level 2 and DCFC depending on location.

Resources

Guidelines for EO594 Section 5C: Electric Vehicle Supply Equipment



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

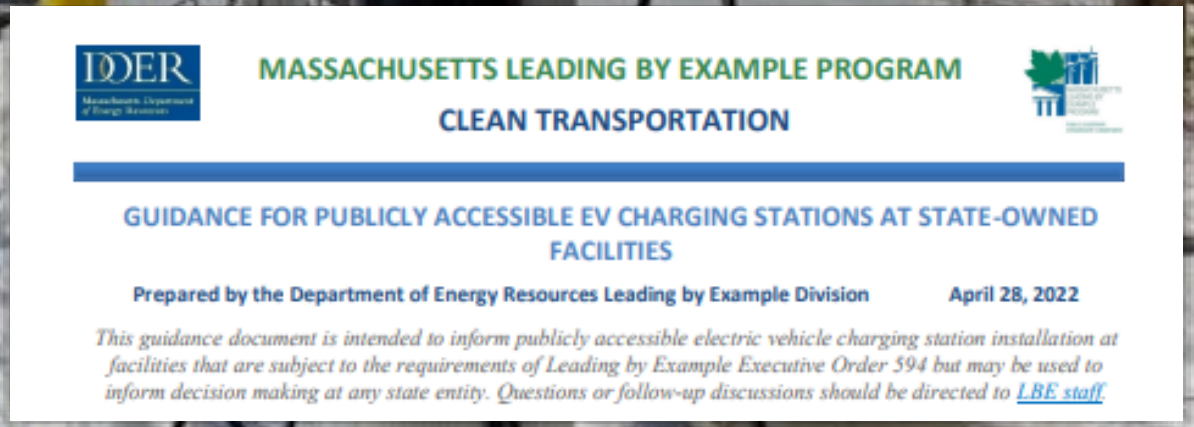
Executive Order No. 594
LEADING BY EXAMPLE: DECARBONIZING AND MINIMIZING ENVIRONMENTAL IMPACTS OF STATE GOVERNMENT

Section 5C Guideline
Electric Vehicle Supply Equipment

Guideline Effective Date: April 28, 2022

Prioritization for Fleets, Recommended Numbers, Funding and Procurement, LBE Resources

Guidance for Publicly Accessible EV Stations



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MASSACHUSETTS LEADING BY EXAMPLE PROGRAM

CLEAN TRANSPORTATION

GUIDANCE FOR PUBLICLY ACCESSIBLE EV CHARGING STATIONS AT STATE-OWNED FACILITIES

Prepared by the Department of Energy Resources Leading by Example Division April 28, 2022

This guidance document is intended to inform publicly accessible electric vehicle charging station installation at facilities that are subject to the requirements of Leading by Example Executive Order 594 but may be used to inform decision making at any state entity. Questions or follow-up discussions should be directed to LBE staff.

Locations, Types, Siting, Numbers, Funding and Procurement, Costs, Fees and Access

Additional LBE Clean Transportation Resources

- Links to statewide contract user guides
  - VEH102: EV Charging
  - VEH110: Light and Medium-Duty Vehicles
- Links to funding programs
  - MassEVIP
  - MOR-EV and MOR-EV Trucks
- TCO comparison calculator
- Lists of EVs on statewide contracts
- Quick guides on EVs and EV Charging
- Upcoming EV Models database

Visit: www.mass.gov/info-details/lbe-priorities-and-efforts-clean-transportation

Upcoming EVents! (and site visits)

- Recharge Massachusetts – Commonwealth official program that supports participants with their electrification effort.
  - Recharge Massachusetts | Recharge America (recharge-america.org)
  - RMA_Longwood_July-23-2024.pdf (recharge-america.org)
  - RMA_Springfield_Oct-19_2024.pdf (recharge-america.org)
- National Drive Electric Week (Sep 27-Oct 6, 2024)
  - National Drive Electric Week website
  - Major EVents in Westborough & Shrewsbury (Hebert Candy Mansion)

THANK YOU! - Questions?

Supplementary Slides

EV Charging Funding Programs

MassEVIP Charging (link)

- Public access grants
  - Up to 100% of equipment and installation costs at government-owned locations
- Workplace and fleet grants
  - At least 15 employees on site (workplace); where light-duty fleet vehicles are garaged (fleet)
  - Up to 60% of hardware and installation costs
- All programs: limited to $50,000 per street address

LBE Fleet EVSE Deployment Grant (link)

- Executive branch, public higher ed, and MBTA non-revenue fleet charging infrastructure
  - Up to 100% of costs associated with infrastructure and equipment; 3 years of prepaid networking and maintenance services; extended warranties; pre-wiring for future charging
- Maximum $100,000-$150,000 per state entity per fiscal year depending on fleet size

Utility Programs (Eversource, National Grid, Unitil)

- Public/workplace and fleet charging programs
  - Up to 100% of equipment and infrastructure costs; sites located in certain Environmental Justice Communities eligible for greater cost coverage

NOTE: Certain third-party funding requirements impact how the utility programs interact with other available funding sources like MassEVIP (more info)

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Preparing for the Next Phase

What we know…

The transportation sector (including the state fleet) is expected to rapidly electrify in the coming years

Funding from LBE, MassEVIP, and the utilities are supporting installation of charging stations for public access, workplace, multi-unit dwelling and fleets

DCFC is becoming increasingly available for public use, especially along highway corridors

Examples of Massachusetts Policy and Program Mechanisms

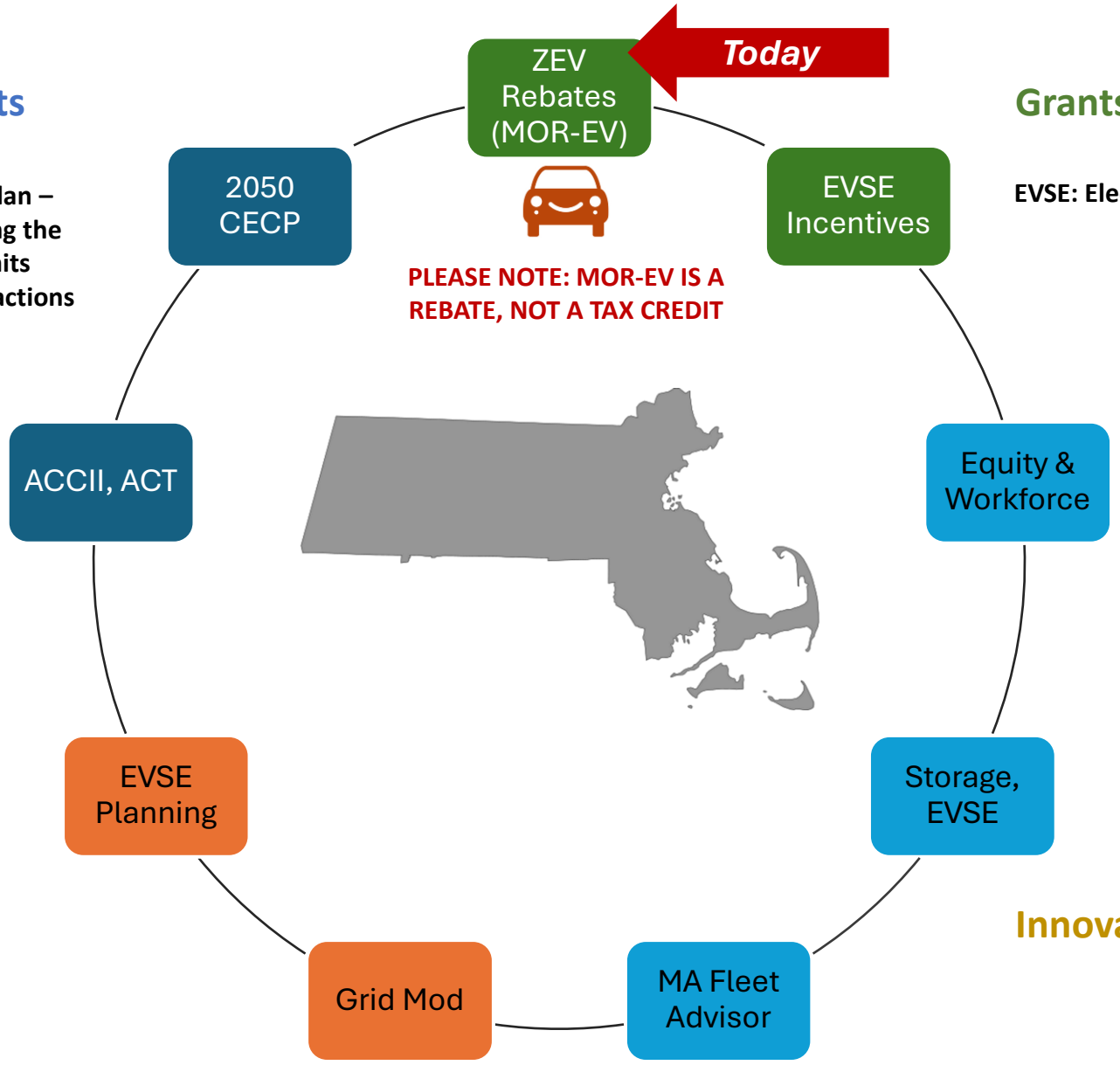
Regulations and Targets

CECP: Clean Energy and Climate Plan – MA's comprehensive plans detailing the actions to achieve emissions limits comprehensive plans detailing the actions to achieve emissions limits

ACCII: Advanced Clean Cars II - California Air Resources Board (CARB) passenger vehicle and light-duty truck regulations that other states are following
ACT: Advanced Clean Trucks Rule

Grants and Incentives

EVSE: Electric Vehicle Supply Equipment = EV Charging Station



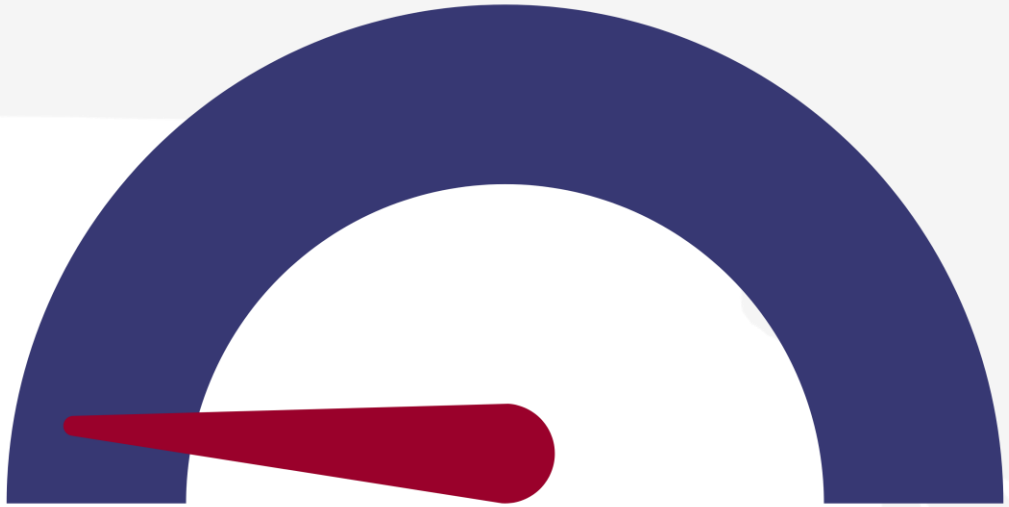
Strategic Planning

Innovative Approaches

EVs on the Road in Massachusetts

January 2022

40,000 EVs



2030

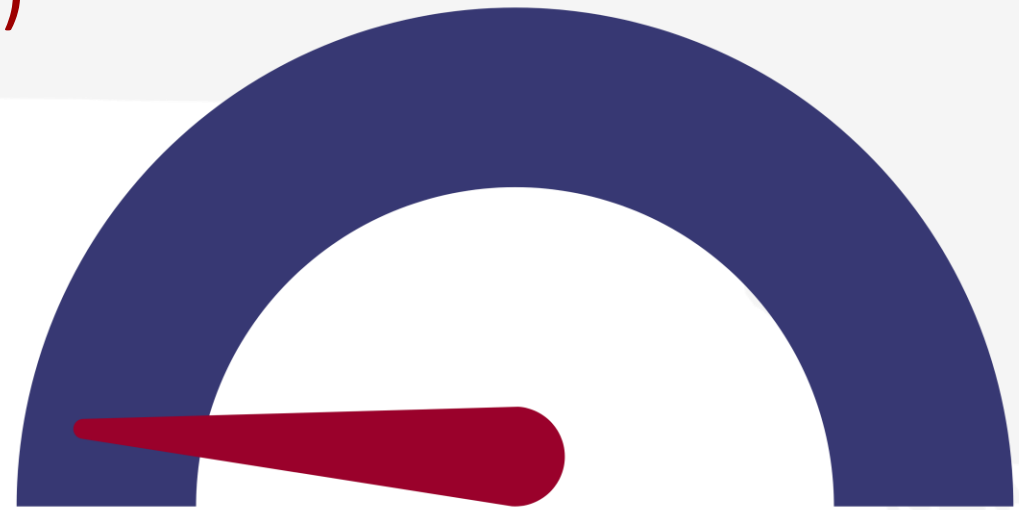
750,000 EVs

RECHARGE|MA

EVs on the Road in Massachusetts

"Today"
(January 2024)

100,000 EVs



2030

900,000 EVs

RECHARGE|MA

Sampling of New and Upcoming EV Models - REVISE

Sedans, Crossovers, & SUVs	Pickup Trucks	Vans & Specialty Vehicles
• Nissan Ariya (2021) • Volvo C40 Recharge (2021) • Mazda MX-30 (2021) • Hyundai Ioniq 5 (2021) • Kia EV6 (2022) • Ford Explorer EV (2023) • Honda Prologue (2024)	• Ford F-150 Lightning (2021) • Rivian R1T and R1S (2021) • Chevy Silverado Electric (2023) • Ram 1500 EV (2024)	• Ford E-Transit (2021) • Canoo (2022)

Reminder: Electric Vehicles on Statewide Contract - ?

Sedans, Crossovers & SUVs	Pickup Trucks	Vans & Specialty Vehicles
• Chevy Bolt • Hyundai Ioniq • Chevy Bolt EUV* • Ford Mustang Mach-E • Hyundai Kona • Hyundai [illegible]	• Ford F-150 Lightning	• Ford E-Transit • Lightning Electric Transit 350

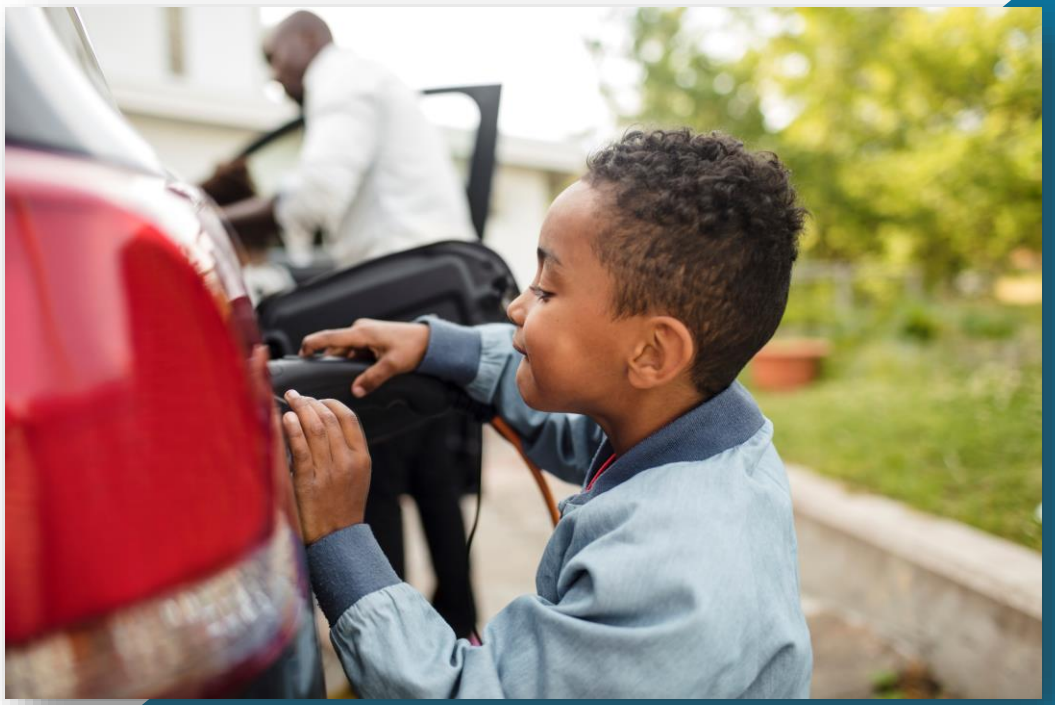
Click here for a full list of EVs on statewide contract

Buying or Leasing a Car? – MOR-EV Current Programs:

MOR-EV Standard, **MOR-EV Used**, and **MOR-EV+ Rebates**

PLEASE NOTE: MOR-EV IS A REBATE, NOT A TAX CREDIT

- $3,500 for eligible new battery electric (BEVs) or fuel cell electric vehicles (FCEVs)
- $3,500 rebate for used BEVs/FCEVs if income-qualifying resident
- $1,500 MOR-EV+ rebate adder if income-qualifying resident
- $1,000 rebate adder for trading in an eligible internal combustion vehicle
- Several rebates now available at point of purchase or lease through participating MA auto dealerships



Buying or Leasing a Truck? – MOR-EV Trucks Programs

MOR-EV Class 2b Trucks and **MOR-EV Medium- and Heavy-Duty Rebates**

- Fleets can access funding for eligible new BEVs and FCEVs
  - Pickup trucks 6,000–10,000 pounds GVWR and other body types 8,501–10,000 pounds; maximum $80K MSRP; **$7,500 rebate**
  - Vehicles over 10,000 pounds; maximum $2M MSRP; **$15,000–$90,000 rebate**
- Rebates can be combined with new federal Commercial Clean Vehicle Tax Credit incentives
  - *Cannot* be combined with funds from other state-administered programs (e.g., MassDEP's programs, including MassEVIP for public fleet vehicles <10,001lbs)

PLEASE NOTE: MOR-EV IS A REBATE, NOT A TAX CREDIT

Zero Emission Vehicle Incentives - ?

- ❑ New $7,500 credit for purchase of new ZEVs 2023 through 2032
  - ✓ Eliminates 200,000 vehicle manufacturer cap
  - ✓ Maximum MSRP of $80,000 for vans, SUVs, and pickups; $55,000 for others
  - ✓ Income eligibility limit of $150,000; $300,000 for joint filers
  - ✓ Credit only available to EVs where final assembly occurred in N. America
  - ✓ 40% of battery minerals' value must be mined or processed in N. America or free trade country or recycled n the US (worth $3,750)
  - ✓ 50% of value of battery components manufactured or assembled in N. America (worth $3,750)
  - ✓ Battery requirements ramp up over time to 80% (mineral) and 100% (components)
  - ✓ Vehicles cannot have any battery components from a "foreign entity of concern as of 2024, or critical minerals as of 2025"
- ❑ New credit for pre-owned vehicles starting 2023
  - ✓ $4,000 or 30% of vehicle cost (whichever is less)
  - ✓ Max price of $25,000
  - ✓ Income limit of $75,000; $150,000 for joint filers
  - ✓ No battery requirements
- ❑ New commercial clean vehicle credit
  - ✓ $7,500 for ZEV under 14,000lbs
  - ✓ Up to $40,000 for ZEV over 14,000lbs

Limited vehicles eligible for tax credit through December 2022 if meet assembly requirement and are not subject to 200,000 manufacturer cap

Clean Vehicle Credits Under the IRA – July 2023; update?

New Clean Vehicle Credit

- Eligibility: **Individuals** who meet the adjusted gross income thresholds; can also apply for vehicles purchased by individuals for their business
- Vehicle criteria:
  - Battery capacity at least 7 kWh
  - <14,000 pounds
  - Qualified manufacturer and model
- Credit amount: $3,750-$7,500
  - Dependent on meeting battery components and/or battery mineral requirements

VS.

Commercial Clean Vehicle Credit

- Eligibility: **Businesses and tax-exempt organizations**
- Must meet vehicle criteria:
  - Battery capacity
  - Vehicle use
  - Manufacturer
- Credit Amount:
  - $7,500-$40,000
- Eligible for Direct Pay
  - Not eligible for transferability

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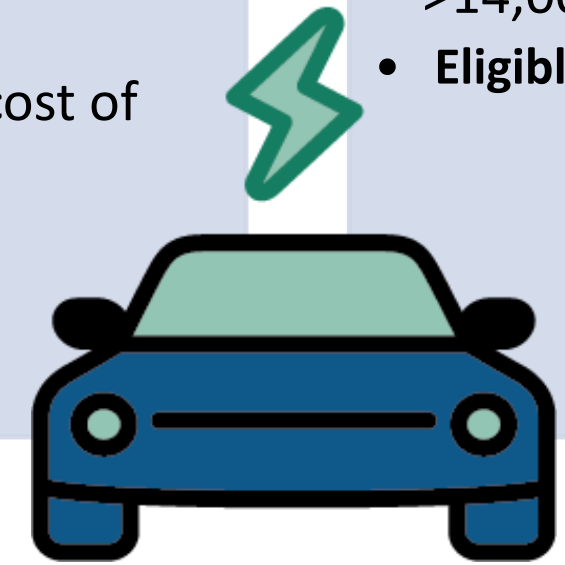
Commercial Clean Vehicle Tax Credit (CCVC)

The credit amount equals the lesser of:

- 30% of the purchase price if the vehicle is not powered by gas or diesel

or

- The incremental cost of the vehicle



Maximum credit allowed:

- $7,500 for vehicles <14,000 pounds
- $40,000 for vehicles >14,000 pounds
- **Eligible for Direct Pay**

Additional criteria:

- Must meet battery requirements
  - 7 kWh or 15 kWh depending on vehicle weight
- Fuel cell motor vehicle requirements
- Must be from a qualified manufacturer
- Must be domestically assembled

More Information

Electric Vehicle Funding Programs

MassEVIP Fleets (link)

- Rolling grant for municipalities, state agencies, and public higher education campuses
- PHEVs and BEVs with a purchase price $60,000 or less and gross vehicle weight of 10,000 pounds or less
- Vehicle must be retained for 3 years
- Maximum incentives for public fleet vehicle purchases and leases:
  - BEVs = $5,000-$7,500
  - PHEVs = $3,000-$5,000
- Funding must be approved prior to vehicle order

MOR-EV Trucks (link)

- Post-purchase rebate for individuals, corporations, and public entities
- BEVs and FCEVs with a sales price over $50,000 and gross vehicle weight over 8,500 pounds
- Vehicle must be retained for 4 years
- Rebate amounts vary by vehicle weight:
  - Class 2b-3 = $7,500-$15,000
  - Class 4-6 = $30,000-$60,000
  - Class 7-8 = $75,000-$90,000

NOTE: Various MOR-EV program changes coming soon; details to be announced

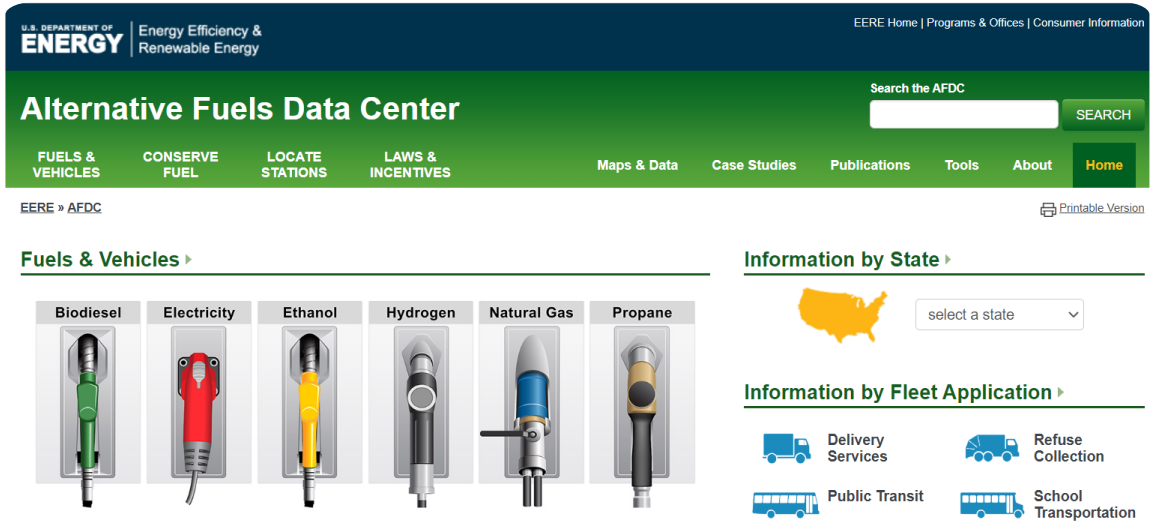
EV Charging Funding Programs

Charging Type	MassEVIP	LBE Grant	Utilities
Public Access	✓		✓
Public (State) Fleets	✓ Light-Duty Fleet	✓	✓
Workplace	✓		✓
Multi-Unit Dwellings (& educational campuses)	✓		✓

REMINDER! All Level 1 and Level 2 charging stations sold and installed in the Commonwealth must meet the MA Appliance Efficiency Standards

Navigating ZEV Requirements

- U.S. Department of Energy's AFDC list of electric vehicles that likely meet the North America final assembly requirement
- To determine if a specific vehicle's final assembly occurred in North America, enter the 17-character VIN into the NHTSA VIN Decoder tool
  - Refer to the "Plant Information" field at the bottom of the page, which lists the build plant and country for the searched vehicle



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New Clean Vehicles Tax Credit Timeline

Aug 2022
- Tax credit limited to vehicles final assembled in North America

Dec 2022
- IRS to issue guidance on critical mineral and battery requirements

Jan 2023
- OEM unit cap eliminated. Revised tax credit created.

Jan 2024
- Credits apply to non-taxable entities
- Vehicles no longer eligible if any battery components are *manufactured/ assembled* by a "foreign entity of concern"

Jan 2025
- Vehicles no longer eligible if any critical minerals contained in battery are *extracted, processed, or recycled* by a "foreign entity of concern"

Dec 2032
- Clean Vehicle tax credit program ends

Tax Credit by the numbers:

- **$3,750** – Base credit amount if critical mineral requirements met
- **$3,750** – Additional credit if battery component requirements met
- **$80,000** – Maximum MSRP for vans, SUVs, pickup trucks to be eligible
- **$55,000** – Maximum MSRP for other vehicles
- **$150,000** (single); **$225,000** (head of household); **$300,000** (filing jointly) – maximum eligible income

For more information about this program and lists of vehicles that qualify, see this helpful guide from Electrek and this page from Green Energy Consumer Alliance.

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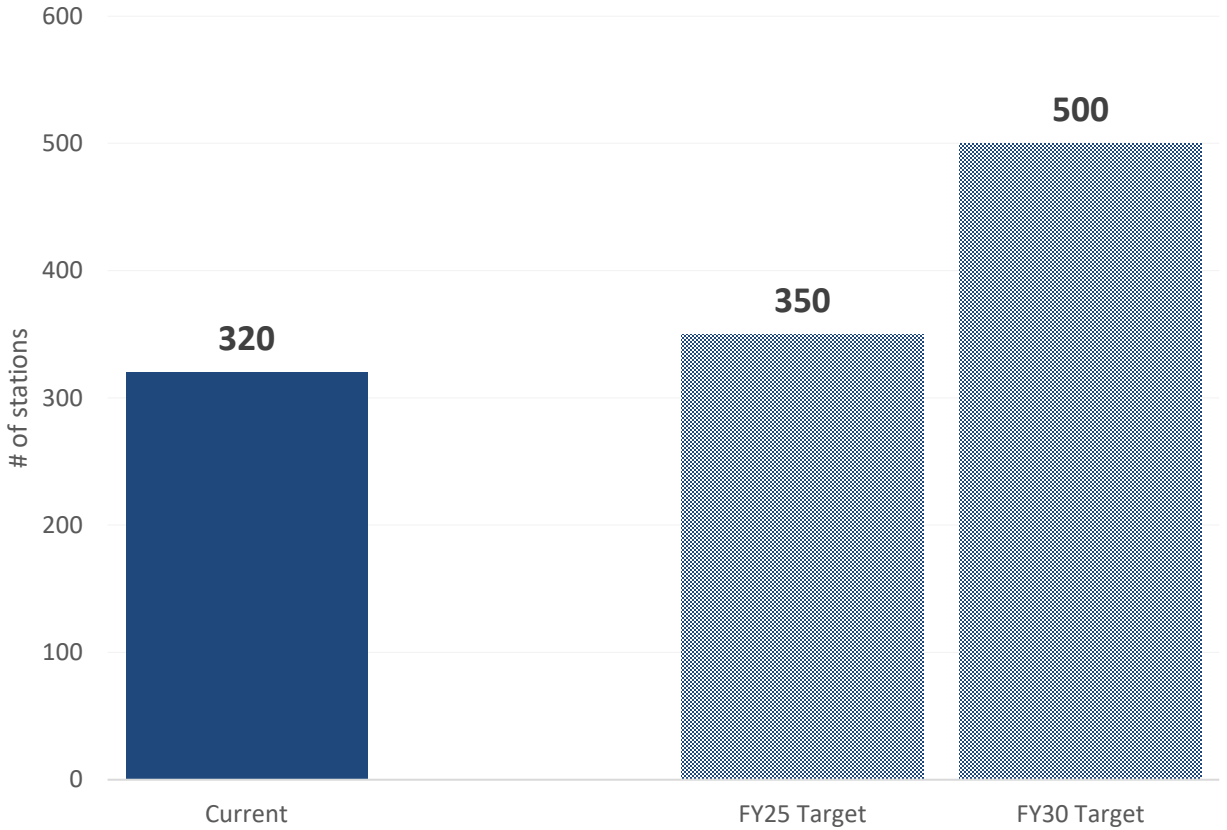
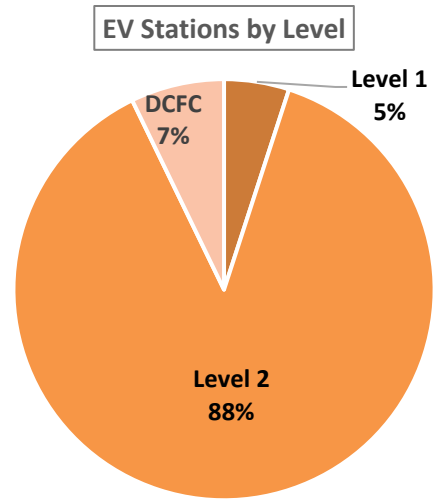
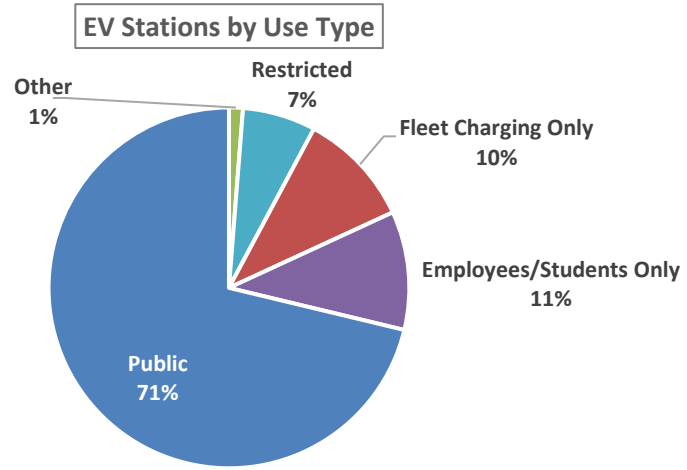
EV Charging - from May 2023 – update??

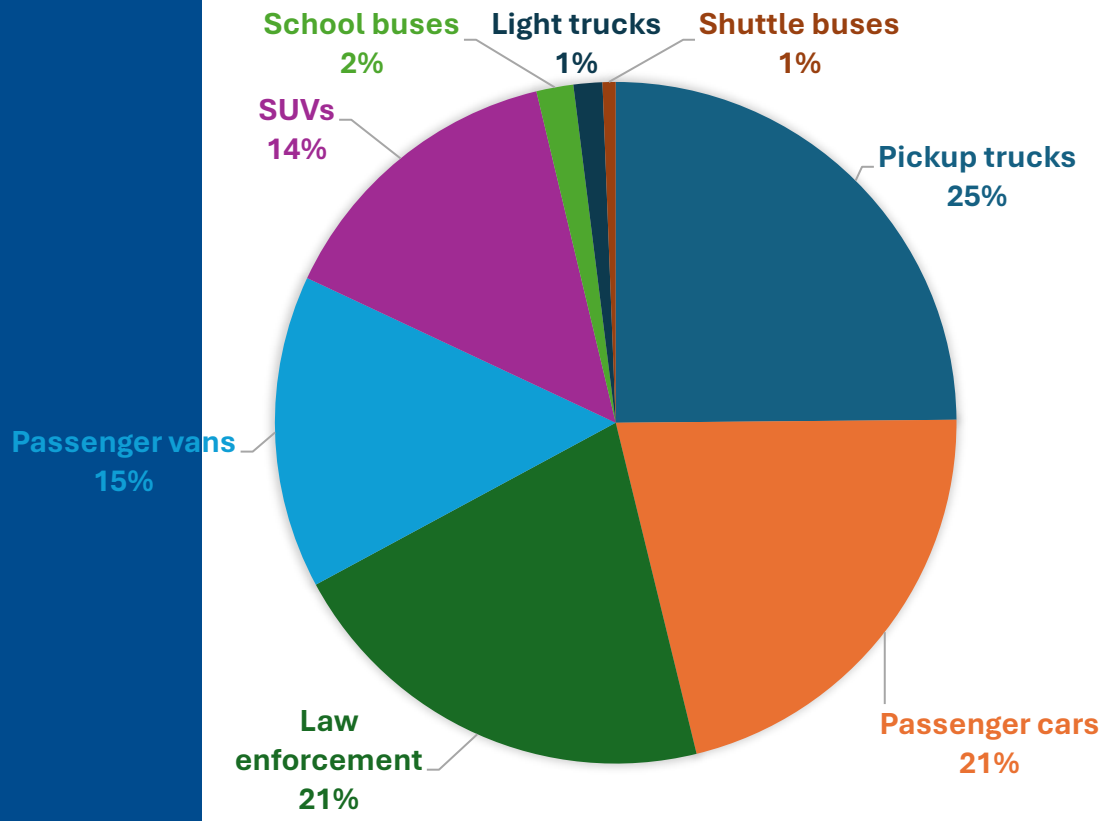


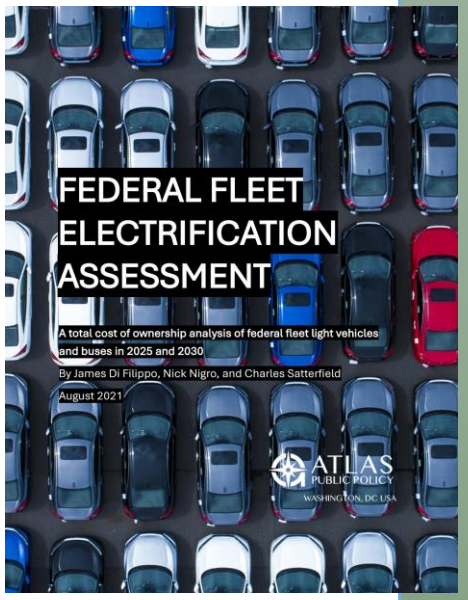




- Currently 320 active & installed EV charging stations (538 ports) in the state portfolio
- Majority of these stations are both Level 2 and for public use (62%)
- Additional 101 stations (188 ports) planned & in progress

An Analysis of Electrifying the Federal Fleet – UPDATED from 9/14/21?





Report

- Third party report assessed federal government fleet, which is the largest in the US
- Suggests that between 2025-2030 a growing percentage of federal vehicles could be replaced with EVs at a lower TCO, with the vast majority being cost competitive by 2030
- Non-USPS fleet EVs could yield lifetime savings of as much as $1.18B
- Report quantifies reinvestment of savings and public benefits of more rapid electrification

USPS fleet electrification could yield as much as $4.3B in lifetime savings

2025/2030 CECP Transportation Strategies

Goal of 200,000 total EVs on the road and 15,000 public charging stations by 2025

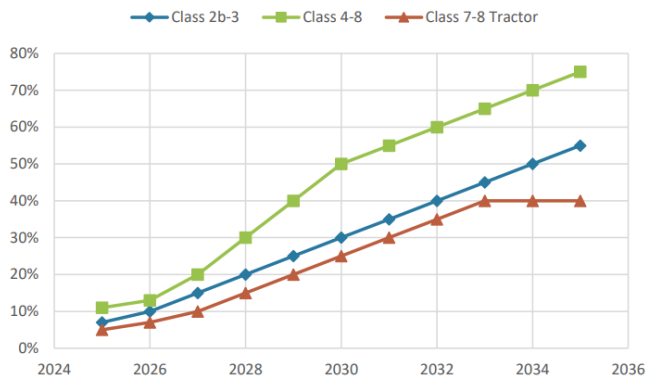
Goal of 900,000 EVs on road and 75,000 public charging stations by 2030

Building training and resource libraries for workforce development, technical assistance, and customer support

Entire MBTA bus fleet to battery electric buses by 2040

Scale up ZEV sale requirements in alignment with CA regulations

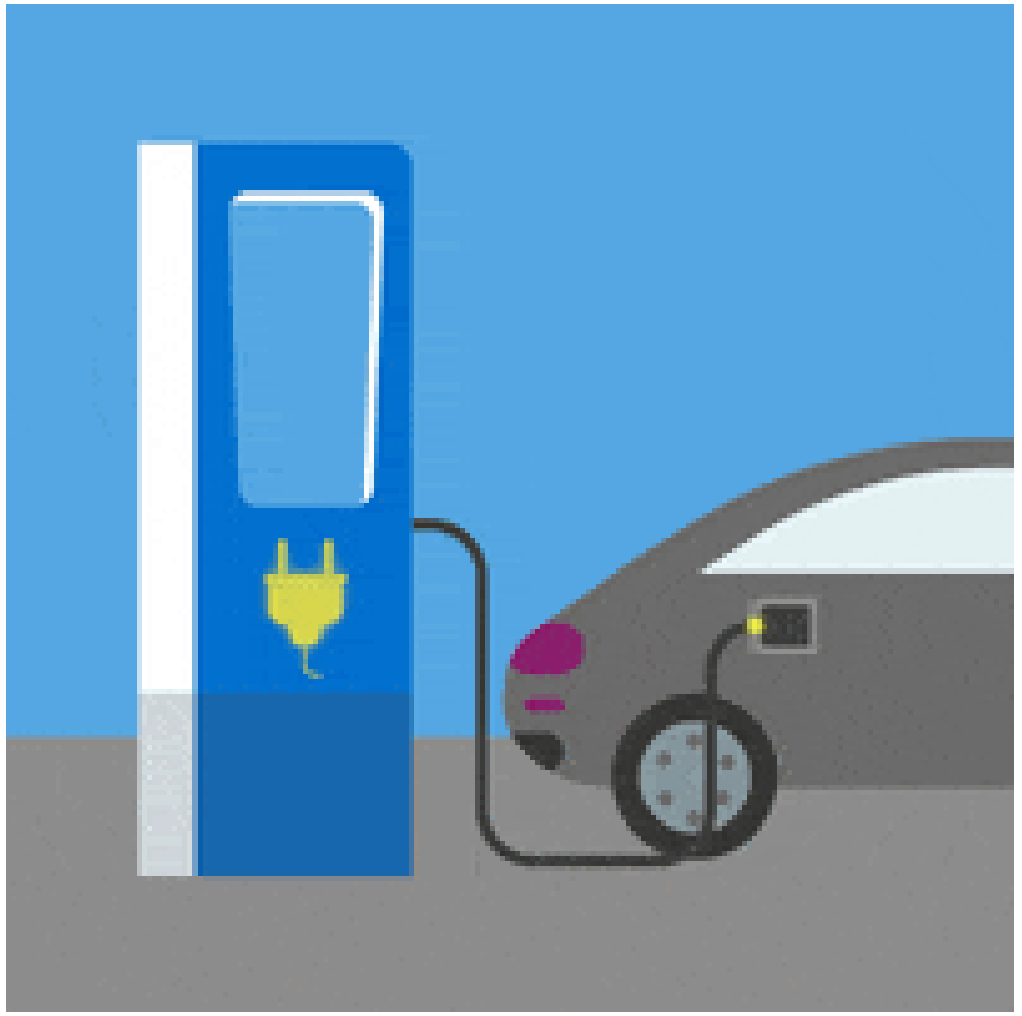
Figure 4.2. Advanced Clean Truck Rule with ZEV Sales Requirements



Update: LBE Fleet EV Charging Station Grant

Sophia to update / present?

- New LBE grant will fund 100% of cost of installing Level 1 and 2 charging stations for fleet use, and up to three years of data and maintenance packages
- Applications will be accepted through April 2023, deadline may be extended if funding not fully committed
- LBE currently investigating how grant recipients can comply with new federal Buy America requirements
- In the meantime, state entities can plan in advance: identify potential EVSE locations, draft a scope of work for vendors, etc



Statewide Contract Updates - REVISE

VEH110 -- Light and Medium Duty Vehicl

Replaces VEH98

- Accepting bids through **October 13th at 2pm**
- Estimated contract start date: **December 1st, 2021**
- More competitive; new category distribution and requirements; preference given to ZEVs
- **Only ZEV/HEV models being sought for sedan, minivan, and SUV categories**

VEH111 -- Heavy Duty Vehicles & On-Road Construc

Replaces VEH93

- Estimated contract start date: **November 1st, 2021**
- New category distribution, preference given to ZEVs and AFVs