

A satellite view of the Earth from space, showing the Western Hemisphere. The image is darkened with a semi-transparent black overlay to make the white text stand out. The text is centered on the image.

The Role of WRRFs in the Global Climate Challenge - Opportunities for Decarbonization

Jen Muir & Molly Keleher

JKMuir, LLC



Agenda



The climate challenge we face



Best strategies to succeed



WRRFs as a resource



“Climate change is already affecting every inhabited region across the globe, with human influence contributing to many observed changes in weather and climate extremes” – IPCC AR6

2021 Pacific Northwest heat wave
Hurricane Ida Makes Landfall as an

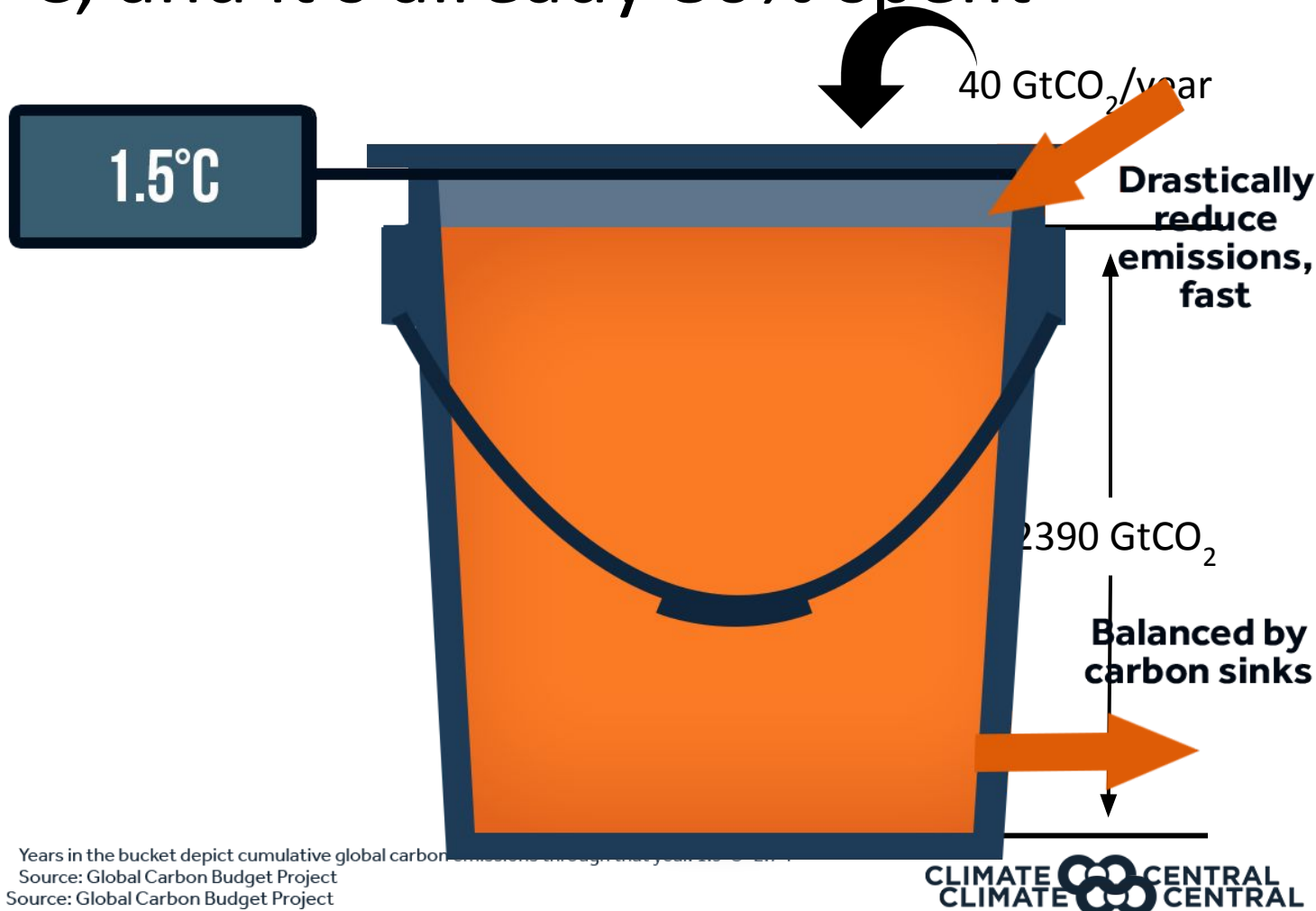
“Climate-related climate change impacts on Colorado water supply, human security, and economic growth are projected to increase with global warming of 1.5°C and increase further with 2°C”
– IPCC SR1.5

ABC NEWS | Elizabeth Chuck

The New York Times



There is a global carbon budget for limiting warming to 1.5° C, and it's already 80% spent



500 Gt CO₂ global carbon budget remaining

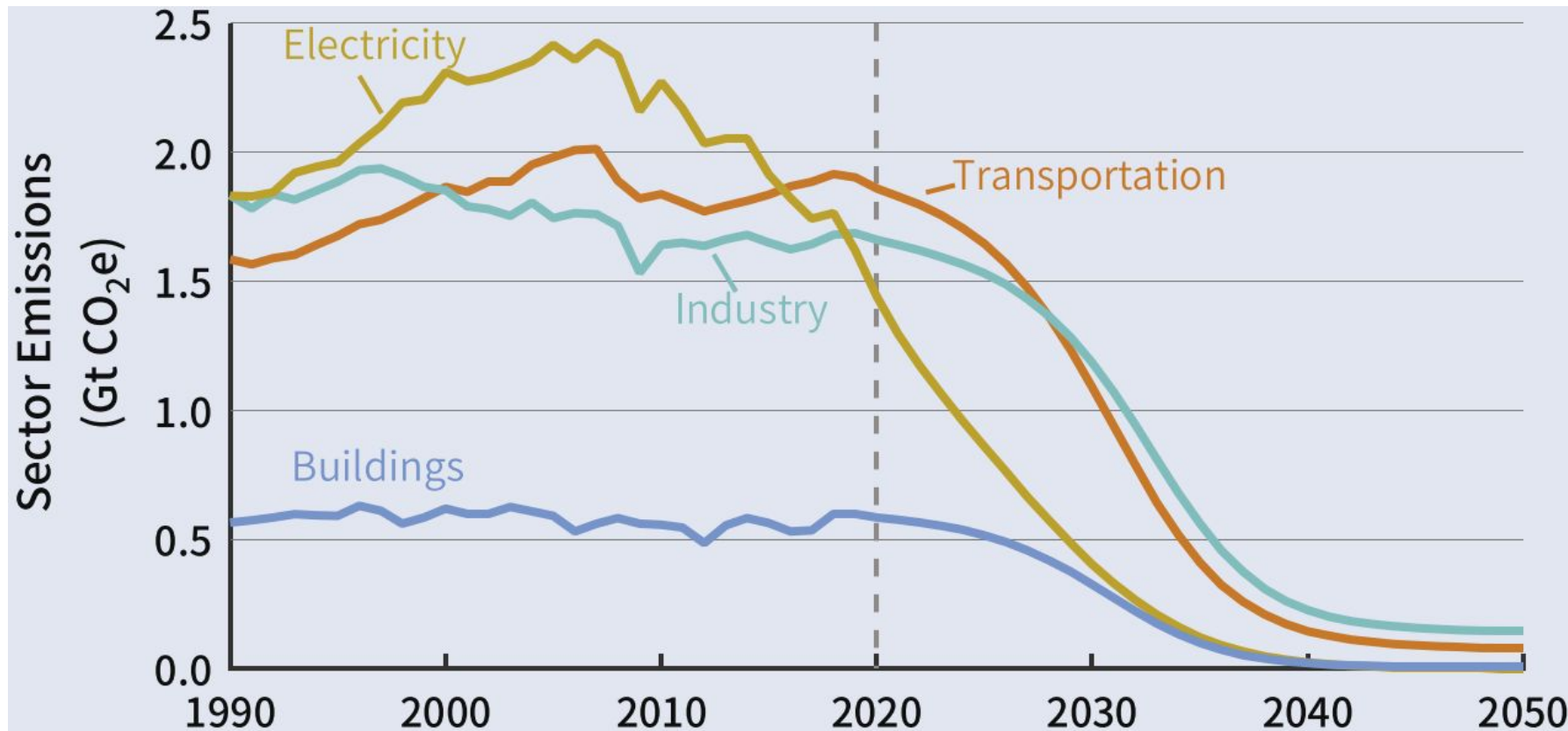
~7% is US' 'fair share' of the budget, or 37 Gt CO₂





Less than 10 years at current emissions level (~4.4 Gt CO₂/year)

Years in the bucket depict cumulative global carbon emissions through that year since 1900.
Source: Global Carbon Budget Project
Source: Global Carbon Budget Project



Keeping cumulative US emissions within the carbon budget requires significant reductions by 2030



-  Transportation: 45% below 2005 levels
-  Buildings: 45% below 2005 levels
-  Industry: 37% below 2005 levels
-  Electricity: 83% below 2005 levels



High Level Principles of Decarbonization

A review of decarbonization studies show us there are a few key strategies we should focus on near term to limit warming to 1.5°C

Increase Efficiency

- Reduce energy needs in buildings, transport and industry

Build Renewables

- Deploy solar, wind, and battery storage on a massive scale

Electrify Things

- Rapidly adopt heat pumps and electric vehicles

Decarbonize other sectors

- Develop clean, low carbon fuels
- Build out carbon sinks

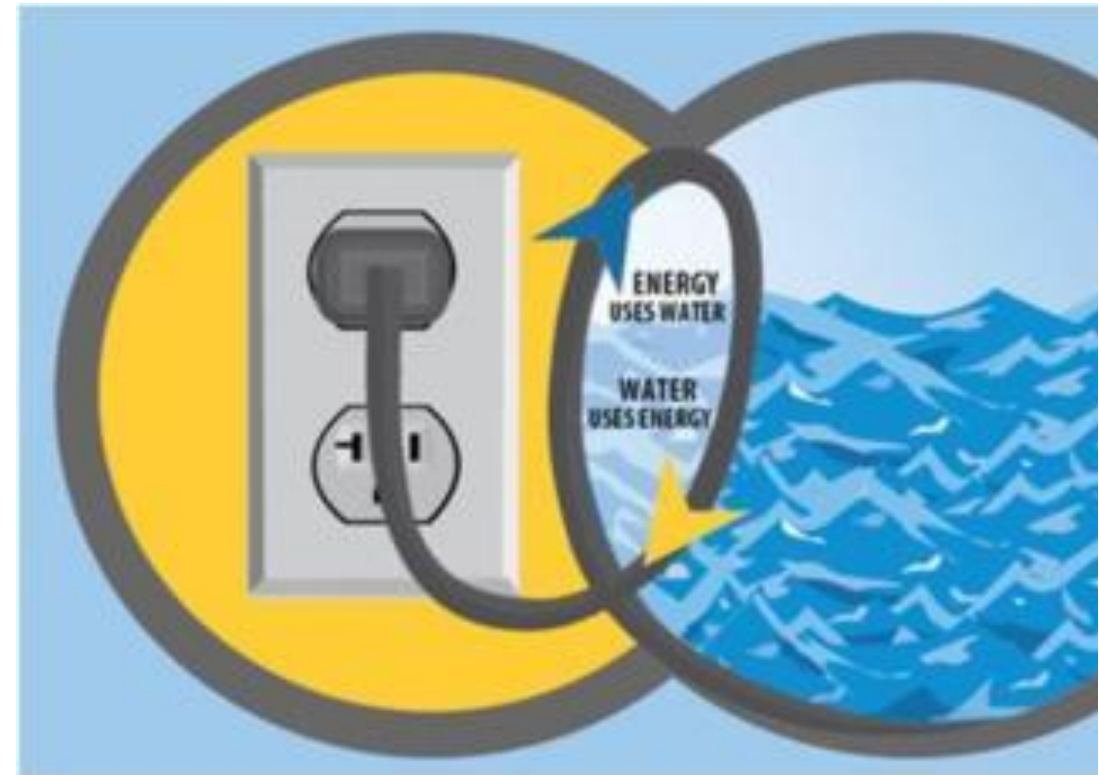


The water sector: part of the problem, but also a solution

3% Water sector's share of global GHG emissions¹

4% Water sector's share of US energy use²

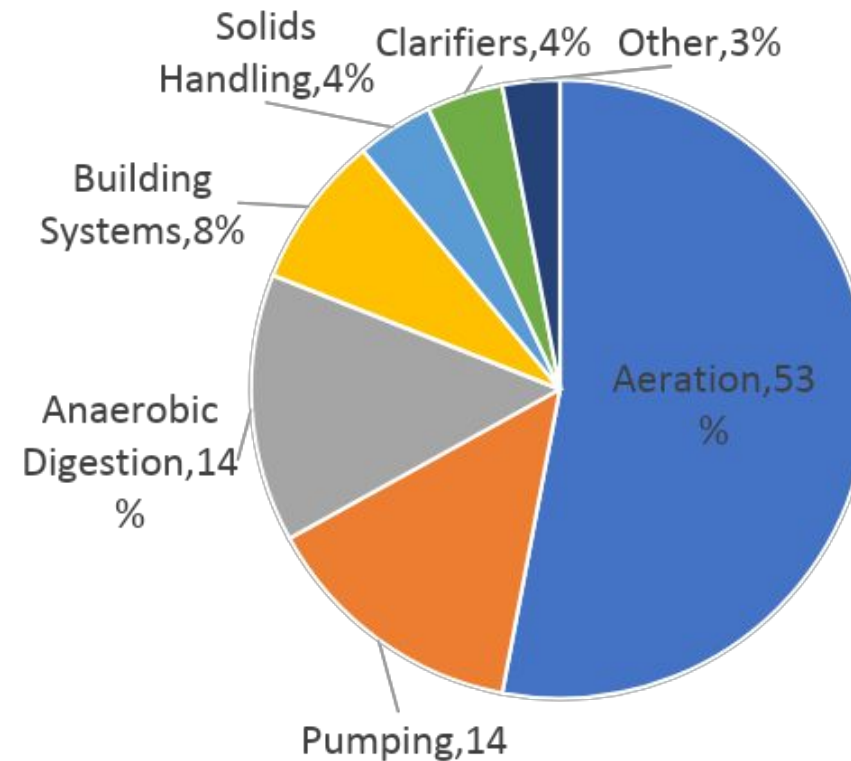
5 X Ratio of energy potential in wastewater to energy required for treatment³



Reducing Energy Needs

Typical WRRFs can reduce energy use by 15-30%¹

- Benchmark energy use
- Focus on energy intensive processes/equipment
- Turn it off (or turn it down)
- Implement automated process controls
- Right-size equipment
- Monitor equipment performance to maintain efficiency



Energy Efficiency Incentive Programs

Funding for high efficiency equipment and controls for process, HVAC, and lighting equipment

\$410k

- Ridgefield, CT South Street WPCF
- UV controls, blowers, pump VFDs

\$559k

- Town of Meriden, CT WPCF
- Blowers, jockey pumps, VFDs

\$502k

- Town of Enfield, CT WPCF
- Aeration blower, pump VFDs, mixers

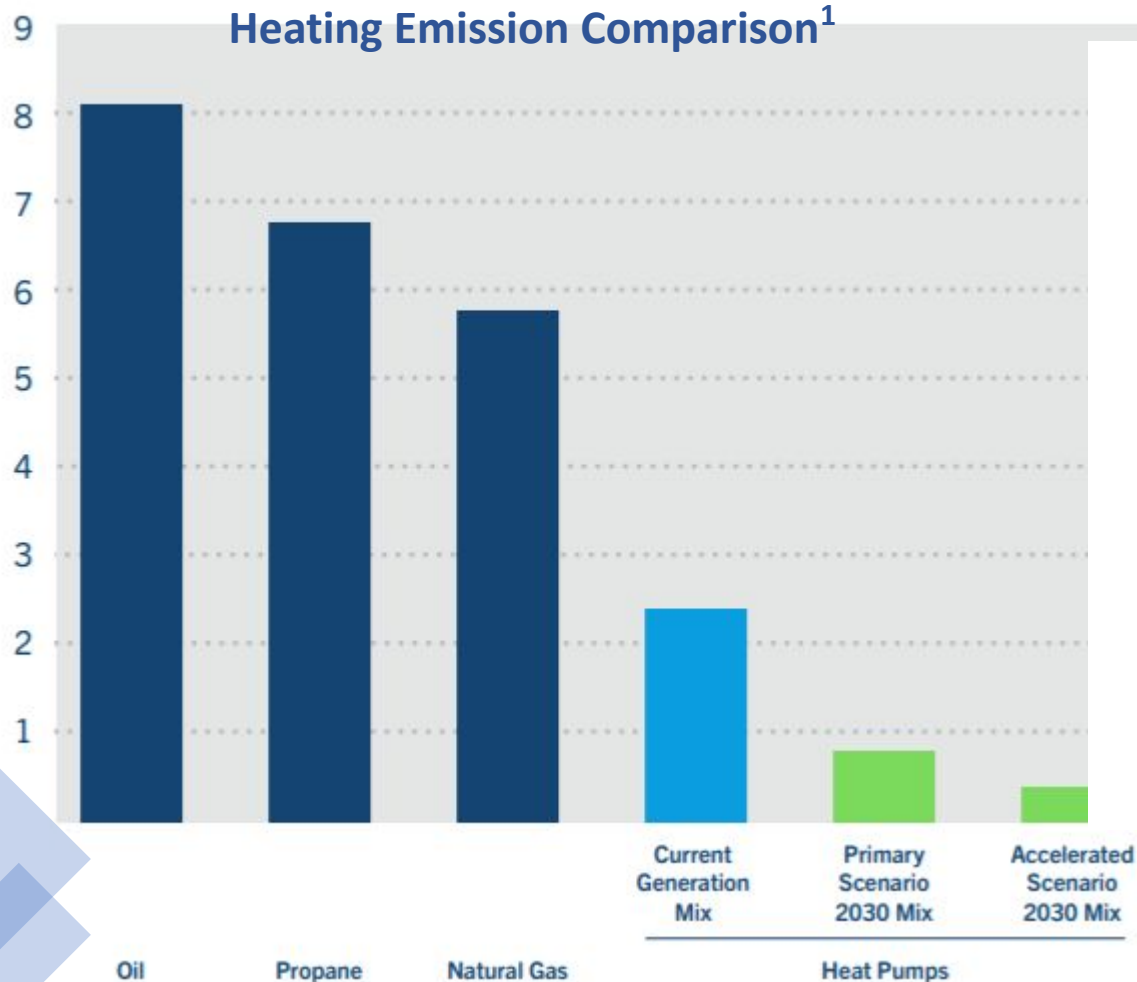
energize 
CONNECTICUT


mass save[®]

Anticipated in 2022: MassDEP's Gap Grant Funding to "fill the gap" by leveraging incentives from energy utilities to move projects forward

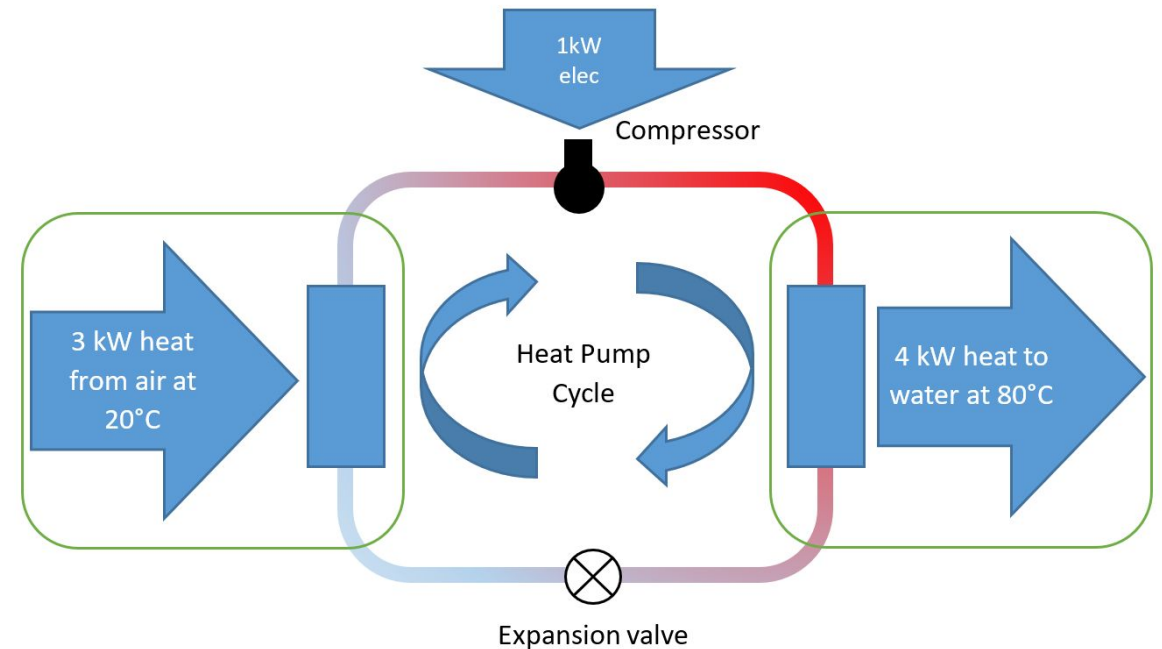


Electrification at WRRFs: lower carbon emissions + drastically increase efficiency (without increasing costs)



¹From Acadia Center's EnergyVision2030

Heat Pumps achieve efficiencies of over 400%

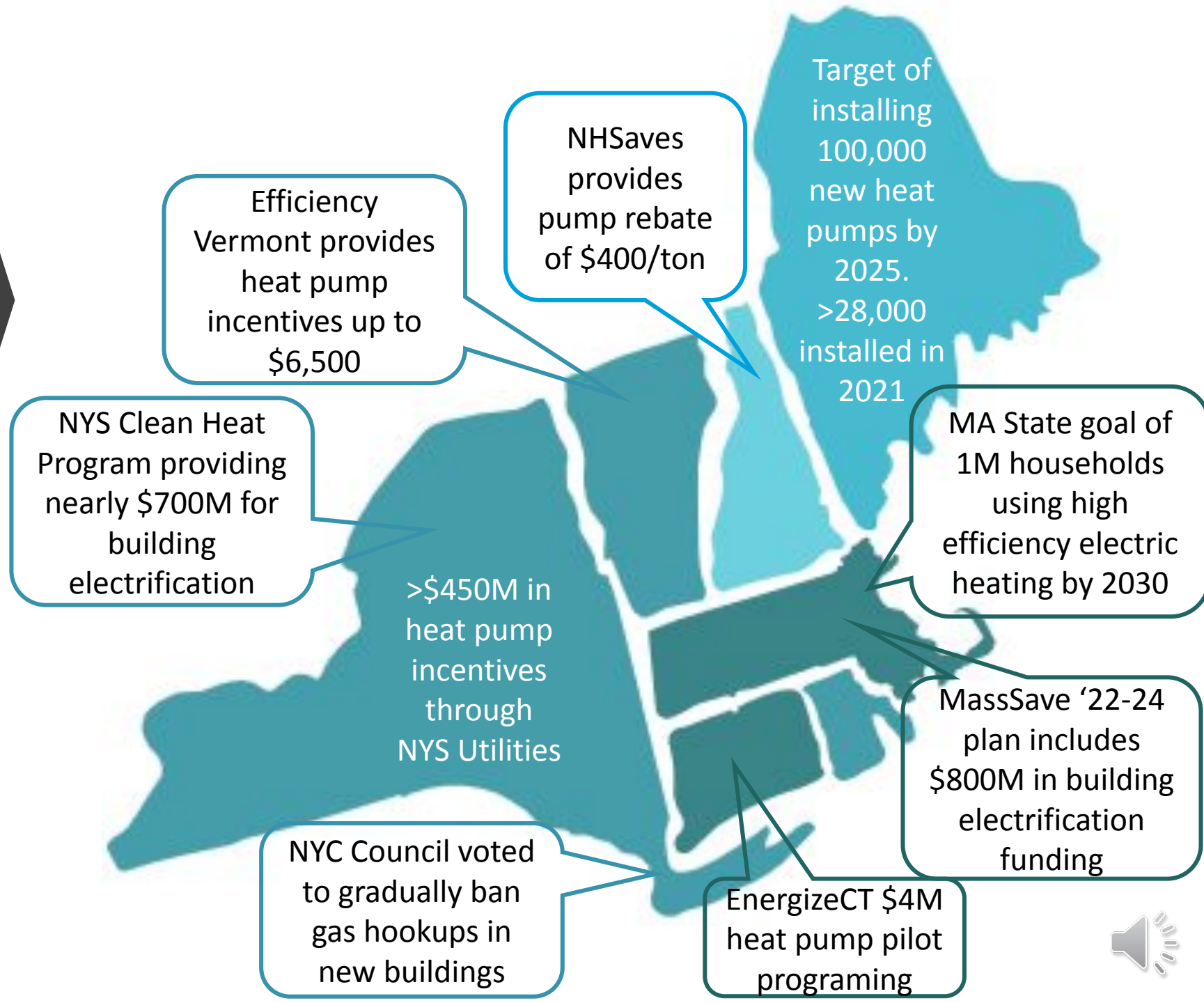


- Water source heat pumps can be used to recover heat from process stream for heating spaces, water, and processes
- Air source heat pumps use the heat within outdoor air and can operate down to temperatures of -17°F
- Ground source heat pumps use the heat underground



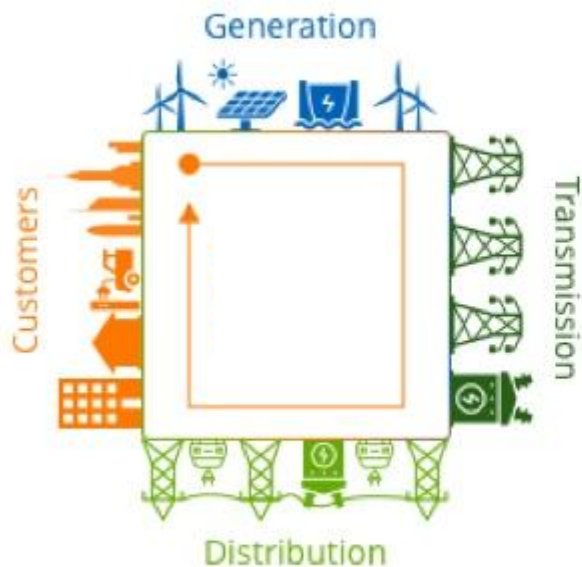
The push towards strategic electrification

*“powering end uses with electricity instead of fossil fuels in a way that **increases energy efficiency** and **reduces pollution**, while **lowering costs** to customers and society” -[NEEP](#)*



Part of the Grid: WRRFs as a distributed energy resource

The grid of the future is *decentralized*, and WRRFs are well-positioned to *respond to grid needs* by developing and deploying a variety of resources



Renewables



Batteries



Demand response



Cogeneration

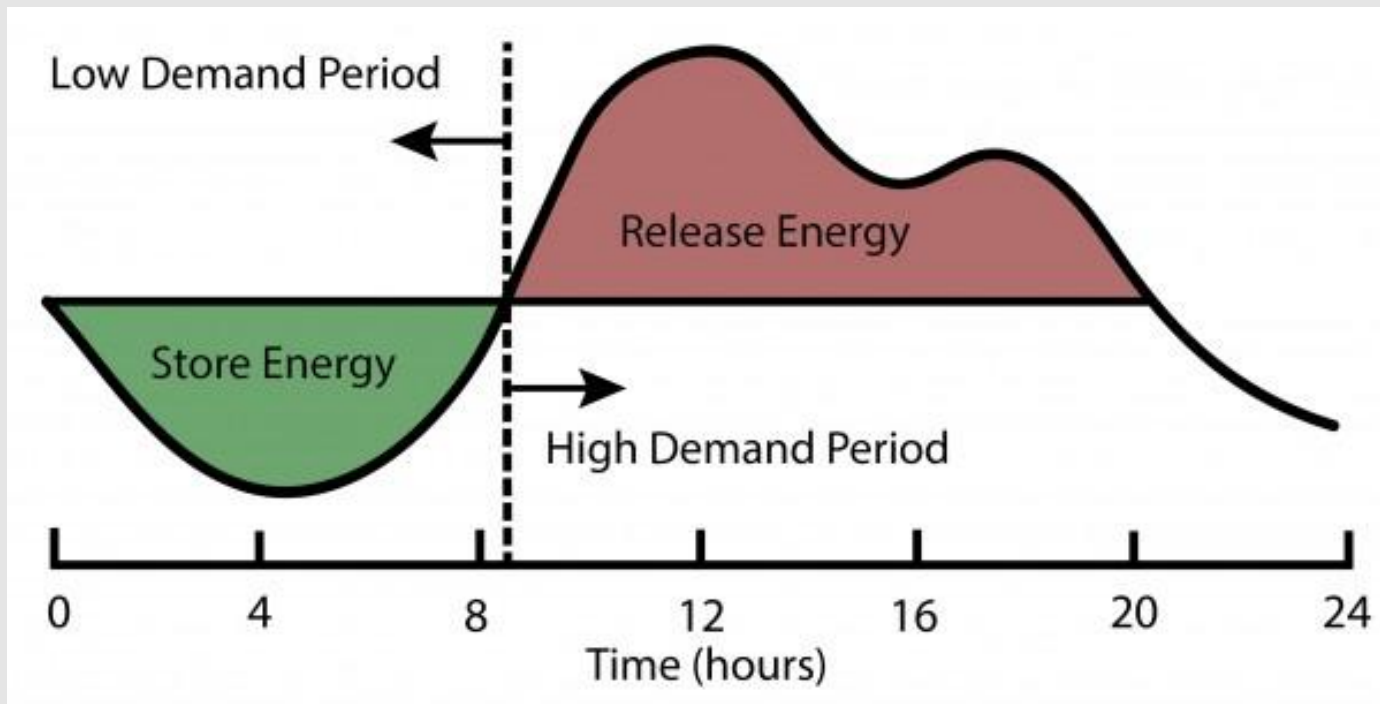


Demand Response Programs

Program	State(s)	Payment Type	Performance Requirement
ISO-NE Active Demand Capacity Revenue (ADCR)	CT, MA, RI, NH, ME, VT	Monthly based on enrollment + actual energy shed during event	30-minute notice of event. No penalty for underperforming
Connected Solutions: Targeted Dispatch	CT, MA, RI, NH	Performance payments based on average kW load reduction during event	Day ahead notice of event. No penalty for underperforming
ISO-NY Emergency Demand Response Program (EDRP)	NY	Performance payments for energy reduction during event	Voluntary / no penalty for underperforming
Commercial System Relief Program (CSRP)	NY	Options for performance payments and/or monthly enrollment payments	Day ahead notice. Participation required varies by utility



Battery Storage

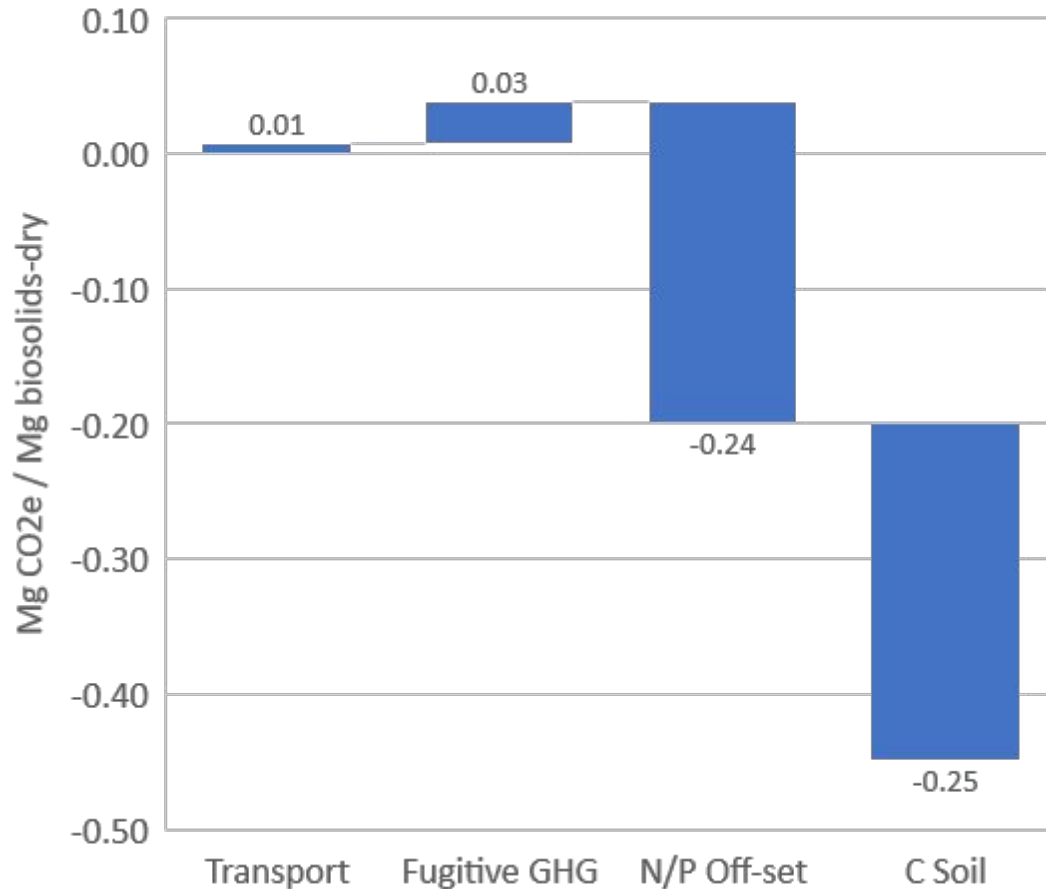


- Clip load during high-cost kWh times and charge from the grid during low-cost kWh times
- Participate in previous demand response programs + additional with more frequent events
- New England Utilities Daily Dispatch Program: \$200 - \$300/kWh; up to 60 summer events
- NYSEERDA offers upfront commercial storage incentives paired with renewables



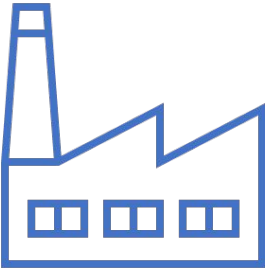

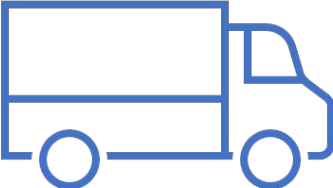
The unique opportunity in biosolids

Disposal: Enhancing Carbon Sinks



Source: BEAM model

Resource Recovery: Low Carbon Fuels

RNG	Jet Fuel	CNG/LNG
		
Firm capacity for power generation	Drop in, renewable fuel for aviation	Fuel for hard to electrify HDVs



OneNYC 2050
BUILDING A STRONG AND FAIR CITY

A LIVABLE CLIMATE

VOLUME 7 OF 9

New York City will lead a just transition to achieve carbon neutrality and adapt the city to withstand and emerge stronger from the impacts of climate change.

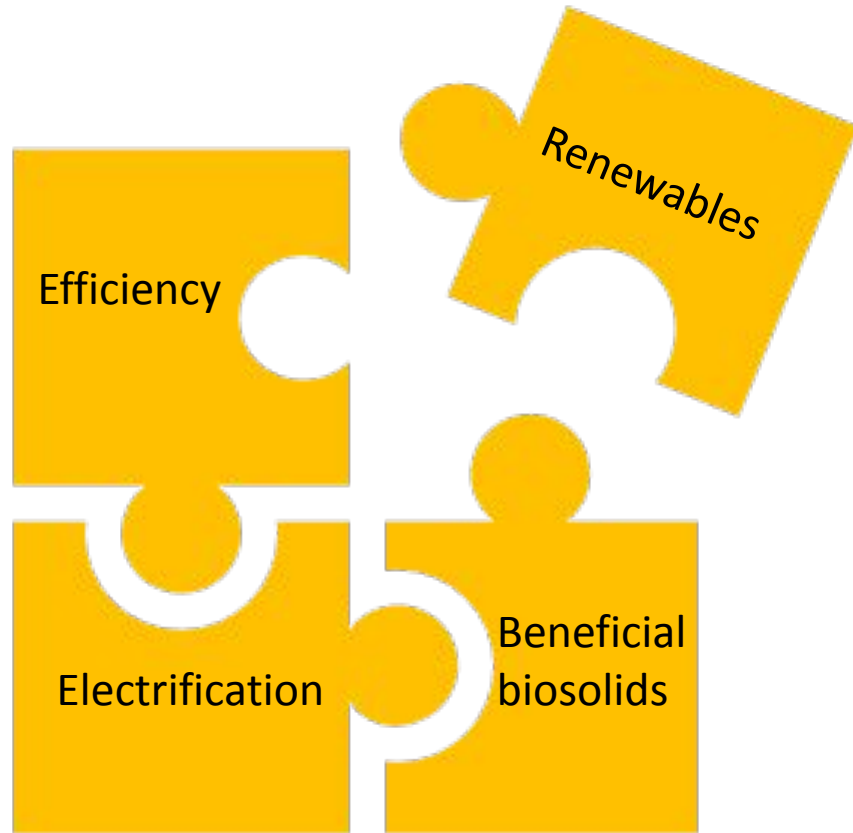
NYC

Spotlight: NYC DEP

“The City will continue to implement deep energy-saving measures, increase the production of renewable gas through digestion of wastewater and organic waste, and generate renewable electricity to reach net-zero energy for treatment of wastewater by 2050”



Our Role in the Climate Challenge



Educate

Educate others on this issue



Advocate

Vouch for these opportunities



Implement

Make these projects happen



Share

Share successes to inspire others



“Change will not come if we wait for some other person or some other time. We are the ones we’ve been waiting for. We are the change we seek.”

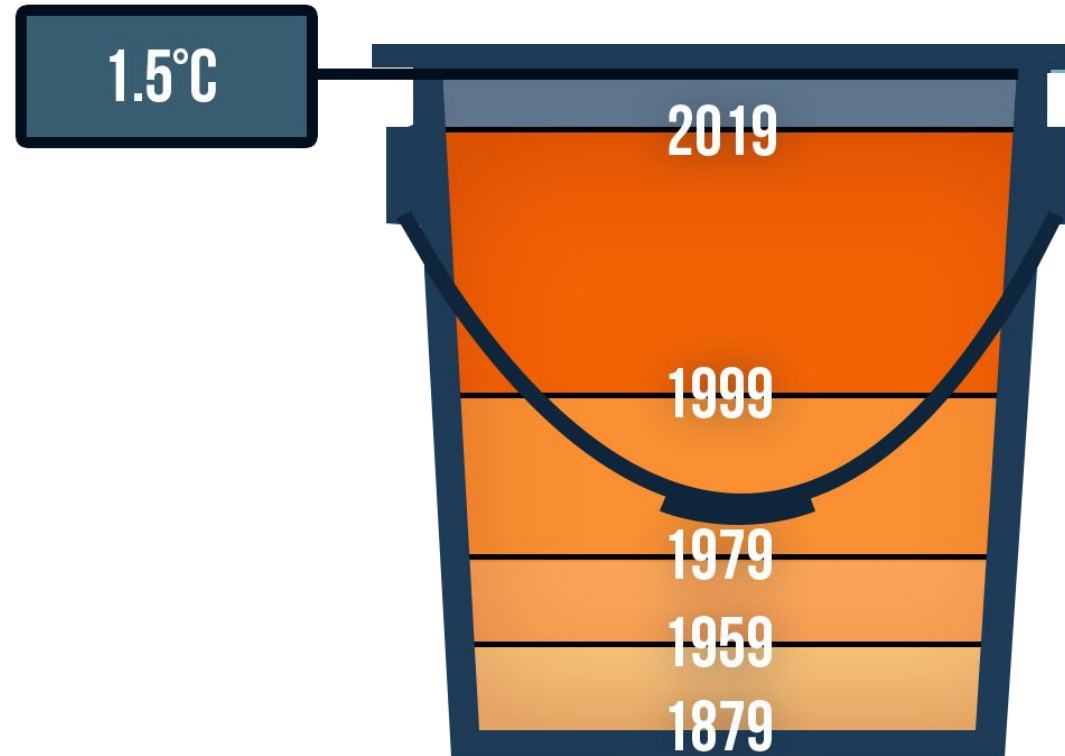
-Barack Obama

Jen Muir & Molly Keleher
jenmuir@jkmuir.com; mkeleher@jkmuir.com
(860)-249-0989
<https://jkmuir.com/>



Worldwide carbon budget and implications for US

- Facts/figures from RMI Report arithmetic of 1.5degC showing remaining carbon budget worldwide -> US -> years left at current emissions rates-> last stand against climate change in this decade



Years in the bucket depict cumulative global carbon emissions through that year. 1.5°C=2.7°F
Source: Global Carbon Budget Project

Our Role in the Climate Challenge

- Maybe a smartart flow by type of person and what actions they can take (design engineer, facility operator, WPCA board member, etc.)
- Also could be a more abstract slide with icons or a circle showing how advocating for efficiency, renewables, electrification, and beneficial biosolids, educating others on these issues, and sharing our progress can hopefully inspire others to do more too
 - Educate -> Advocate -> Implement -> Promote With the 4 strategies in the center

Our Role in the Climate Challenge

