UMassAmherst
The Commonwealth's Flagship Campus

Carbon Mitigation Planning

Questions from the webinars
Answers from the CMTF

Fall 2020

Introduction

This document is a summary of the Carbon Mitigation Task Force (CMTF) answers to the community questions asked during the Carbon Mitigation Planning Webinars held online for the UMass Amherst (UMA) community in October 2020.

The slides presented at the webinar is at the appendix and to watch a recording of the webinar content please go to https://vimeo.com/468763561.

To learn more about UMA sustainability work go to UMA Sustainability Taskforces and Initiatives.

Overview

CMTF organized the questions based on different topics related to the Carbon Mitigation Plan (CMP). The following topics were covered in the questions from the community:

1) Context and Impact
2) Technical
3) Financial
4) Process and Governance
5) Scope of CMP
6) Collaborations
7) Engagement (campus, local, and government)

Why is embedded energy and building standards not included? When will they be considered?

Answer:

The CMTF has a sub-committee to address policy for building standards and net-zero building standards. Embodied carbon falls under scope 3 greenhouse gas emissions and it is not part of the chancellor's charge for the CMTF. The CMP study looks at how to get to 100% renewable energy of the campus energy system, which includes scope 1 and 2 emissions.

Works with animals on the Hadley and Deerfield farm; concerned about excess emissions of biofuel. Is there a way to implement animal waste into biofuel, or is there a way to implement that somewhere else?

Answer:

For this study, local animal waste as a fuel (biogas or pellets) was not assessed as specific solutions as it is not ready to be implemented within the timeframe. However, thermal heat from local sewage and renewable fuel oil from wood are considered as they are at scale.

Can we keep food in the lead as a way to decarbonize our campus? Can we do more and more regenerative food and working with farmers, rotating, reducing our carbon footprint??

Answer:

Food falls under scope 3 GHG emissions for the campus and has not been part of the CMTF study to decarbonize the energy system (scope 1 and 2). Assessing the possibility of using local farms to purchase greenhouse gas offsets or REC's for any emissions of the energy system that cannot be decarbonized was considered.

How does UMass Amherst compare from 20 years ago when it was well known for its waste and recycling efforts back then?

Answer:

From a scope 1 and 2 emissions standpoint UMA is now emitting less GHG than 20 years ago when the campus used coal for its energy needs. The study has not assessed the scope 3 emissions from the campus overall resource consumption. UMass is still a leader in waste reduction and recycling efforts. More information on those efforts can be found here: https://www.umass.edu/sustainability/waste-recycling.

Lower-hanging fruit to pay back projects moving forward?

Answer:

Yes, as the hierarchy of greenhouse gas emission shows, reduction is key and low-cost interventions can help defray cost of deeper interventions. But in the end, there will be real upfront costs. Each solution has been assessed on financial pay-back but there are other pay-backs to consider as well such as buildings and a campus that is more user-friendly and support human health and wellbeing by better air quality, comfort, and beyond.

Are you looking at ways to achieve lower emissions earlier?

Answer:

Reaching a zero-emission goal by 2030 requires UMA to achieve lower and lower emissions every year than the year before, starting in 2021. No-one on the CMTF can see a realistic pathway for the campus to reach zero-emission any earlier than 2030 and doing so will require bold and significant commitments to be made this year. A 2030 neutrality target is leading by example as the rest of the state and many peer institutions don't have a neutrality goal until 2050.

What are living lab opportunities?

Answer:

Living lab is the practice of incorporating campus operations and infrastructure into academic opportunities for students. This gives students the opportunity to learn from real-life examples and support the institution in advancing sustainability. Implementation of this CMP will lead to many living lab opportunities for disciplines across the academic community. One example: engineering students can help the test bore drilling for our geothermal exchange system.

What kind of feedback are you looking for from us, the community?

Answer:

CMTF wants feedback on ways you want to be involved in supporting the campus decarbonizing its energy systems, as well as ways you think we can better engage the community, and you to provide your overall level of support of this effort.

Are there ideas of how the plan can involve student learning?

Answer:

The plan will outline policy, infrastructure/operational, and engagement solutions to implement on campus for UMA to decarbonize, the current ideas for student learning is to create living lab opportunities within the academic program for further developing the solutions (see slide 10).

What role to you anticipate for the campus unions?

Answer:

CMTF co-chairs are communicating with MSP union, and have been presenting to union AFSCME and PSU. CMTF welcomes suggestions, recommendations, and ideas on how to involve unions in this energy transition - please reach out to the two co-chairs Ezra Small (esmall@umass.edu) and Dwayne Breger (dbreger@umass.edu).

Is there a way to remain involved in this plan past this event? And how?

Answer:

Yes - depending on your role on campus and capacity the CMTF is looking for expertise to provide input and research to further develop the study into implementation. Please reach out to the co-chairs of the CMTF: Dwayne Breger and Ezra Small at dbreger@umass.edu and esmall@umass.edu.

Have you looked at good-spirited competitions on the behavioral front for energy savings?

Answer:

No, this study has not assessed specific behavior change solutions to reduce emissions, since studies on impacts of "behavior change" show that these may account for only ~2% of the solution. The study is assuming that UMA will meet the 2% reduction in emissions from behavior change and also acknowledge that community support, collaboration, and understanding of the need for energy transition and reduction is key for the larger infrastructure changes. CMTF is focusing on the large-impact solutions and to incorporate human behavior as a key for, e.g., new building designs to make sure they are functional for the university's mission of research, teaching, and service.

Has there been a conversation with the town of Amherst?

Answer:

The town is aware and CMTF co-chair is a committee member of the town's task force.

Has there been communication with the town in making this plan?

Answer:

Yes, informal communication as the co-chair of CMTF is a member of the town committee. We are proposing to the town committee that we present our findings of the Plan once it is completed.

Are there opportunities for the Amherst community to engage or collaborate?

Answer:

Not specific opportunities identified or assessed by CMTF as part of this study, however as UMA moves forward this can be explored.

Is there a plan to join forces with other local universities?

Answer:

There is no current formal collaboration, however, UMA is in regular contact with other higher ed institutions in the area as well as the UMass schools to share work and learn from each other. Smith College has shared their study findings and presented to CMTF and our consultants working on the CMP have also worked with Amherst College, Smith, and Mt. Holyoke.

Are we talking with other schools to share ideas and encourage others to do this too?

Answer:

Yes, UMass system has regular sustainability committee updates from the different schools, and CMTF are in contact with other institutions across the nation also working on decarbonizations plans such as the UC schools. The Co-Chair Ezra Small serves on multiple councils, committees, and networks at every geographical scale and will be sharing the findings of the study at every level of network: Five College + Williams, UMass System, and Northeast Campus Sustainability Consortium, and AASHE (national).

What effort has been made to find out what other campuses are doing nationally and internationally (like the Middlebury example?)

Answer:

The CMTF members and consultants are in regular contact with other leading institutions and attend conferences and share best practices within the higher education sector. We have compared data and findings from other campuses that have completed studies and/or began implementation such as Carleton College, Stanford U., Ball State U., Miami of Ohio, Wesleyan U., etc.

To what extent are we going to be tracking reproducibility/ education, documenting are efforts and communicating them - provide resources for other universities or entities?

Answer:

CMTF hopes to share UMA work and to learn from other institutions, there is no formal plan, but it is happening through presentation to the state, national higher education conferences, and collaboration groups within higher ed in the state and beyond (see slide 20).

How much support do we have from the state?

Answer:

We sharing our work with state agencies, and we are following emission reduction mandate from the state such as GWSA, but not EO 484. There is encouragement and support from Leading By Example and from the feedback when sharing our work with other agencies.

What kinds of discussions has the task force had so far on potential community impact - social equity and academic integration?

Answer:

To date, no formal impact assessment have been carried out. However, the CMTF has a boundaries and value document that the study solutions have been aligned with, and the further work to create implementation plans from the study can include assessment of local impact.

Do you have the data of what is going on now - during COVID- that you can learn about opportunities to have a shift in operations and academic calendar?

Answer:

We have not incorporated any specific data on COVID-19 impact on the campus operations, however the CMTF is following the current changes to the operations of the campus and the impact on energy system and emissions.

Is a biodigester off the table?

Answer:

A biodigester is not part of the current solution list as no specific input source from UMA has been identified and a study in 2013 assessed the options and the administration found a biodigester would be very difficult to site away from land owned by campus that is not situated within a flood zone, and prefers not to site an industrial facility on the campus.

Is there a direct plan to re-master the current co-gen plant?

Answer:

The study is outlining that the co-gen will have to be adjusted for renewable fuels and eventually decommissioned as the campus moves to low-temp hot water.

What sort of biofuels?

Answer:

Biofuels are not the main solutions of the scenarios, but wood as well as renewable fuel oil (RFO) are considered biofuels that can supplement the renewable thermal and electric energy supply the proposed energy system.

Will drilling for ground-source heat pump wells be vertical?

Answer:

Yes, the geo-exchange system will be vertical.

How is this plan adaptable for changes in Green technology?

Answer:

The study is proposing an integrated system that can use many different renewable energy sources for the electric and low-temp hot water needs of the campus thermal and electrical needs. New technologies can be added to the low-temp thermal system as they become commercially available. No one can completely know what the future holds in terms on disruptions to green technology, but the proposed transition will position UMA well for many options for renewable energy sources and the greening of the electric utility grid to be supplying only renewable energy by 2050.

What percent of UMass Emissions would be renewable under this plan? What would we need to offset?

Answer:

There would be no greenhouse gas emissions when the decarbonization plan is complete. There may have to be some purchasing greenhouse gas offsets to address any on-site combustion from the campus vehicle fleet. The campus will purchase off-campus electricity that needs to be sources from renewable energy and tracked by purchasing renewable energy credits (RECs).

Are we locking into one technology or is it more adaptable?

Answer:

The study is focusing in on shifting from steam to low-temp hot water thermal and electrification energy system that can be more flexible for the energy needs of the campus. The thermal energy system of low-temp can be trading heating and cooling and my electric and thermal energy sources can be interconnected such as geothermal, sewage heat recovery, air source heat pumps, and thermal solar.

Were building envelopes investigated at all as a method of reducing upfront costs?

Answer:

Yes.

Is the biggest source of opportunity for a ground source heat pump?

Answer:

The largest opportunity is to switch from steam to low-temp hot water and exchange system would be the main source for storing and exchanging the heat.

What have y'all done/thought about in terms of lower energy demand on campus? Can we achieve that through class scheduling, lowering temperatures in classrooms?

Answer:

Not a deep dive, but overall recommendations on controlling building temperature as well as scheduling and building use.

Is the university tracking scope 3 emissions?

Answer:

Some scope 3 emissions such as commuting are tracked by UMA, but UMA does not have a complete scope 3 inventory.

Do PVTA emissions fall into scope 3?

Answer:

Yes, emissions from the Pioneer Valley Transit Authority (PVTA) are scope 3 emissions for UMA.

Are there multiple plans?

Answer:

No, one study with different scenarios, and one recommendation for a solution portfolio.

What exactly is the plan that was in place since 2017?

Answer:

Johnson Controls Energy Performance Contract, E+ Programs for energy efficiency upgrades, the Chancellor's sustainability advisory committee (CSAC), and the Chancellor's Taskforces.

How does a carbon tax play in the picture?

Answer:

The policy-sub committee is reviewing options but has not consider recommended a carbon tax within UMA. To learn more about price on carbon on state, national and international levels, as well as what other institutions are considering for carbon pricing. Here is a list of resources:

1. Higher Ed: https://secondnature.org/climate-action-guidance/carbon-pricing/
2. State level: https://www.massclimateaction.org/carbon_pricing

What exactly is the difference between portfolios being proposed?

Answer:

There are two portfolio's assessed: (1) keep the current infrastructure systems of central heating plant (CHP) with steam and switch the CHP fuel to biofuels or (2) shift to a low-temp hot-water system and electrify as much of the system using renewable electricity.

How does the CMTF interact with the Energy Transition Initiative (soon to be Institute)?

Answer:

One CMTF co-chair serves on the steering committee and CMTF members are involved with the ETI and collaborating on development for cohesive communication on energy leadership across operations, academics, and research.

Is there a way to ensure the University is held accountable to this plan? 3rd-party auditors?

Answer:

Beyond the state mandates to reduce emissions by 2050, there is not external accountability, at the moment.

What is one specific component of your broad mitigation goals that you are particularly excited for?

Answer:

How the new energy infrastructure would not only reduce emissions but also improve health and well being of occupants of the campus - clean, healthy, non-fossil power for UMA's next 100 years!

What are the kinds of things we can "Avoid"?

Answer:

To avoid emissions, UMA must reduce its energy demand load. It is important that new or renovating buildings meets the needed energy standards and that the campus better utilize the spaces we have before erecting new buildings.

Have return on investment models been compiled?

Answer:

Yes, the proposed portfolio of low-temperature hot water system would break even in 2050.

How will we pay for efficiency?

Answer:

How to finance a carbon mitigation is beyond this study, but currently UMA pays for efficiency projects through utility incentives and operational budget (E+ fund from UMA annually).

How does the $500 million compare to necessary capital upgrades under the status quo, based on the lifespan and age of campus buildings? My question is about how we can frame sustainability investments in comparison to money that will be spent no matter what, but making sure that the spending puts us on a path toward decarbonization.

Answer:

It is about the same amount of money needed for business as usual compared to converting to low-emission system over the next 30 years, but the low-emissions system requires more upfront capital investment over the next 10 years.

Is there a subset of buildings/infrastructures that can give us the biggest bang for the buck?

Answer:

Yes, the buildings that are already up for renovations and are inefficient, and high-energy use buildings that already use hydraulic systems and do not require to be converted away from steam.

Shocked that they didn't say anything about composting?

Answer:

Composting does not provide a renewable energy source for the campus to use and carbon storage for composting would not be an effective approach since it would be an offset approach instead of emission reduction of the energy systems. Composting of food and other organic matter falls under scope 3 emissions.

Is there any discussion around changing the pattern of campus life? - shifting main semester days towards milder temperatures?

Answer:

No, not as part of this study. Instead, we have asked the question how can we get to net-zero carbon emissions assuming that campus life stays substantially very similar to the (pre-COVID) concept of university business.

Has thought been put into using this as a marketing opportunity for the university?

Answer:

CMTF has identified it as an opportunity, but no commitment to planning at this point.

Is there an opportunity to consider UMass as carbon negative through use if its forested landscape and other carbon sequestration assets?

Answer:

There is an opportunity to measure and assess the carbon sequestration from forested landscape, and potentially to certify it. But the key thing is current sequestration doesn't mean we can continue to burn fossil fuels now, and the committee uses the GHG hirrachy model that values offsets as the least favorable option as it still emits emission than the forest has to offset.

APPENDIX (slides from the webinar)

UMassAmherst
The Commonwealth's Flagship Campus

Carbon Mitigation Planning
Webinar

Fall 2020

Welcome

Thank you for joining this interactive webinar!

- If you would like, please introduce yourself using the Zoom chat function – your name, affiliation to UMass, and where you are joining us from.
  - Example: Lisa Bjerke, GreenerU – supporting the CMP, Boston

- If you can, please share your video and add any questions you have in the chat – we want to hear from you!

What brought you here today?

- Interested in learning more about UMass Amherst's carbon mitigation plan?
- Want to be involved in reducing UMass Amherst's carbon emissions?
- Both of above?
- Other reasons?

Instructions:

1. On your computer, phone, or other device, type in **sift.ly** into a web browser. Use the participant code **1023.**
2. Type your responses and click "share your input."

Note: you can alternatively add your responses to the Zoom chat.

Webinar goals

1. Inform UMass Amherst Community about the Carbon Mitigation Task Force study on how the campus energy systems can become 100% reliant on renewable energy by 2030.

2. UMass Community to provide input to what they find valuable and any concerns with the campus becoming carbon neutral by 2030.

Today's agenda

- Welcome and introduction
- Presentation (will be recorded)
- Discussion groups (not recorded)
- Panel conversation
- Summary and next steps
- Feedback

Core values for today

- Collective wisdom
- Radical candor
- Assume good intent
- Compassion
- Have fun

Chancellor's Sustainability Advisory Committee (CSAC)

The Charge

BE REVOLUTIONARY™

“In conformity with the adoption of our new tag line “Be Revolutionary,” we should set an aggressive timeline for reaching a completely renewable energy future.

I am asking the Task Force to study, or oversee a study, that would ask what it would take to get to 100% reliance on renewable energy sources for heating, cooling, and electricity usage on our campus by 2030.

You may think of this as a serious engineering feasibility study. Much as many might have a “gut feeling” that these timelines are unrealistic, I would like to see a study conducted from a scientific/engineering point of view. This could be done by involving our own students, faculty, physical plant professionals, and outside consultants if necessary. We owe our student body such a study.

Thank you.” – Chancellor Subbaswamy

Carbon Mitigation Task Force Members

Students

Student	Representing
Nicholas Simmons	Student Governance Association, Sustainability
Jonathan Blum	Student Government Association, Economics
Kimberly Acevedo	Graduate Student Senate
Caroline Williams	MASSPIRG 100% Renewable Energy Campaign
Angie Gregory	Masters in Sustainability Science

Staff

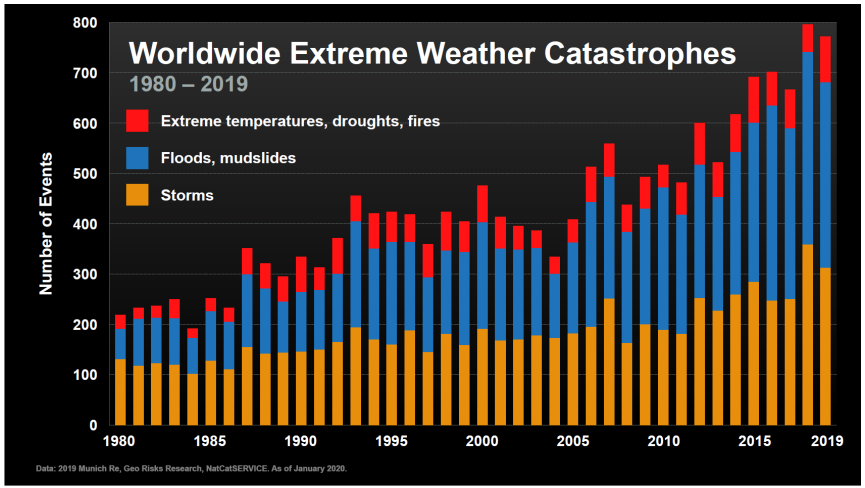
Staff	Office/Department
Ezra Small, (Operations Co-Chair)	Physical Plant
Ludmilla Pavlova-Gillham	Campus Planning
Ted Mendoza	Design & Construction Management
Ray Jackson	Physical Plant
Diana Noble	Transportation Services
Gary Ritter	Environmental Health & Safety

Faculty

Faculty	Department
Dwayne Breger (Academics Co-Chair)	Enviro Conservation and Clean Energy Extension
Krish Thiagarajan Sharmin	Mechanical and Industrial Engineering
Ben Weil	Building Construction Technology
Robert Pollin	Economics
Ajla Aksamija	Architecture
Scott Auerbach	iCons, Chemistry

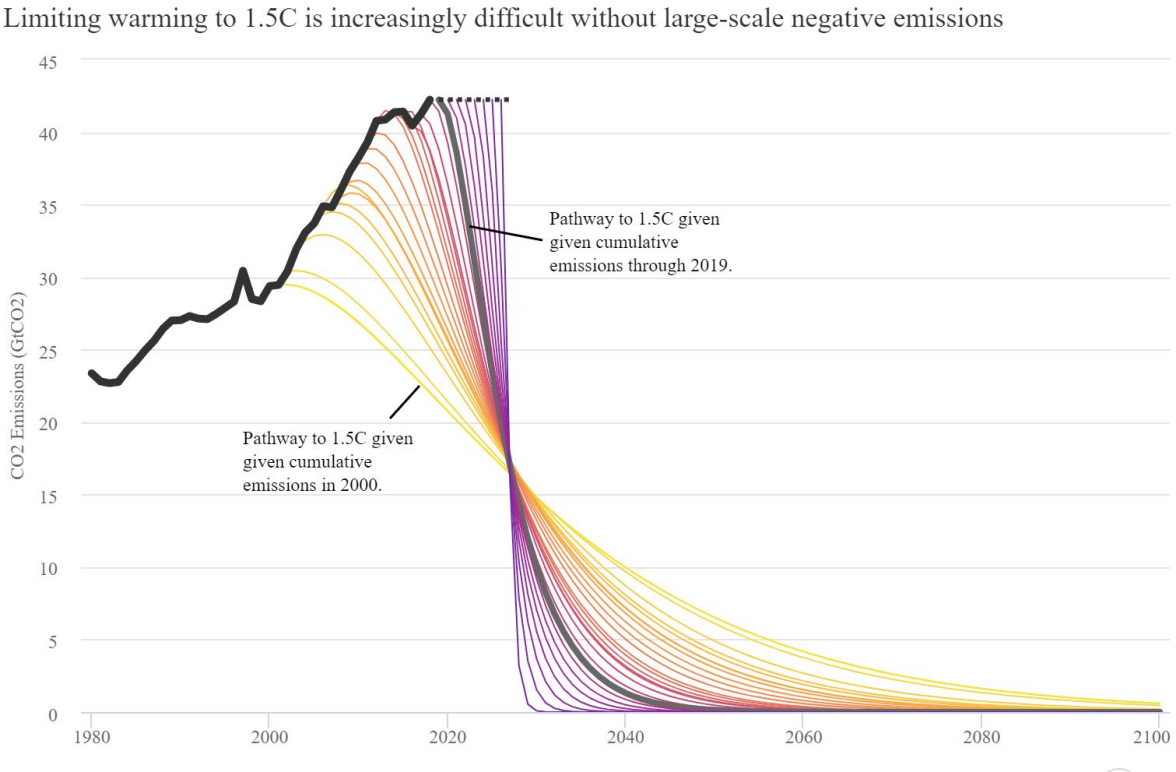
The climate crisis is here and now. It is affecting the UMass Community.

UMass Student: *"It's a reminder that climate change is a really big problem and nothing is really being done to fix it… We've seen the fires only get worse and worse every year"*



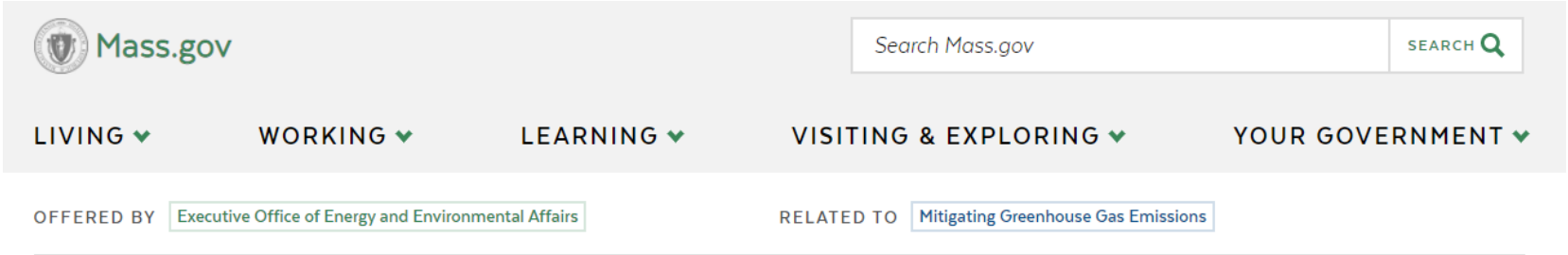
Left image source: https://www.climaterealityproject.org/truth
Right image source: https://dailycollegian.com/2020/09/as-wildfires-persist-umass-students-on-the-west-coast-cope-with-climate-crisis/#photo

Carbon action is needed now.



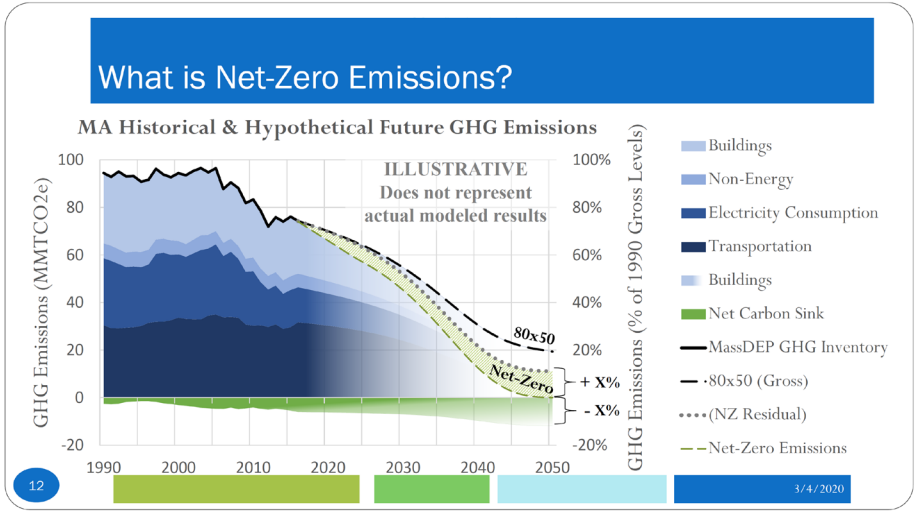
Sources: https://www.carbonbrief.org/unep-1-5c-climate-target-slipping-out-of-reach

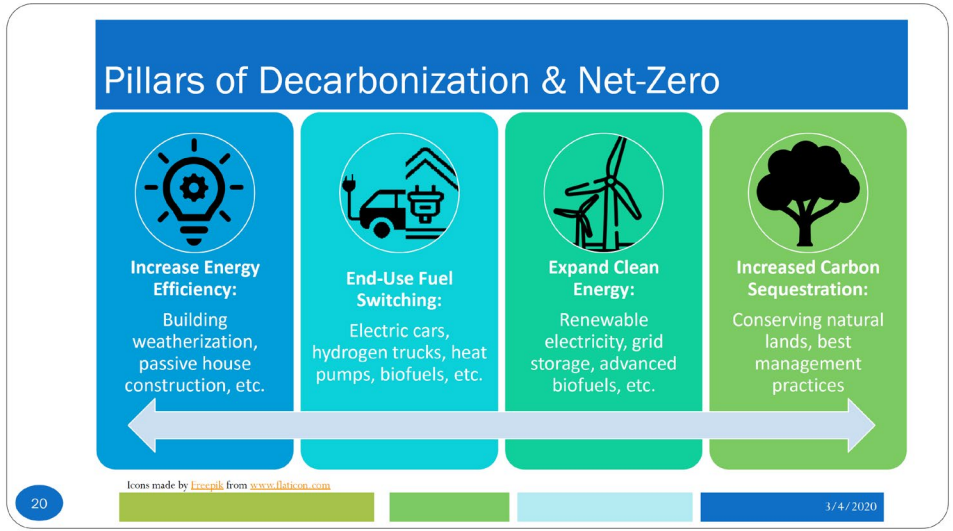
The State's response to climate change



Global Warming Solutions Act of 2008

MA planning for decarbonization by 2050

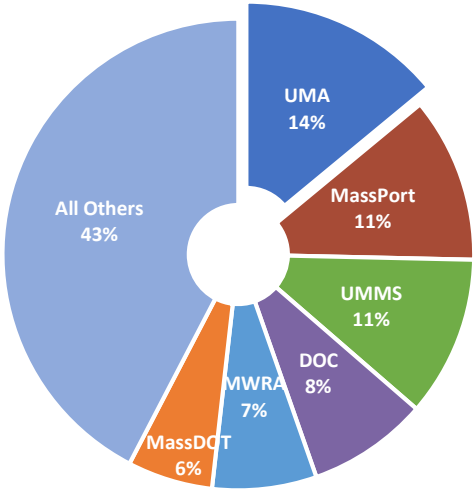




Source: https://www.mass.gov/info-details/ma-decarbonization-roadmap

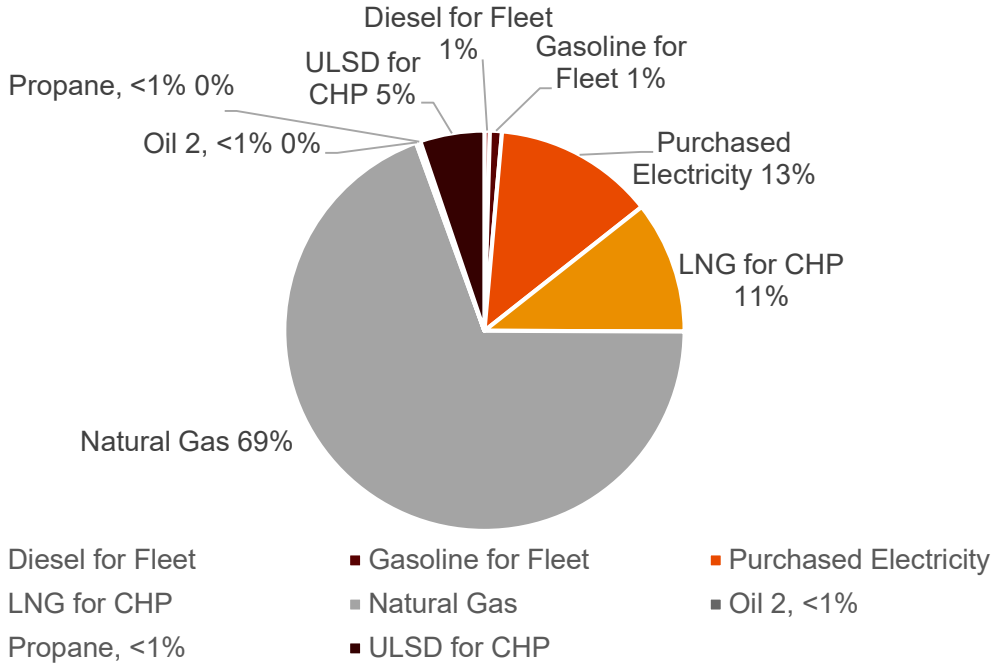
UMA emissions impact

Statewide Emissions % Share



% Contribution from Top 6 Emitters Compared to All Others in FY19

UMass Emission Sources



Purpose of the study

1. Providing the chancellor with enough information to assess if carbon neutrality by 2030 is possible.

2. Outline how to technically get to carbon neutrality by 2030.

3. Help UMass Amherst community envision the transition of the campus energy system to carbon neutrality.

The consultant team

MEP
A SALASO'BRIEN COMPANY

Lead Engineering Firm

BRAILSFORD & DUNLAVEY
INSPIRE. EMPOWER. ADVANCE.

Scenario Planning and Data Visualization

Competitive Energy SERVICES

Renewable Energy Procurement

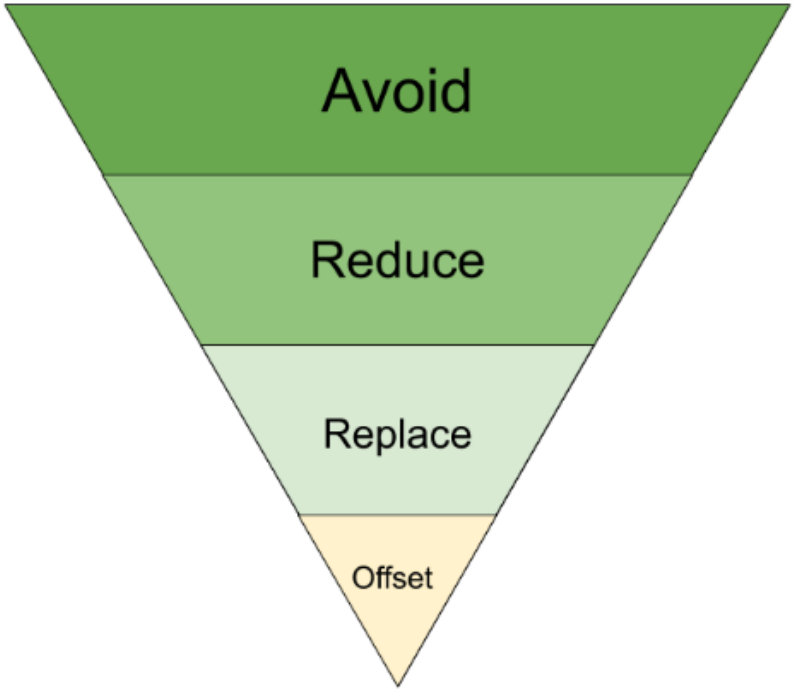
GREENER U

Facilitation & Engagement

Carbon mitigation study process

- **Step 1:** Collect data for current state and business as usual (BAU) scenario, and define values and boundaries based on the charge.
- **Step 2:** Develop a list of solutions and deep-dive into buildings and policy recommendations with sub-committees.
- **Step 3:** Group solutions into scenarios and model impact, benefits, and costs.
- **Step 4:** Share outcomes and get community and key-stakeholder input
- **Step 5:** Create a report recommending preferred strategies and phasing implementation for leadership consideration.

GHG Mitigation Hierarchy



Behavior Change
Procurement Strategies
Building Construction Standards / Policies

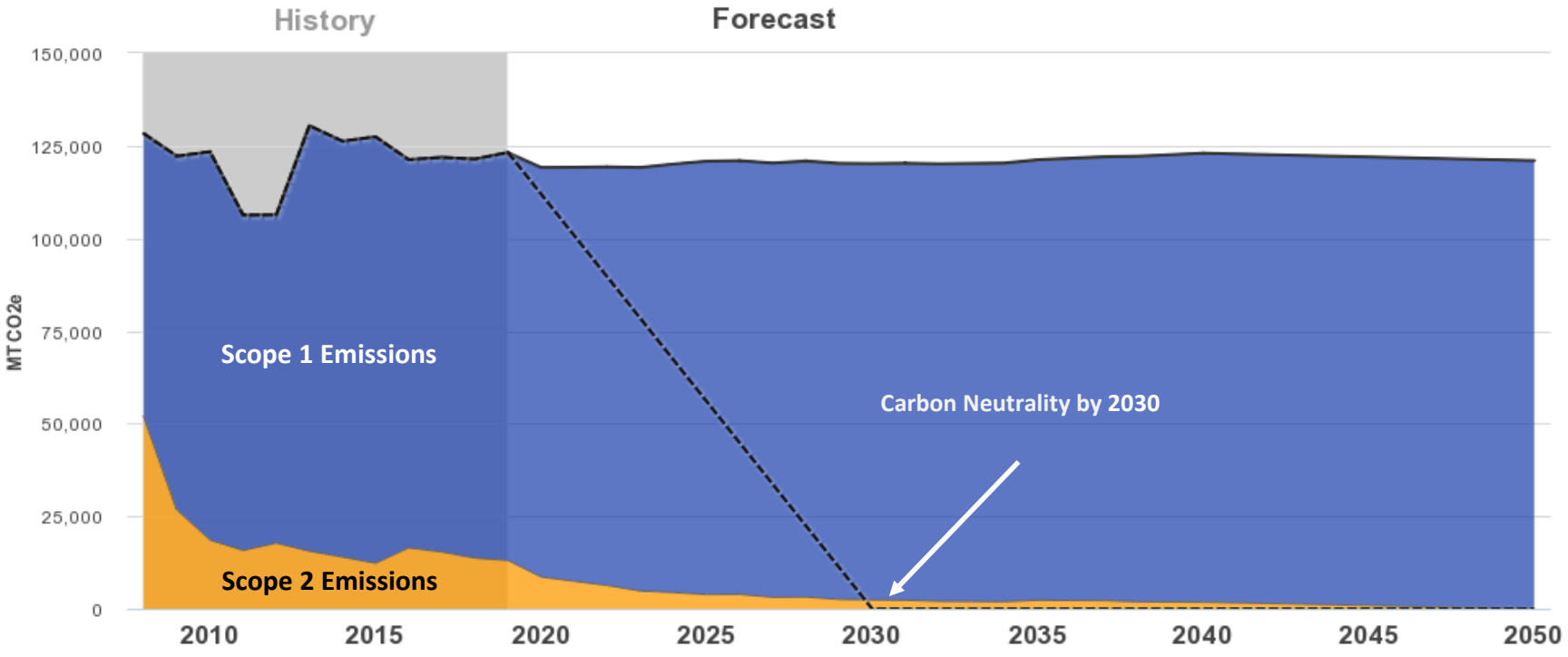
Building Energy Efficiency

Energy Supply Efficiency

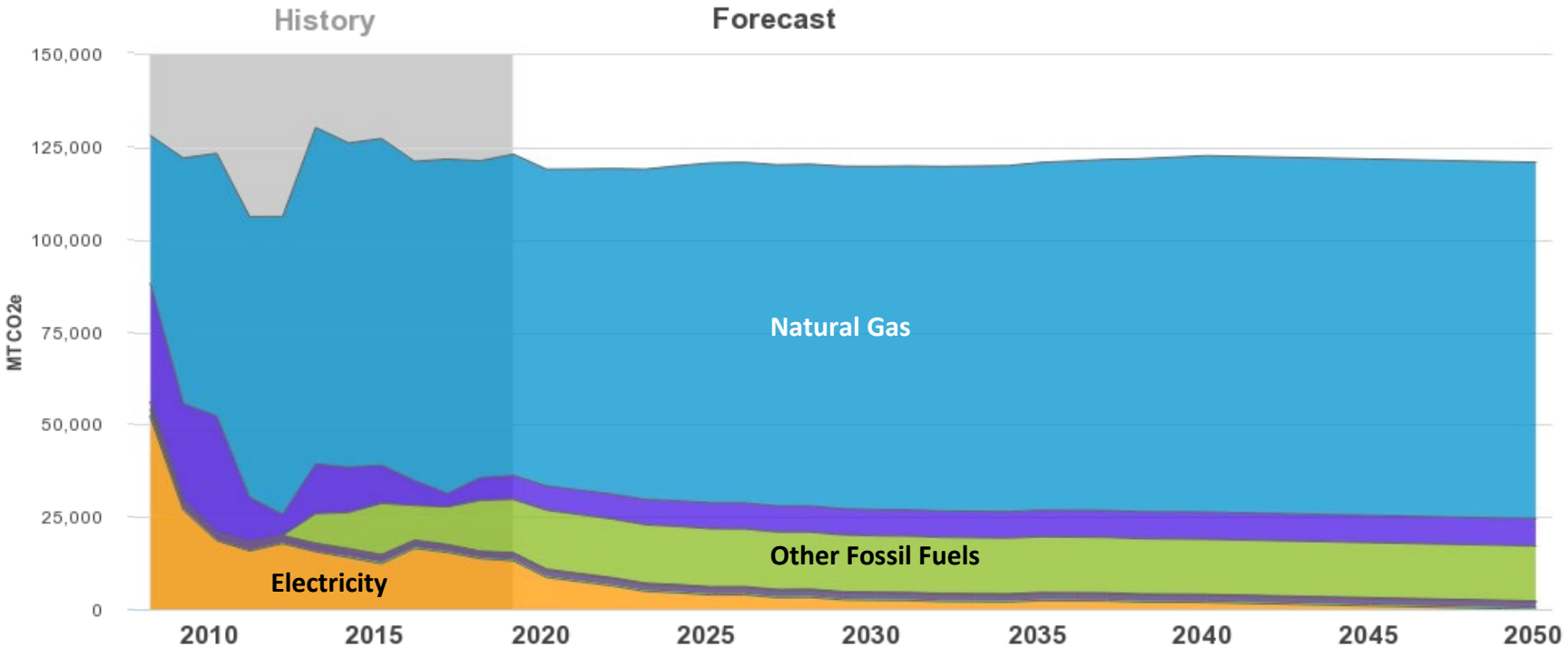
System Upgrades / Replacements
Renewable Electricity Supply (e.g. Solar, Wind)
Renewable Thermal Supply (e.g. Biofuels)

Unbundled RECs and Voluntary
Carbon Offsets

Greenhouse Gas Emissions Forecast and Goal

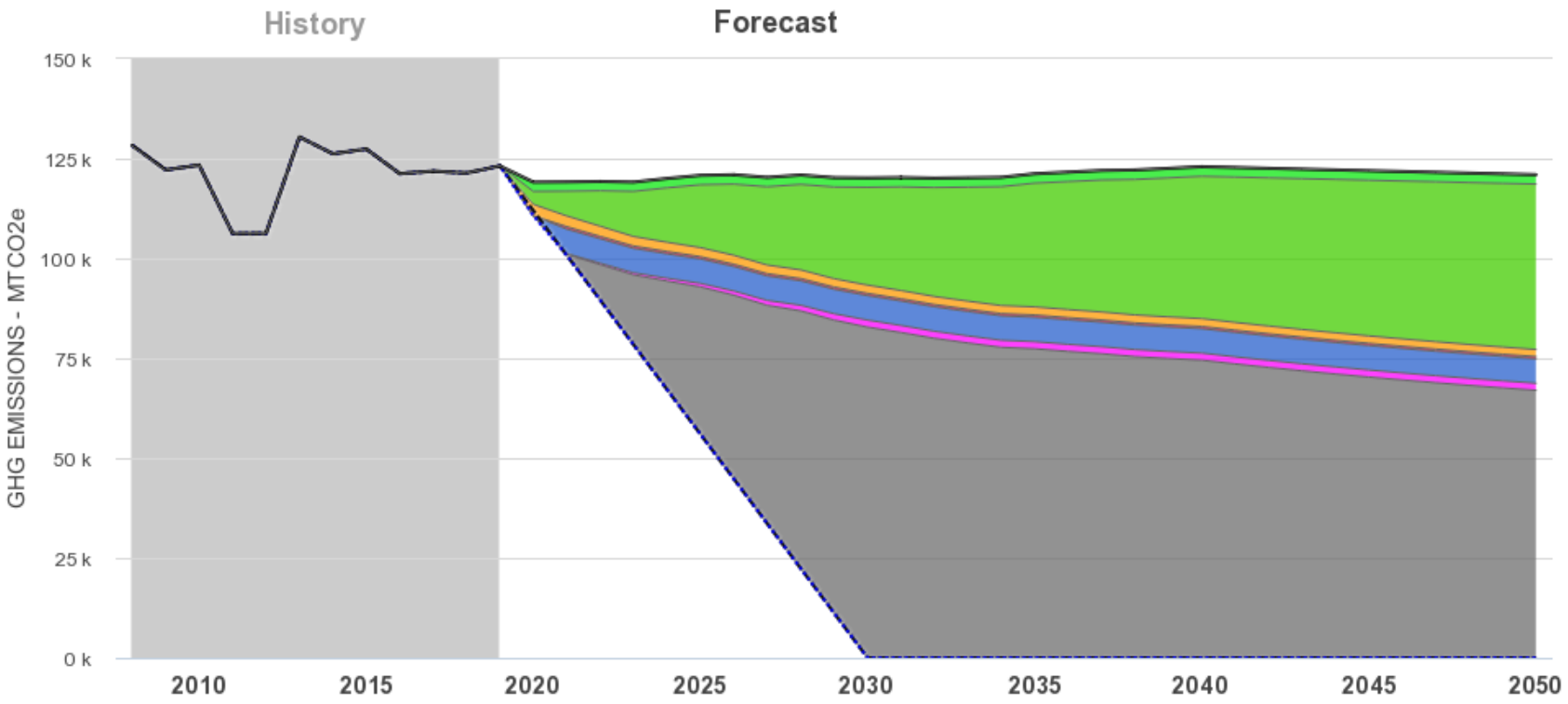


Greenhouse Gas Emissions Sources

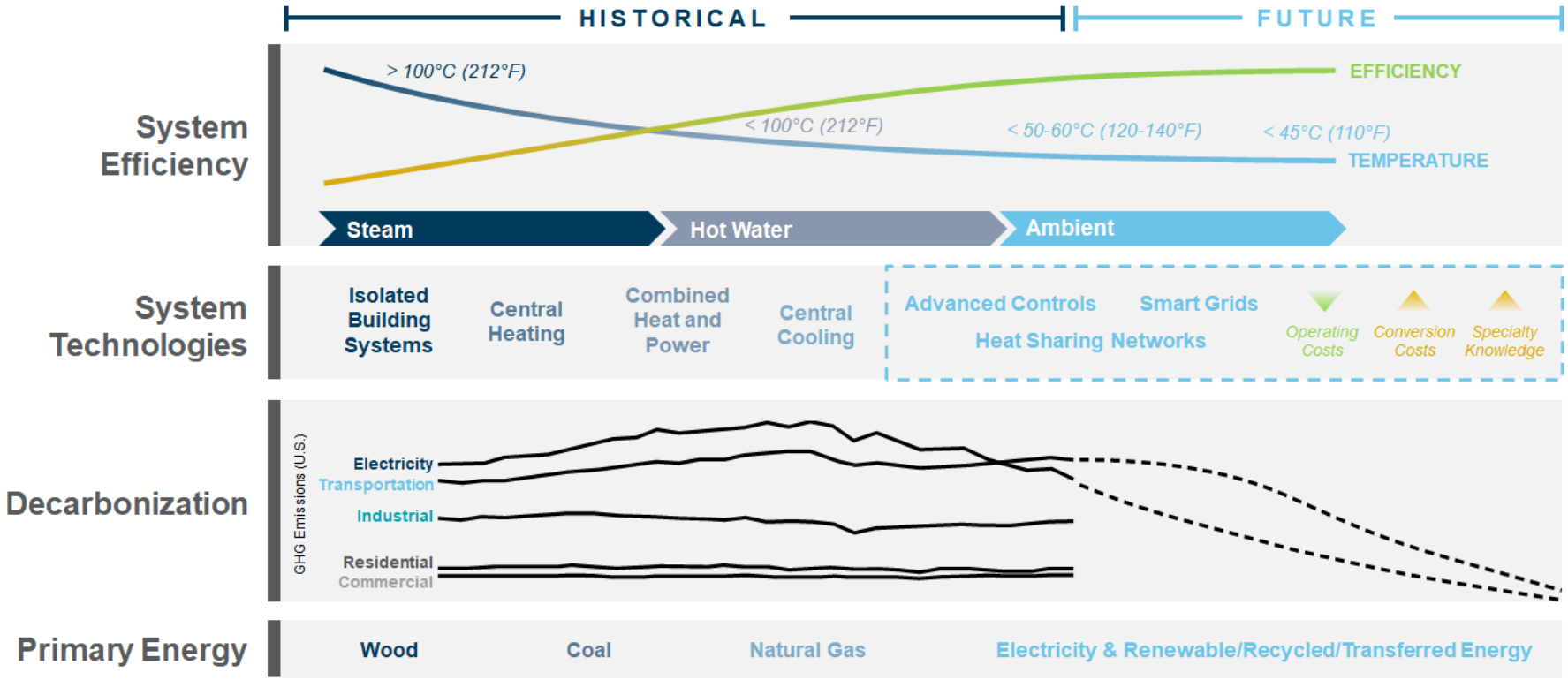


Co-Generation Plant

Efficiency and Biofuels

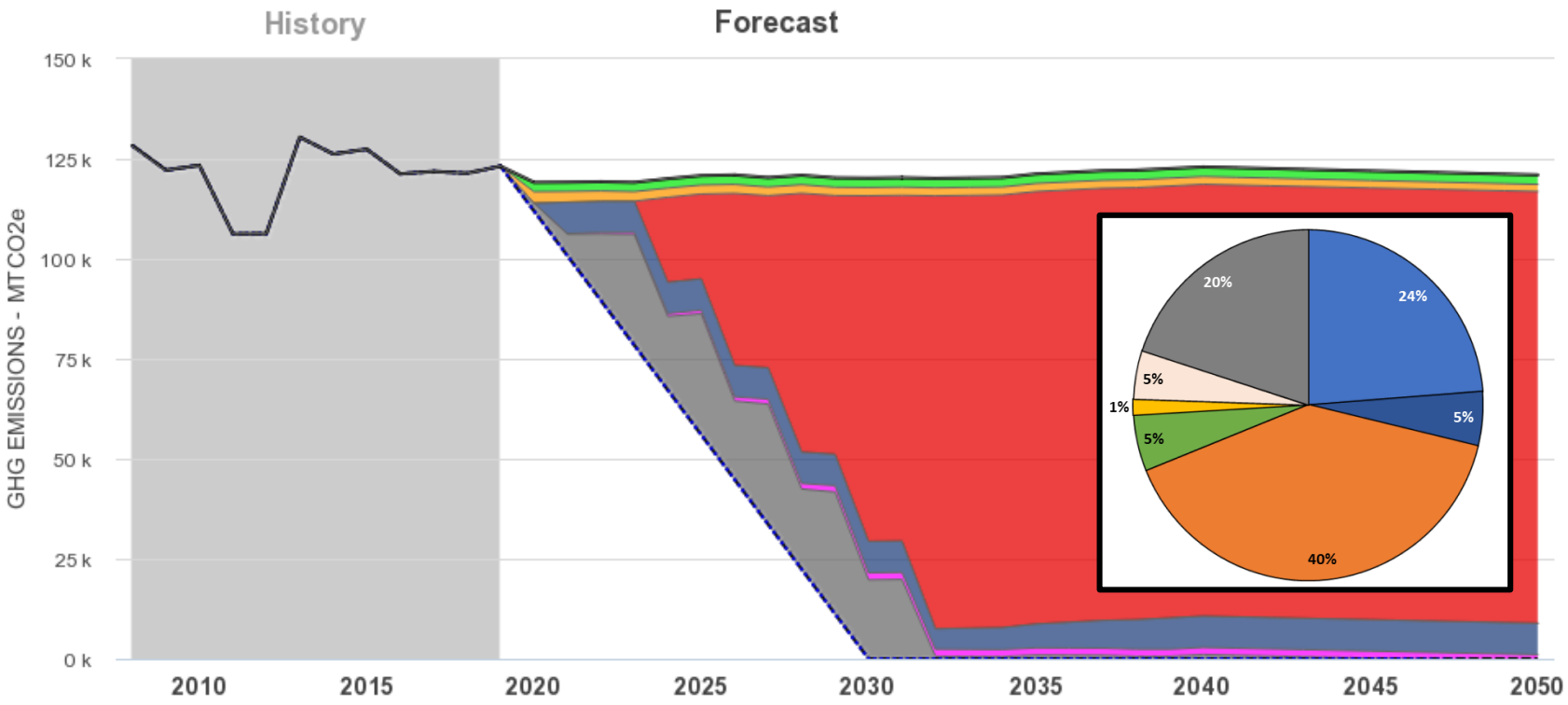


Macro Trends



GHG Emissions Data: https://www.eia.gov/totalenergy/data/browser/index.php, Infographic: © 2020, Brailsford & Dunlavey, Inc.

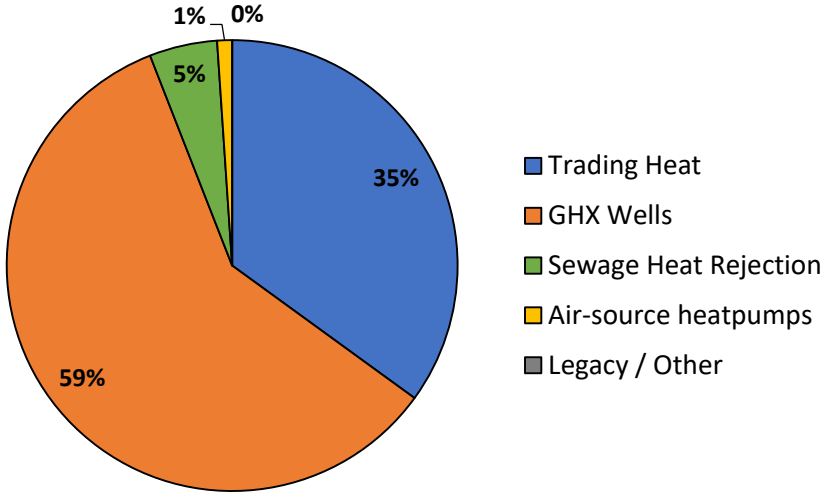
Energy Transition



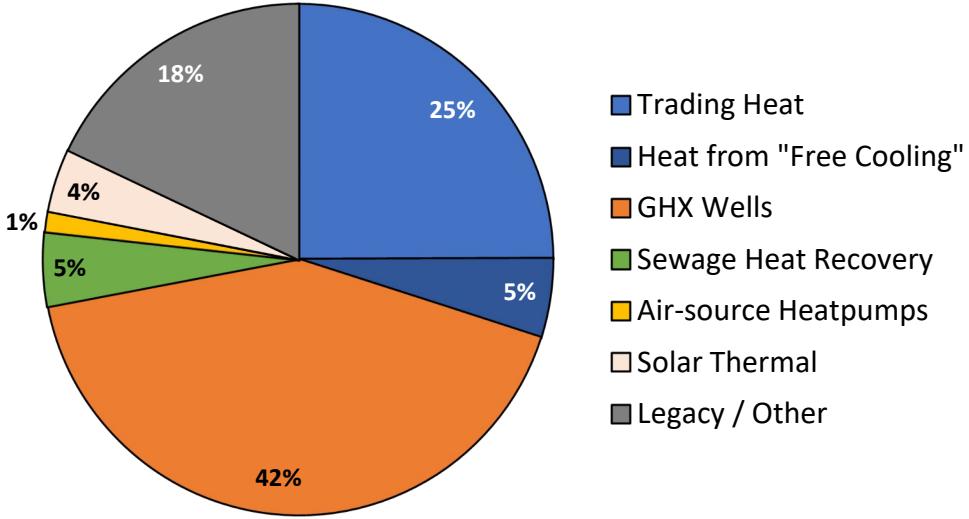
Moving & Recycling Heat
(instead of making it twice)

UMassAmherst

COOLING SUPPLY



HEATING SUPPLY



Key Take-aways
(What will the final report say?)

- This is technically possible with technology we have today.
  - Solar on campus is great, but it is not enough!
  - UMass must address the thermal energy demand and supply systems.
  - Opportunity to setup UMass to ride the renewable wave
- This is about building a campus for the next 100 years.
  - This will be capital intensive (~$500M), but not expensive
- This will take time and hundreds of projects & major decisions.
  - Start with no-regret solutions like energy efficiency
  - Use each upgrade, renovation or replacement with the end goal in mind

What we currently do know

Becoming carbon neutral actions will include:

1. Purchase renewable power from the grid
2. Transition away from steam for the heating system
3. Implement disruptive infrastructure changes to adopt a low-temperature hot water system
4. Obtain additional funding beyond current budget
5. Change renovation and new construction standards

What we currently do not know

Unknown aspects to implementing a plan:

1. Community support, interest, and concerns
2. Impact from the pandemic on long term operations
3. State funding and support to become carbon neutral
4. Availability of emerging future technologies for low-carbon operations

CMTF Sub-committee Draft Recommendations

1. Adopt net-zero-energy standard and low-emission energy systems design for new buildings and renovations
2. Establish a cap on GHG emissions
3. Transition to low/zero-emission vehicles
4. Adopt short term building efficiency measures during COVID
5. Integrate campus operations and education into a living laboratory that supports student learning and research

Discussion Topic 1

Submit your questions:
What questions do you have for the Climate Mitigation Task Force?

Instructions:

1. On your computer, phone, or other device, type in **sift.ly** into a web browser. Use the participant code **1023.**
2. Type your responses and click "share your input."

Note: you can alternatively add your responses to the Zoom chat.

Core Values for implementation

- **What is most important for you to support UMass Amherst in becoming carbon neutral?**

1. Integration with research?
2. Student learning and living lab opportunities?
3. Impact and benefits on local communities and social equity?
4. Leading by example for other institutions?
5. The cost of implementation?
6. Other values?

Core values for break out room

- Collective wisdom
- Radical candor
- Assume good intent
- Compassion
- Have fun

Report Out

1. Overarching questions to the CMTF.

2. Themes of values for how UMA reaches carbon neutrality.

Attendee feedback

- **How can we engage more of the community with the carbon emission reduction planning during this pandemic?**

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Overall support for UMA reaching carbon neutrality by 2030

- **How important is it to you that UMass becomes carbon neutral by 2030?**

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Next steps for the CMTF

1. Complete the technical study for the carbon mitigation plan

2. Outreach to the UMass community and key-stakeholders on the study results posssible implementation of carbon emission reduction strategies

3. Integration of community input into the Carbon Mitigation Taskforce recommendations to the Chancellor

More resources about CMTF

- https://www.umass.edu/sustainability/about/planning-taskforces-and-initiatives
- https://vimeo.com/410154854
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Provide your feedback

- **What did you like about today's webinar?**
- **What can the Carbon Mitigation Task Force do better?**

Instructions:

1. On your computer, phone, or other device, type in **sift.ly** into a web browser. Use the participant code **CMTF20.**
2. Type your responses and click "share your input."

Note: you can alternatively add your questions to the zoom chat.

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