MA Leading by Example Council Meeting

DOER Massachusetts Department of Energy Resources

September 11, 2018

MASSACHUSETTS LEADING BY EXAMPLE PROGRAM
PUBLIC LEADERSHIP. STEWARDSHIP. COMMITMENT.

Massachusetts Leading by Example
State Government Progress – as of August 2018

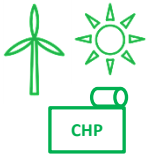
Greenhouse Gas (GHG) Emissions

↓ 28%
2004 -2017

Energy Use Intensity per Square Foot

↓ 15%
2004-2017

Electricity via Renewable or Onsite Generation



20%
In 2017

Heating Oil Consumption at State Facilities

↓ 84%
2006-2017

23.3 MW Installed Solar PV at State Sites

15.2 MW
Since 2015

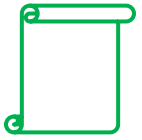
78 LEED Certified State Buildings

40
Since 2015

116 Electric Vehicle Charging Stations at State Sites

54
Since 2015

Leading by Example Grants Awarded



$10.5 M
Since 2015

Agenda

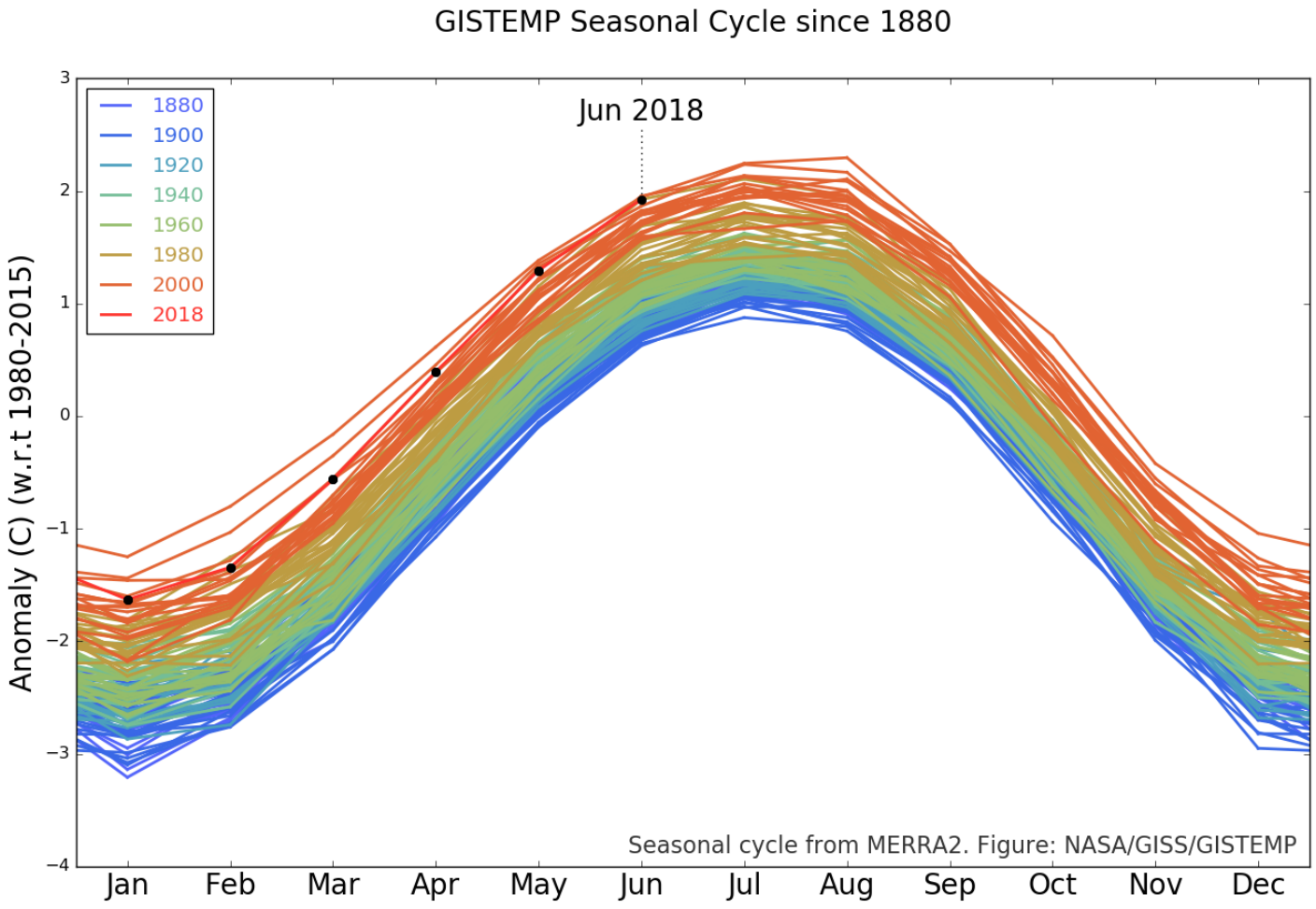
- Welcome & Introductions
- News from Around the World
- Massachusetts Updates
- Grid Capacity Days/Peak Demand
- Vehicles
- Solar Updates
- LBE Updates
- Hampshire College Sustainability Overview
- *Optional Tour: Kern Center*

News From Around the World

Recap of Recent Extreme Weather & Temperatures

June 2018 ties for third-warmest June on record

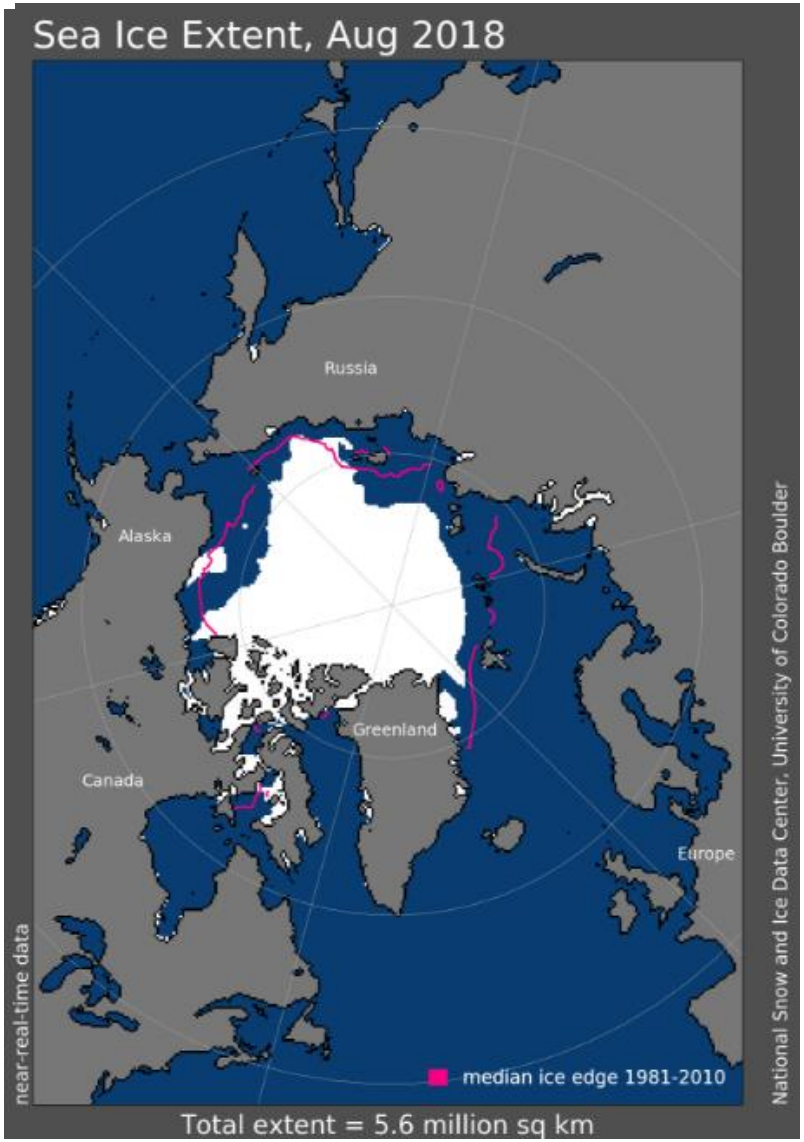
The monthly analysis is assembled from publicly available data acquired by about 6,300 meteorological stations around the world.



NASA, 2018

Some Of The Oldest Ice In The Arctic Is Now Breaking Apart

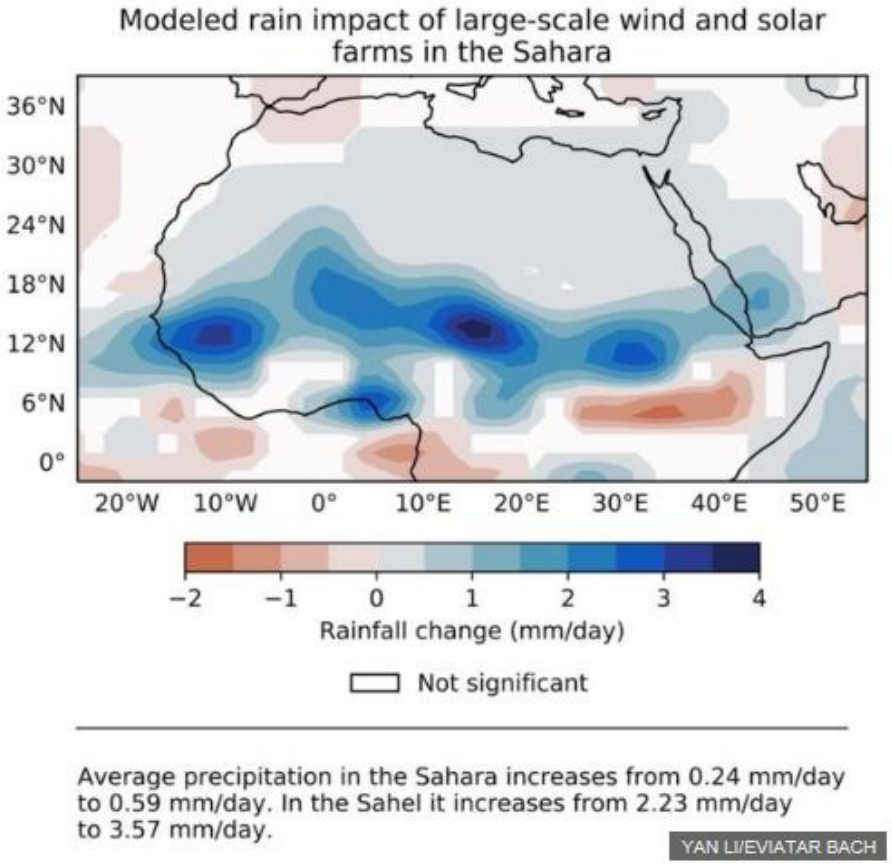
- The Arctic is warming faster than any other part of the planet
- “The normally year-round frozen ice "kind of rattles around in the Arctic now’ according to the National Snow and Ice Data Center
- Scientists say that Arctic environment affects the jet stream, which influences weather across the Northern Hemisphere



NPR, 2018

NSIDC, 2018

Large-scale wind and solar power 'could green the Sahara'



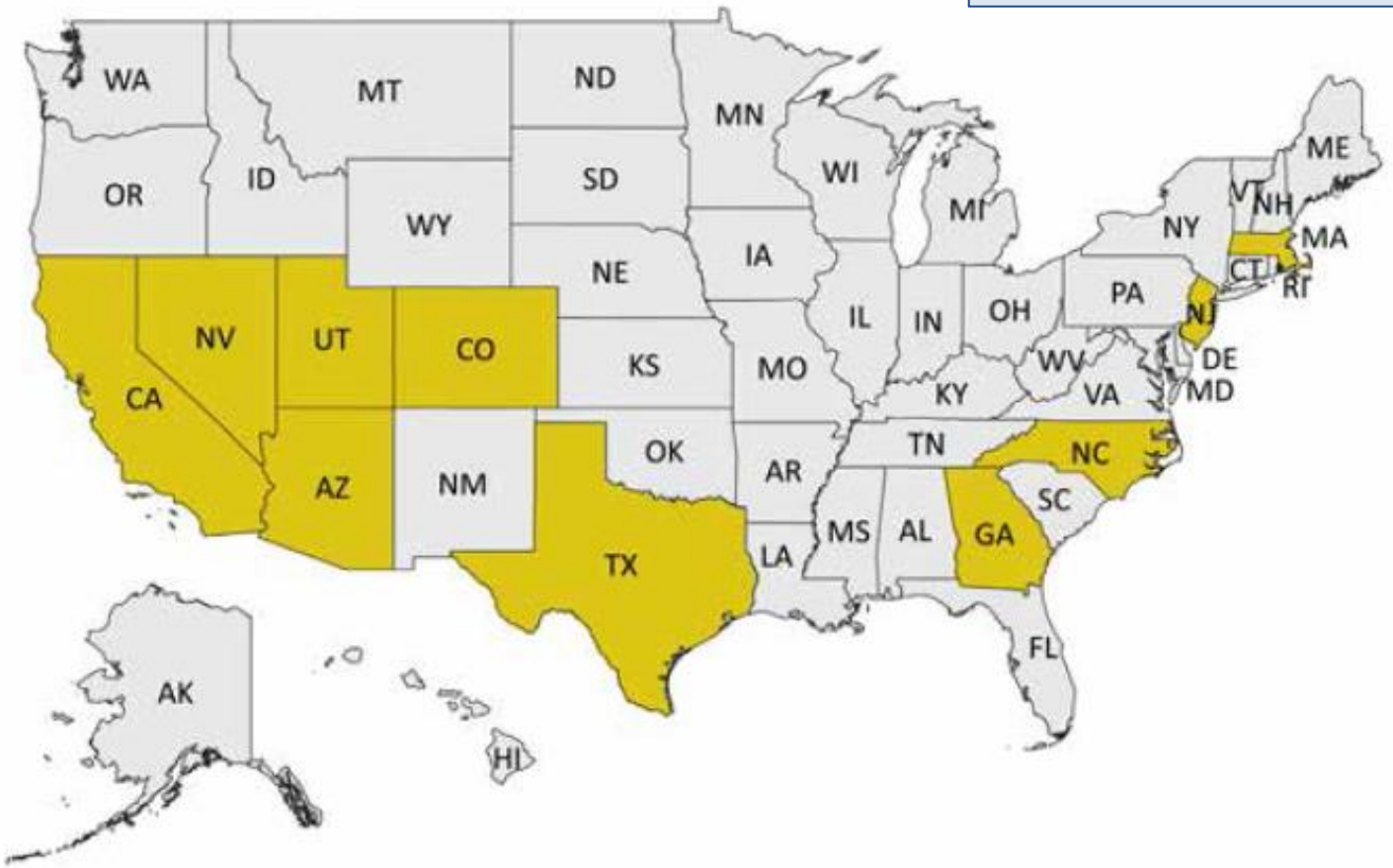
- Scientists modeled a massive installation of renewables (9M sq/km) in Sahara desert would generate > 4x the energy the world uses annually
  - Would more than double precipitation and increase vegetation cover about 20%
  - How? Wind farms mix warmer air from above that creates a feedback loop for more evaporation, precipitation and plant growth

BBC, 2018

Clean Energy Facts of Note

Figure 3. America's Top 10 States for Growth in Solar Electricity Production Since 2008[47]

Environment America, 2018



1. California
2. Arizona
3. North Carolina
4. Nevada
5. Texas
6. New Jersey
7. Massachusetts
8. Georgia
9. Utah
10. Colorado

Clean Energy Facts of Note

Most Improved States for Electricity Efficiency

Data reported by ACEEE's State Energy Efficiency Scorecard reports

State	Electricity Saved as % of Retail Sales, 2008	Electricity Saved as % of Retail Sales, 2016	Change (Percentage points)	Rank, by Increase
Massachusetts	0.69%	3.00%	2.31	1
Rhode Island	0.77%	2.85%	2.08	2
Illinois	0.00%	1.23%	1.23	3
Michigan	0.01%	1.17%	1.16	4
Washington	0.61%	1.54%	0.93	5
Arizona	0.53%	1.42%	0.89	6
Ohio	0.03%	0.87%	0.84	7
Maryland	0.13%	0.91%	0.78	8
New York	0.33%	1.09%	0.76	9
Maine	0.64%	1.38%	0.74	10

Environment America, 2018

Clean Energy Facts of Note

Top EV States through 2017 (Ranked by EVs per Registered Vehicle)

State	EV Sales through 2017	EVs per Thousand Registered Vehicles	Rank (per Registered Vehicle)	Rank (Cumulative Sales)
California	182,805	12.6	1	1
Hawaii	5,310	10.4	2	13
Washington	19,800	6.9	3	3
Georgia	23,658	6.8	4	2
Oregon	9,210	6.3	5	7
Colorado	7,444	4.2	6	9
Vermont	664	2.9	7	31
Utah	2,639	2.8	8	22
Arizona	6,030	2.6	9	11
Massachusetts	5,411	2.4	10	12

Environment America, 2018

EPA Proposed Changes

- Fuel Efficiency standard established by Obama Administration required 46.7 mpg fleet average by 2025
- Trump Administration proposed changes would stop increases in 2020 resulting in 37 mpg fleet average

EPA, August 2018

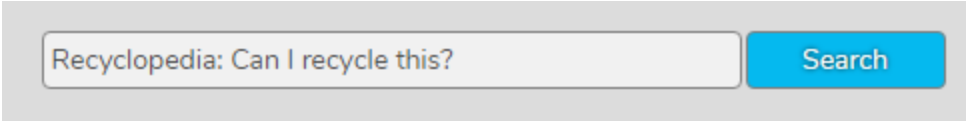
- Proposed rules also look to eliminate California authority to set own standards

MA Clean Energy Plan: Vehicle Standards, 2015

Massachusetts Updates

Recycle Smart MA

- **New recycling education program from MassDEP launched in August**
- **Goals:**
  - Educate MA residents on what's recyclable
  - Reduce contamination
- **Tools:**



  - Searchable database of how to dispose of items
  - Printable recycling signage

recyclesmartma.org

MassDEP AN INITIATIVE OF THE MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION

Recycle Smart

DOER, 2018

Hospital Resiliency Awards

- DOER awarded nine grants for $9.6 million for hospital resiliency projects in August
  - To provide medical services through grid outages w/ clean energy technologies
  - This includes:
    - Adding battery storage
    - Add black start and islanding capabilities to combined heat and power (CHP) systems
    - Upgrading electrical switchgear and load management

Grant Recipients
• Berkshire Medical Center (Pittsfield)
• Brigham and Women's Faulkner Hospital (Boston)
• Brigham and Women's Hospital (Boston)
• Heywood Hospital (Gardner)
• Lahey Hospital & Medical Center (Burlington)
• Milford Regional Medical Center (Milford)
• Tufts Medical Center (Boston)
• UMass Memorial HealthAlliance Hospital (Leominster)
• UMass Memorial Medical Center/Memorial Campus (Worcester)

DOER, 2018

Green Communities Grants

- DOER awarded $14.7 million to 80 cities and towns for energy efficiency and renewable energy projects in August

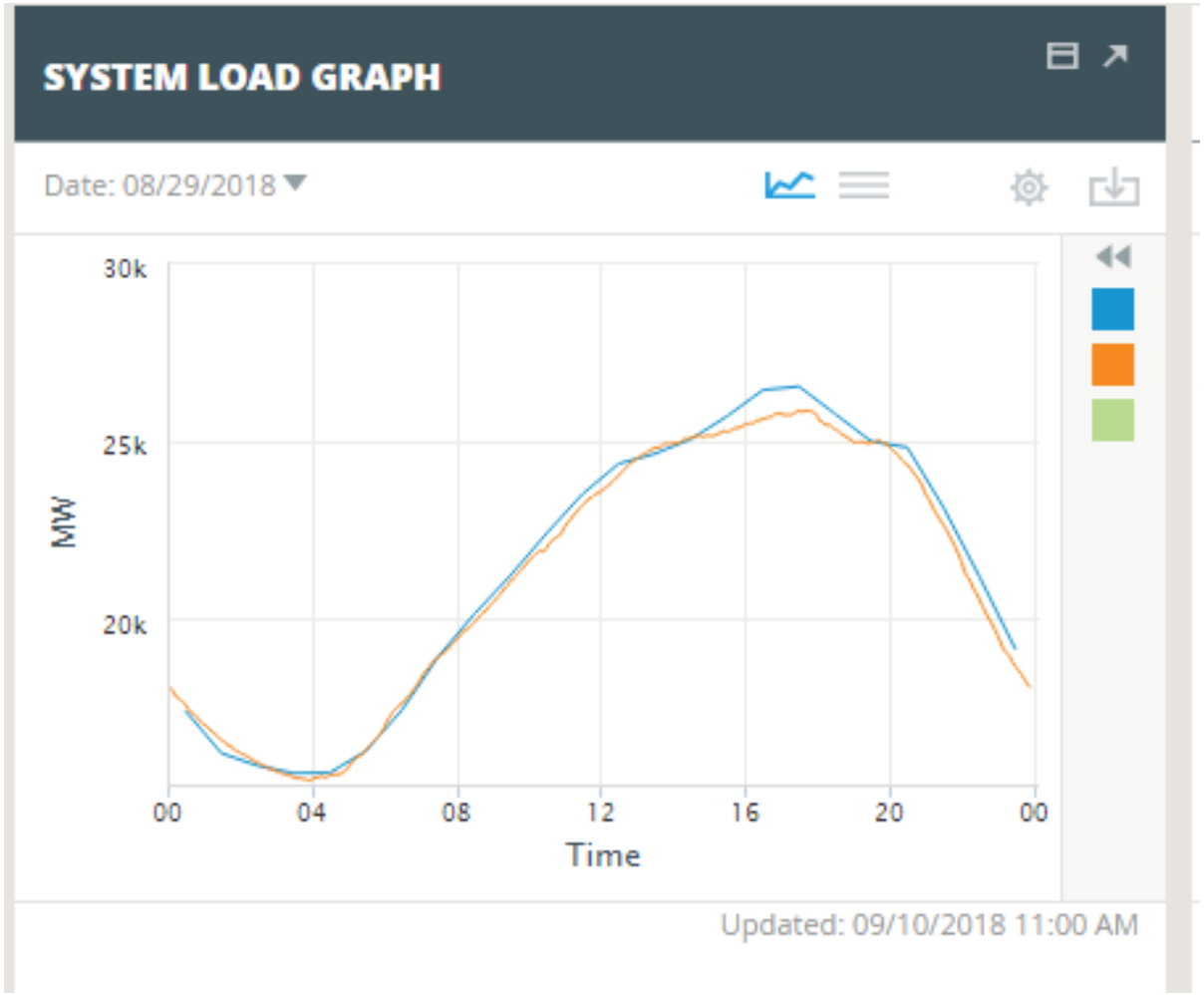
- Projects range from:
  - ventilation system upgrades
  - high efficiency lighting
  - LED streetlights
  - installation of insulation and energy management systems
  - oil-to-gas heating system conversions
  - electric vehicles and EV charging stations

- Nearly $100 million awarded to Green Communities since 2010

Grid Capacity Days/Peak Demand

Summer 2018 Peak Demand Days

iso-ne.com/isoexpress/



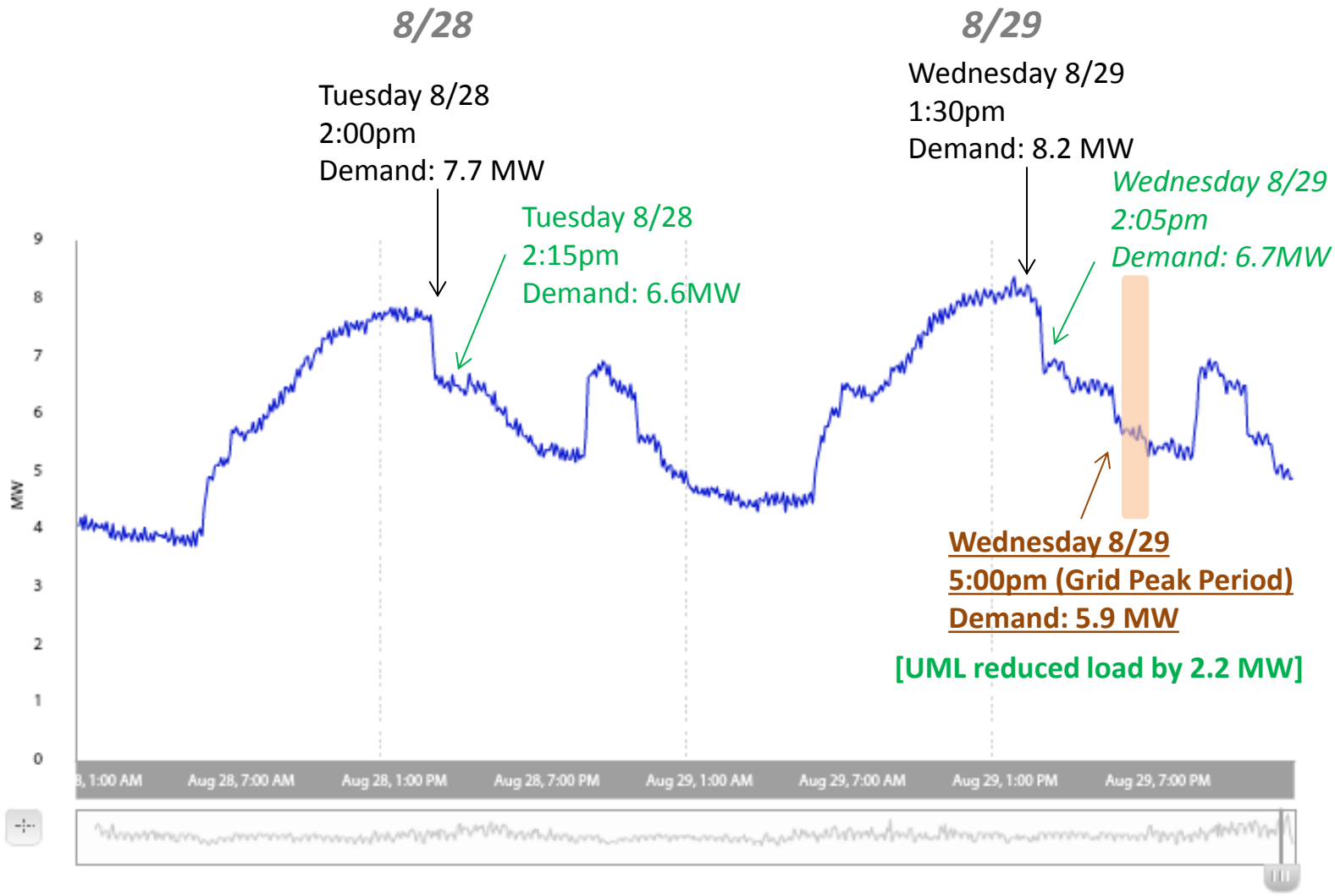
Forecasted

Actual

Grid Peak:

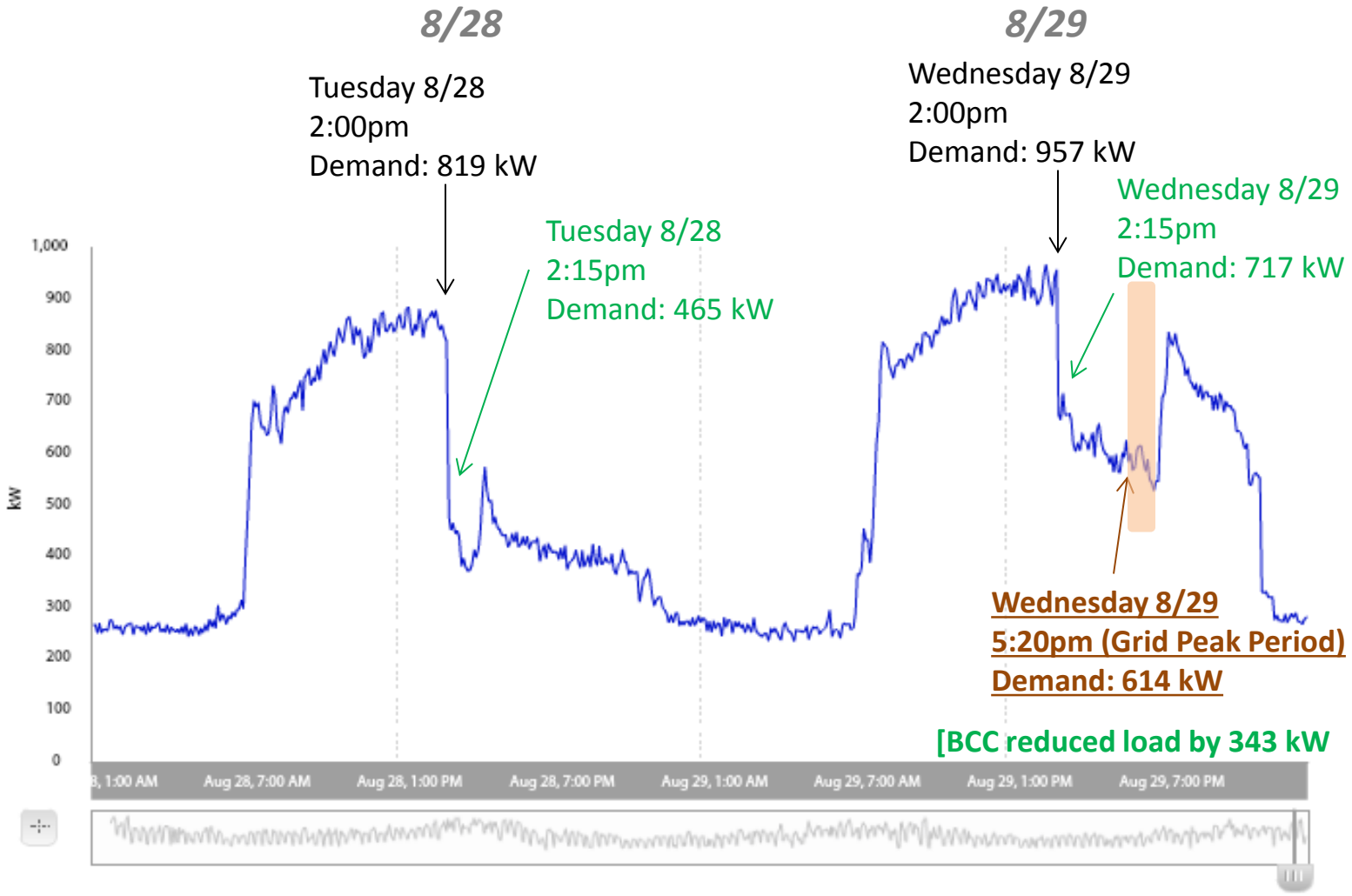
- Wednesday 8/29 ~25.7 GW from 5-6pm
  - About 750 MW less than forecasted

UMass Lowell Peak Shaving: Afternoons of 8/28 – 8/29



Estimated $188,000 savings in next year capacity tag charges
(or $15,000/month savings per monthly utility bills)

Bristol Community College Peak Shaving: Afternoons of 8/28 – 8/29



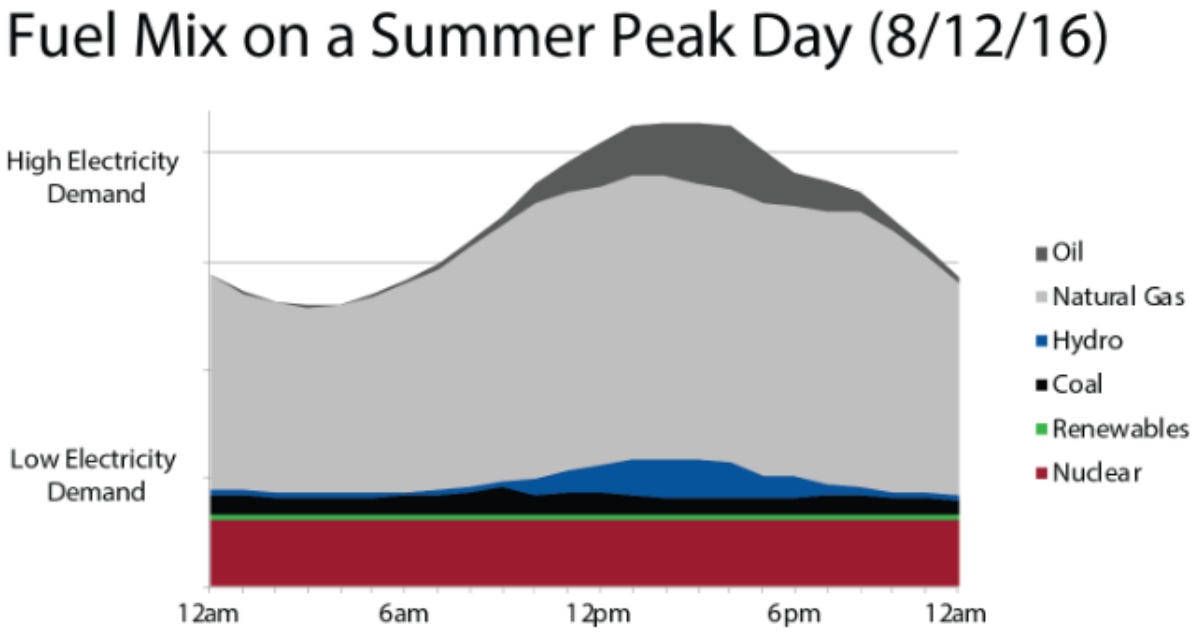
Estimated $28,000 savings in next year capacity tag charges
(or $2,400 /month savings per monthly utility bills)

Mass Energy Shave the Peak

- For residential: Mass Energy will send text alerts on peak days

massenergy.org/shavethepeak

- Participants can reduce electric loads at home on peak days – to help reduce use of more polluting peaker plants

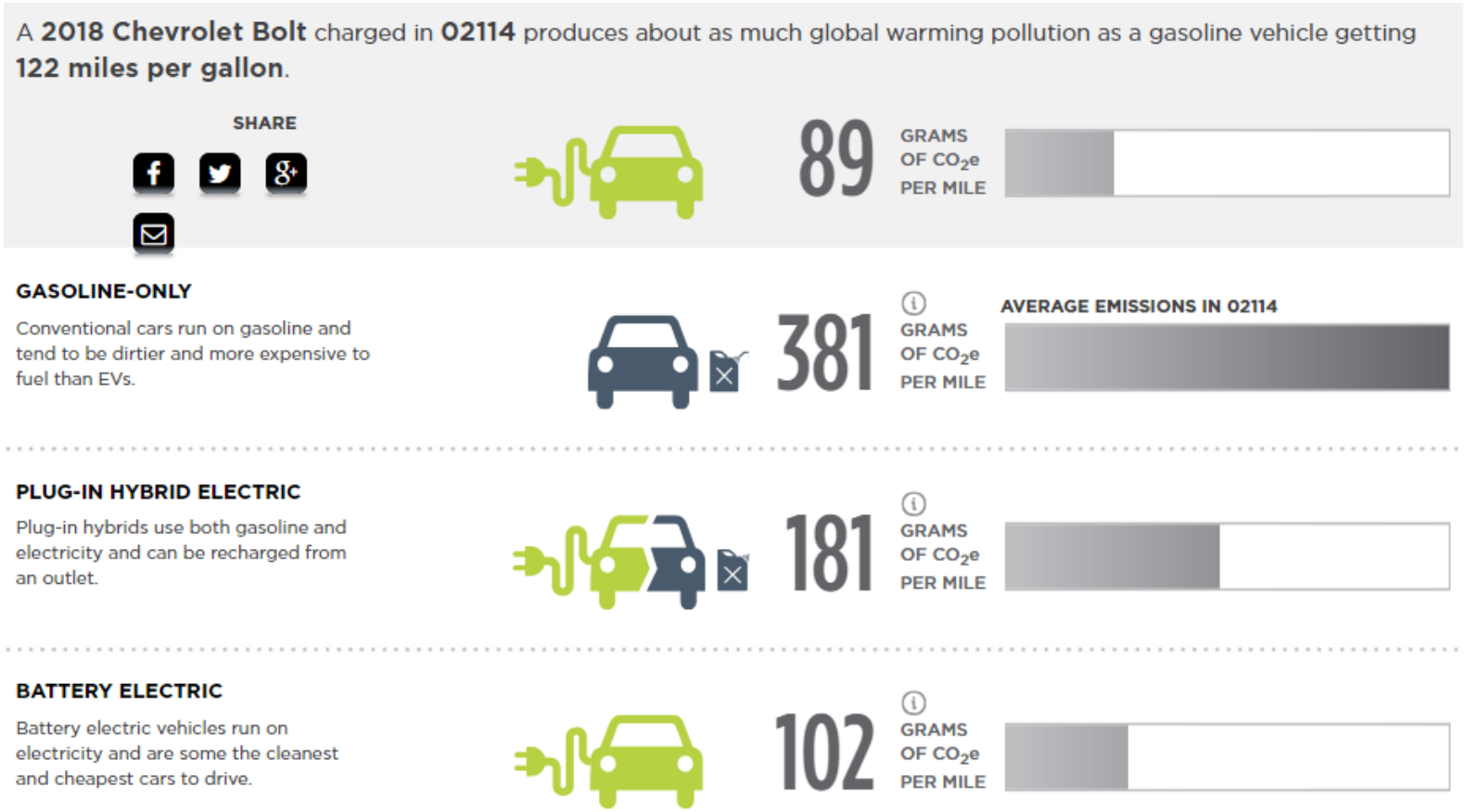


MASS ENERGY
CONSUMERS ALLIANCE
A Non-Profit Organization

Vehicles

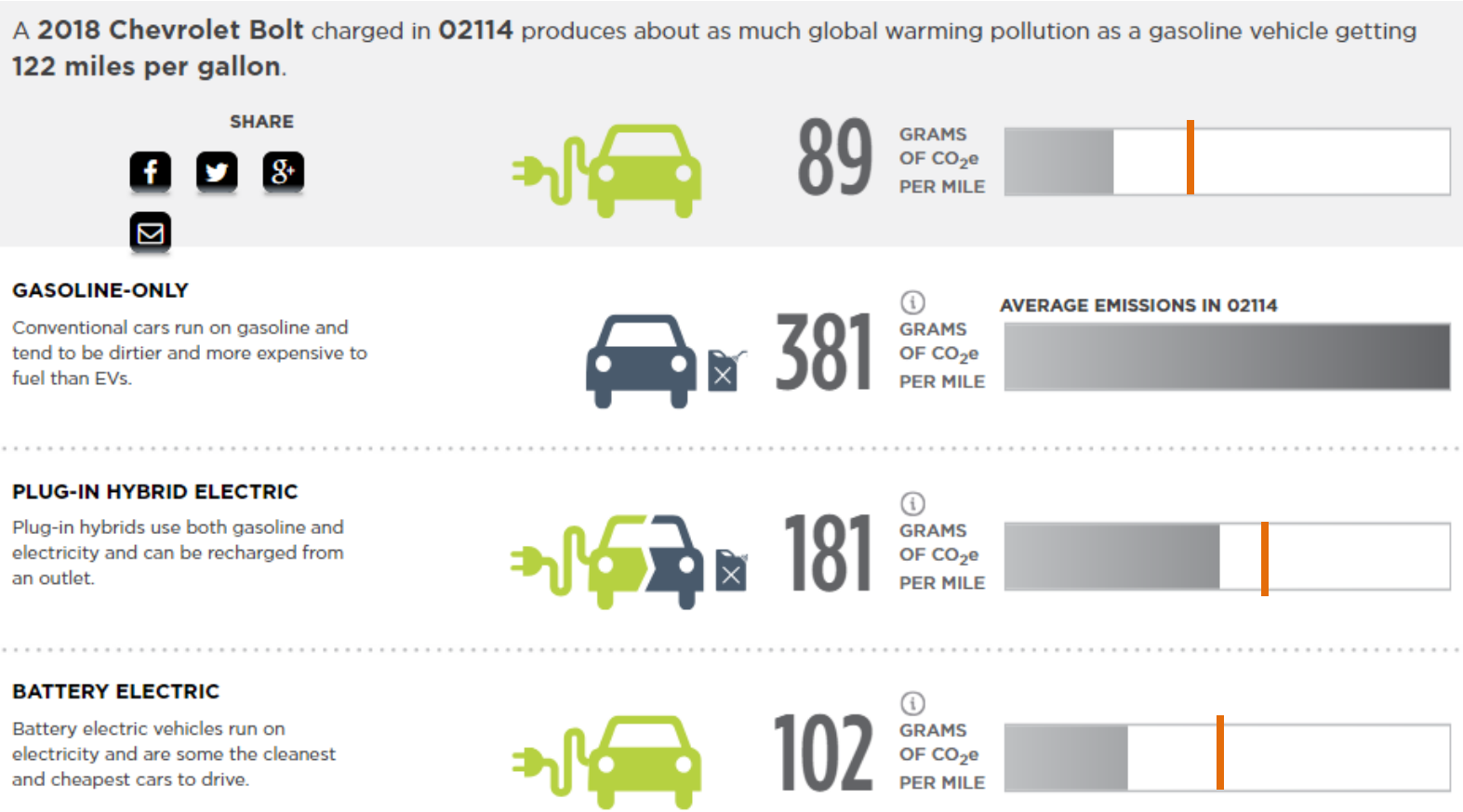
Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the Commonwealth or DOER.

EV Emissions Calculator



UCS USA, 2018

EV Emissions Calculator

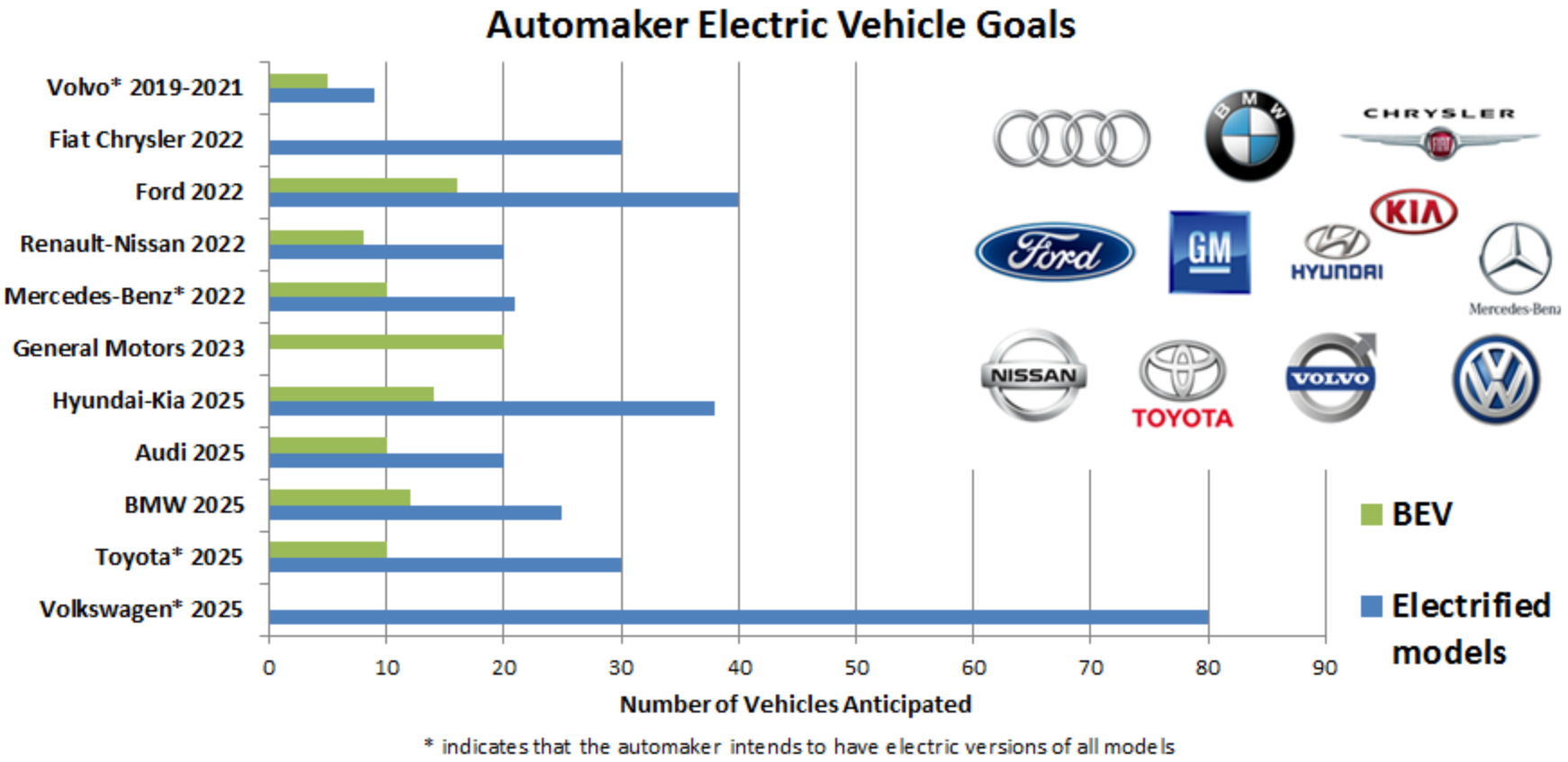


*Compared to a different zip code

UCS USA, 2018

EV Projected Models Through 2022

Electric vehicles will grow from 3 million (2017) to 125 million (2030).
– International Energy Agency



Summary: By 2025, 13 automakers expect to have more than 300 electrified models available and of those models, 105 being battery electric vehicles.

BEV Projected Models Through 2022

Current		2019		2020		2021	
Model	**Range (mi)**	**Model**	**Range (mi)**	**Model**	**Range (mi)**	**Model**	**Range (mi)**
Passenger Cars		**Passenger Cars**		**Passenger Cars**		**Passenger Cars**	
BMW i3	114	Aston Martin RapidE	200	Audi A9 E-Tron	311	Aston Martin Lagonda	400
Chevrolet Bolt	238	Audi E-Tron Sportsback	310	Audi E-Tron Vision Gran Turismo		Mercedes-Benz EQA	250
Fiat 500e	84	BMW MINI E		Fisker EMotion	400	Volkswagen I.D. AEROe	
Ford Focus Electric	115	General Motors Cruise AV		Honda Sports EV		**SUV/CUVs**	
Hyundai Ioniq Electric	124	Honda Urban EV	155	James Dyson Concept		BMW iNext	435
Kia Soul EV	110	Lucid Motors Lucid Air	250/400	Nissan IDS		Subaru Concept	
Nissan Leaf	151	Mazda Concept		Porsche Mission E	300	Volkswagen I.D. Lounge	
smart fortwo electric drive	58	Nissan Leaf E-Plus	~225	Rimac C_Two	400	**2022**	
Tesla Model 3	220/310	Volvo Polestar 2	350	Tesla Roadster	620	**Passenger Cars**	
Tesla Model S (3)	259/335/315	**SUV/CUVs**		Volkswagen I.D. Vizzion	300	Audi E-Tron GT	
Volkswagen e-Golf	125	Audi e-tron quattro	310.7	**SUV/CUVs**		Genesis Essentia	
SUV/CUVs		Faraday Future FF91	378	Aston Martin DBX	200	Maserati Alfieri	
Tesla Model X (3)	235/ 395/289	Hyundai Kona (4)	186	BMW iX3	250	Maserati Alfieri Cabrio	
Dates Unknown		Hyundai Kona Electric	250	Byton Concept	200/310	Maserati Quattroporte	
Passenger Cars		Jaguar i-Pace	240	Ford “Mach 1”	300	**SUV**	
Bentley EXP 12 Speed 6e	200	Kia Niro EV	240	Kia Soul EV	186	Fiat Chrysler Portal	250
BMW i4	435	Mercedes-Benz Concept EQC	310	Rivian Automotive AIC	200/450	Jeep Renegade	
SUV/CUV		Volvo XC40 EV	300	ŠKODA Vision E	310	Jeep Cherokee	
General Motors Buick Enspire	370	**Trucks**		Tesla “Model Y SUV”		Jeep Wrangler	
Lexus LF-1 Limitless		Bollinger Motor B1	200	Volkswagen I.D. CROZZ	311	Maserati Levante	
Mitsubishi e-Evolution		Workhorse W-15 Pickup	80	**Trucks**		Nissan “IMx EV”	
				Rivian Automotive A1T	200/450	Volvo XC90	300
						Minibus	
						Volkswagen I.D. Buzz	300

Almost all future electric vehicles plan to have a driving range of *at least* 200 miles

BEV Projected Models Through 2022

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General Motors Buick Enspire	370	**Trucks**					
Lexus LF-1 Limitless		Bollinger Motor B1					
Mitsubishi e-Evolution		Workhorse W-15 Pickup					
				Rivian Automotive A1T	200/450	Volvo XC90	300
						Minibus	
						Volkswagen I.D. Buzz	300

Nissan Leaf E-Plus

Description: Compact car

Top Speed: Not available

Power: 142-200 horsepower

Range: ~225 miles

Battery Size: TBA

Almost all future electric vehicles plan to have a driving range of *at least* 200 miles

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						Minibus	
						Volkswagen I.D. Buzz	300

Workhorse W-15 Pickup

Description: Pickup truck

Top Speed: Not available

Power: 460 horsepower

Range: 80 miles

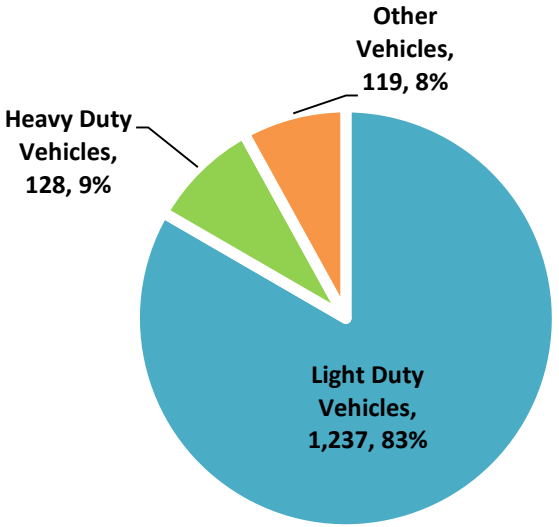
Battery Size: TBA

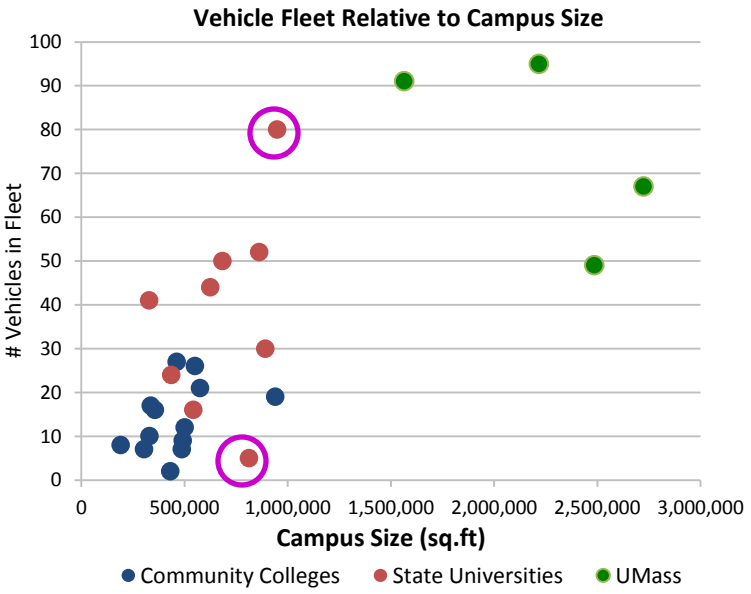
Almost all future electric vehicles plan to have a driving range of *at least* 200 miles

College and University Vehicle Analysis

Campus Fleet Makeup:

- **27** campuses
- **1,444 total vehicles**, including light duty, heavy duty & other non-road vehicles
- Light duty vehicles comprise **83% of fleet,** w/ heavy duty & other vehicles making up 9 % and 8 % respectively





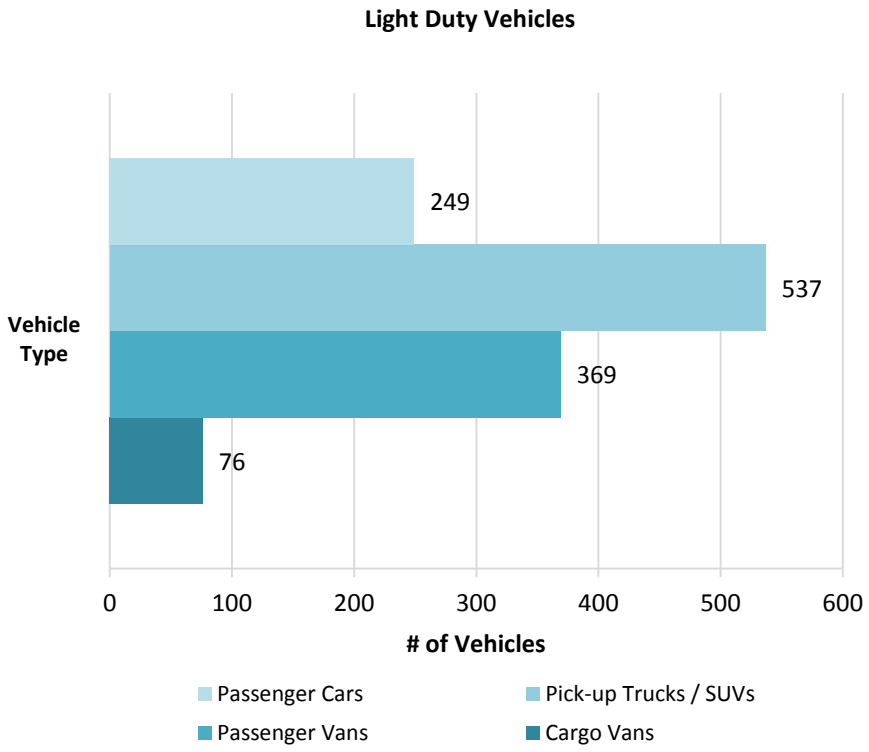
Note: UMass Amherst removed from graph (anomaly)

Range of Fleet Size:

- Community Colleges: 2-27 vehicles
- State Universities: 5-80 vehicles
- UMass System: 49-619 vehicles

- **Largest Fleet:** UMass Amherst (619)
- **Smallest Fleet:** Roxbury Community College (2)

College and University Vehicle Analysis

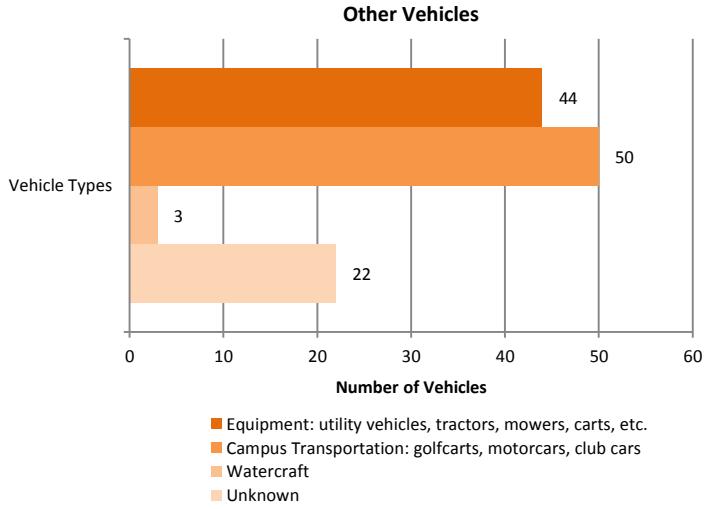


Light Duty Makeup:

- Out of 1,237 LDVs**, 43 % comprised of pick-up trucks & SUVs**
- LDV **makeup consistent across campus types**, w/ exception of higher % of passenger vans in UMass system
- Some reporting anomalies noted for LDVs

Heavy Duty & Other Vehicles

- Lack of / inconsistencies in data make heavy duty & other categories difficult to report
- Considerable detail provided by some agencies regarding number & type of non-LDV vehicle types



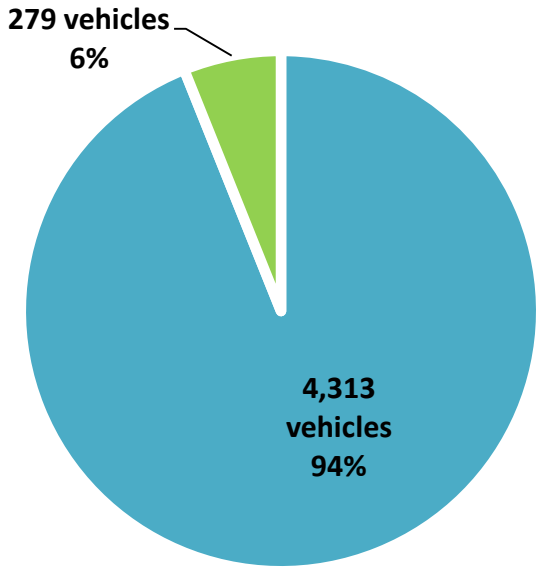
Fleet Electrification

Hybrid/Electric Vehicle Makeup:

Entity	HEVs	PHEVs	BEVs	Total	% of LDV Fleet
Community Colleges	5	1	1	**7**	4.61%
State Universities	18	2	0	**20**	6.90%
UMass	22	0	10	**32**	4.03%
Executive Branch	213	1	6	**220**	7.15%

Fleet Electrification: **(Higher ed & Executive branch)**

- 258 HEVs
- 4 PHEVs
- 17 BEVs
- **270 vehicles** comprising **6 %** of LDV fleet



Challenges to Fleet Electrification

Given the Commonwealth's long-term goals for Electric Vehicles:

- *Are you considering electric vehicles for your fleet applications?*
  - *If yes, what types of vehicles and when?*
  - *If not, what are the biggest challenges preventing you from making progress in this area?*

3rd Annual Fall Fleet Event

Agenda:

- Electric Vehicles (EVs), EV Charging Infrastructure, EV Station Funding Opportunities
- Innovation and After-Market Technologies — Telematics, Hybrid Upfits, Idle Reduction Technologies
- Expansion of VEH98 Statewide Contract
- Statewide Contract Vendor Networking
- Test Drive Electric and Hybrid Vehicles

Sturbridge Host Hotel

- **Wednesday October 3**
- 9:00 a.m. – 3:00 p.m.
- Register here

OSD
OPERATIONAL SERVICES DIVISION

Solar Updates

SMART Program Update

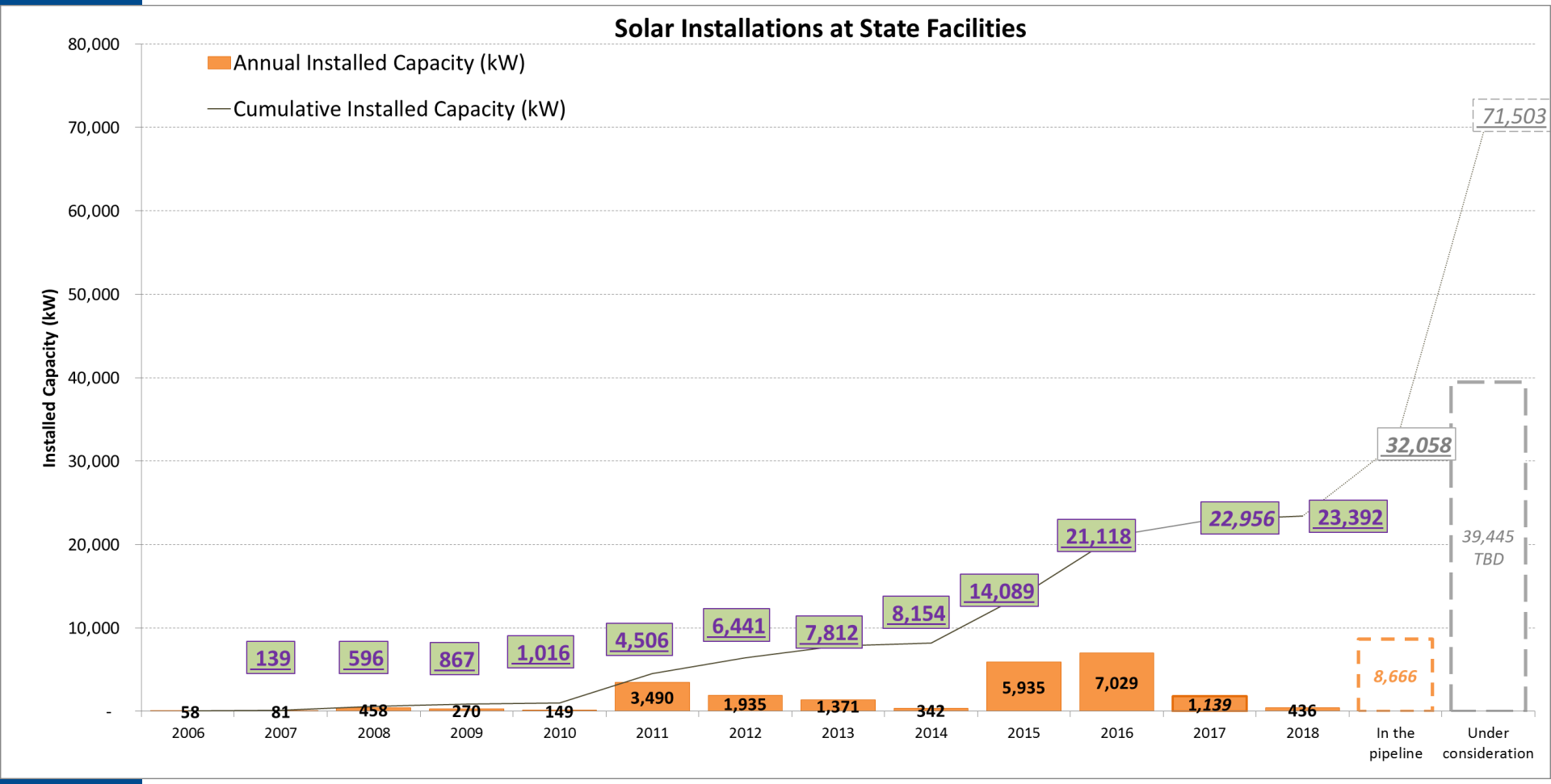
- Ruling from Department of Public Utilities (DPU) tentatively expected by end of September
- Timeline for SMART Program launch will be more known following ruling
- LBE will send out updates

DOER SMART Website:

mass.gov/solar-massachusetts-renewable-target-smart

LBE Solar Grants & Updates

Franklin County Sheriff's Office	Solar PV Canopy (Completed)	Completed in 2018, FCSO installed a 436kW solar canopy at the Franklin County Jail and House of Correction in Greenfield. Annually, the solar installation is expected to generate 439,000 kWh and save $92,000 in energy costs. The project includes two EV charging stations and pre-wiring for an additional three stations to be added at a future date. This is part of a comprehensive DCAMM energy project which includes over 20 additional energy and water conservation measures. **Completed spring 2018.**
Dept. of Correction	Solar Canopy (Feasibility Study)	In 2018, DOC was awarded a $30,300 feasibility study grant for a solar canopy study of a 67,000 SF parking area across 3 lots at the DOC's Milford HQ. **DOC reviewing results for potential solar canopy installation(s).**
MA National Guard	Solar PV Canopy (In Progress)	In 2017, the MA National Guard awarded a $256,250 grant for a 205kW solar canopy at the Natick Readiness Center. Annually, the solar installation is expected to generate 260,000 kWh, save $30,000 in energy costs, and produce enough electricity to offset approximately 82% of the facility's electricity consumption. **DCAMM is currently managing this project.**



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

DOER
Massachusetts Department of Energy Resources

PowerOptions Model

- Reminder on Current Status:
  - PPA pathway allowable with no separate procurement
  - 2 vendors awarded (Solect <300 kW/SunPower>300 kW)
  - Working on PPA/Ts&Cs language
- Preliminary Information:
  - Ability to net meter and apply generation to large accounts key
  - Utility territory significantly impacts storage effectiveness
  - Advantageous PPA rates, especially when sized to maximize LBE grant

LBE Updates

LBE Tracking Form

- **Expected release date: September 15th**

- Tracking form categories:
  - Contact Info
  - Square footage
  - Electricity consumption
  - Building fuel consumption
  - Vehicle & other fuel consumption
  - EE projects
  - Installed Clean Power
  - Vehicle Fleet
  - EV Charging Stations
  - Recycling
  - Water Use
  - Sustainability
  - Landscaping

- **Due date: November 15th**

- **New elements:**
  - **Reformatted content**
  - **Contact info selection**
  - **Autofill functionality**
  - **Landscaping tab**

NEW ELEMENTS OF FY18 TRACKING FORM The new tracking form for fiscal year 2018 has undergone some minor changes in an effort to make the tracking form more comprehensive and user-friendly. Below is a list of changes that have occurred to the form.	
General	The FY18 Tracking Form has been reformatted and streamlined for ease of use. Where appropriate, we have automated individual tabs to pre-populate with previously submitted data. ALL pre-populated fields rely on the selection of your agency/campus from the "Contact Information" tab dropdown. If not selected, no data will pre-populate. Additionally, you will no longer be able to select your agency/campus on individual tabs.
Contact Information	Contact information that LBE has on record will autopopulate once your agency/campus has been selected. Once this information is selected, all subsequent tabs with autopopulate function will prepopulate. If there are additional contacts or changes to existing contacts, please manually input them in the spaces provided and LBE will update our records.
Square Footage	Square footage that was submitted the previous reporting year will prepopulate once your agency/campus is selected from the contact tab. Detailed tables have been added to this tab for those agencies/campuses that made changes to their square footage in FY18 and/or plan to make changes to their square footage over the next 2 years. If either of these apply to your agency/campus, please provide as much information as possible in the provided tables.
Installed Clean Power	Clean power installations that LBE has on record from the previous reporting year will prepopulate once your agency/campus is selected from the contact tab. If current installations are not included in the pre-populated list, please add them in the space provided. Similarly, if there are installations in progress, please add them and provide estimated date of completion.
Vehicle Fleet	Vehicle totals will now autopopulate as individual class and fuel types are entered into the Lighty Duty Vehicle section. These totals will then populate the overall light duty fleet total at the top of the page. If there is a discrepancy between these totals, please correct entried where appropriate or explain in the notes section.
Recycling	Similar to last year, please provide total tonnage of materials that were diverted or entered the waste stream, if available. Additionally, if can provide tonnage of specific materials diverted by your campus/agency, please note this in the table provided. If a particular material is not included in the list, enter this information in the yellow rows labeled "other" and provide details in the notes section.
Sustainability	This tab has been reformatted with the same content as last year. If "yes" is selected for any of the questions, you will be prompted to provide details in the space provided. In addition, if you have submitted data in past years and would like to use all or some historical information for your FY18 submission, there is now an area to select these options.
Landscaping	A set of voluntary questions regarding sustainable landscaping efforts at your agency/campus has been added. This information will help track interest in and progress towards LBE's broader sustainability intiatives. If any are applicable, please provide brief descriptions of your efforts.

2018 LBE Awards

- Applications now available, separate applications for:
  - Public Entities
  - Individual Achievement
- **Application deadline: 5pm, Tuesday, September 25**
- Ceremony in fall at State House
- Email applications to trey.gowdy@mass.gov
- More information: LBE Awards webpage

Awards for energy and environmental achievements, for:

- State Agencies (2)
- Public Higher Ed. (2)
- Municipalities (2)
- Individuals (2)

Pollinator Habitat Calculator

- Final draft of Pollinator Habitat Calculator now available
- Provides a high-level cost estimate of the benefits of converting state land into pollinator habitat
- Benefits include:
  - Economic savings
  - Reduced GHG emissions
  - Site maintenance-time savings
  - Beautiful, healthy habitats for local & migratory pollinators!

Pollinator Habitat Savings Calculator

Pollinator habitats are areas of natural vegetation where pollinators can live and grow. This calculator tool is intended to provide a high-level cost estimate of the benefits of converting state land into a pollinator habitat. These benefits include economic savings, reduced greenhouse gas emissions, and the time savings in maintenance of the site.

Instructions: Fill out information in the box below regarding your site. Green boxes are required while yellow boxes are optional. We have provided "default" values with rough estimates. If you do not want to use a default option, please indicate that in the "Use default" column and input your data. For further information on how those values are calculated, please visit the "Assumptions" tab.

Category	Default	Use default?	Data
Parcel Size (acres)	Must input	N/A	2
Current # of Mows (anually)	Must input	N/A	4
Fuel Type for Mower	Must input	N/A	diesel
Type of Change	Must input	N/A	till & seed
Mowing Time (hours per mow)	3	yes	3
Fuel Cost (per gallon)	$3.19	yes	$3.19
Fuel Usage (gallons per mow)	3.00	yes	3.00
Labor Cost (per hour)	$40.00	yes	$40.00
Annual Amortized Mower Maintenance Cost	$20.40	yes	$20.40

required / optional

Pollinator Habitat Capital Costs

Insert values below if known. Otherwise, default is used.

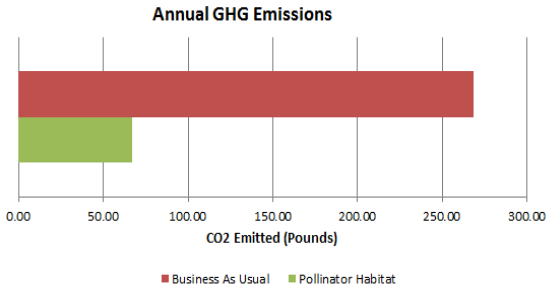
Preparation Costs	Default Costs	Input
Tilling, air raiding, etc.	$31.00	
Seed Cost	$748.59	
Seeding cost	$39.00	
Total Cost	$818.59	

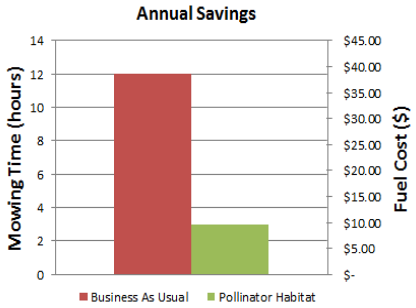
RESULTS & ANALYSIS

Payback of Capital Cost	Year 3
Annual Savings	75.00%
ANNUAL SAVINGS	
Fuel Cost Savings	$ 28.71
Labor Savings	$ 360.00
Maintence Cost Savings	$ 15.30
Total Savings	**$ 404.01**
Avoided GHG Emissions (lb CO2)	**201.59**
Mowing Time Savings (hrs)	**9**

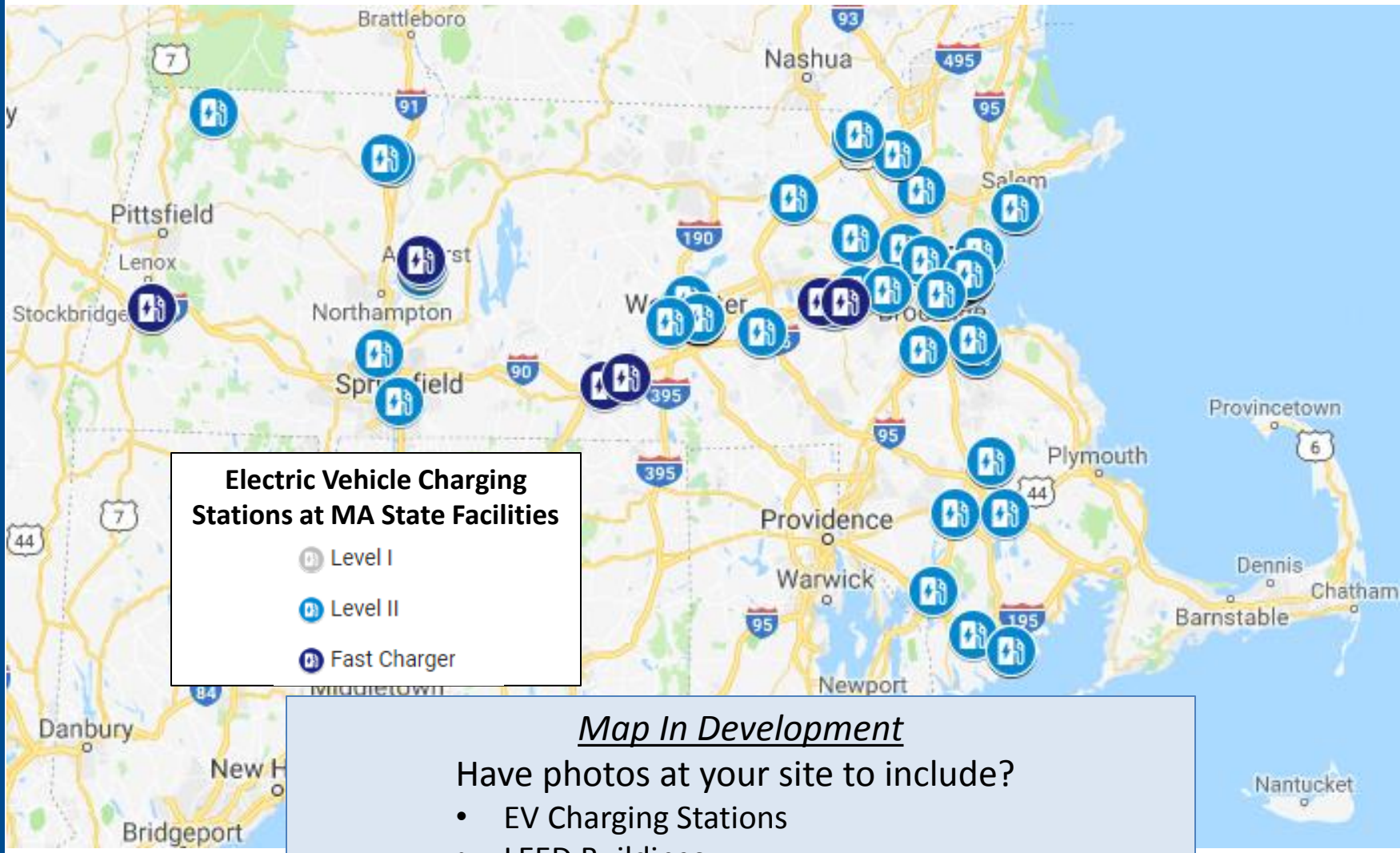
Pollinator Habitat Case: Till & Seed		Business As Usual Case	
Site Preparation Costs	$ 818.59	Site Prepartion Costs	$ -
Annual Fuel Cost	$ 9.57	Annual Fuel Cost	$ 38.28
Annual Labor Cost	$ 120.00	Annual Labor Cost	$ 480.00
Annual Maintenance Cost	$ 5.10	Annual Maintenance Cost	$ 20.40
Total Annual Cost	**$ 134.67**	**Total Annual Cost**	**$ 538.68**
GHG Emissions (lb CO2)	**67.20**	**GHG Emissions (lb CO2)**	**268.79**
Annual Mowing Time (hrs)	**3**	**Annual Mowing Time (hrs)**	**12**

Typically, pollinator habitats are only mowed once a year. However, they may need extra care in the first two years in order for the seeds to take, but this is not accounted for in the calcualtions.





LBE Project Map



Map In Development

Have photos at your site to include?

- EV Charging Stations
- LEED Buildings
- Solar Installations
- Renewable Thermal Installations
- Pollinator-Friendly Habitats

Contact trey.gowdy@mass.gov

Battery-Powered Landscape Equipment Trainings

Added to statewide contract FAC 88, Category 13

Benefits:

- Eliminates on-site emissions and health impacts
- Reduces GHG emissions
- Eliminates need to transport gasoline and risk of spills
- Lower noise levels for workers and neighbors
- Less maintenance

Upcoming Training Sessions – Learn About and Try Equipment:

Cary Memorial Building (Lexington)

- **Wednesday, September 26**
- 9:00 a.m. – 3:30 p.m.
- Register here

Tower Hill Botanic Gardens (Boylston)

- **Thursday, September 27**
- 9:00 a.m. – 3:30 p.m.
- Register here

OSD
OPERATIONAL SERVICES DIVISION

Questions? Contact:
Julia Wolfe, Director of Environmental Purchasing, OSD
Julia.Wolfe@mass.gov or 617-502-8836

Hampshire College Sustainability Overview

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

DOER
Massachusetts Department of Energy Resources

Optional Building Tour of R.W. Kern Center