Carbon Free Boston:

Creating 2030 Goals and Strategies that Move the City Towards a 100% Clean Energy Future

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Summary

The Green Ribbon Commission is partnering with the City of Boston to develop 2030 emissions reduction targets and strategies for inclusion in the City's next Climate Action Plan update. The 2030 targets will be consistent with and strongly advance the actions the City needs to take to reach its goal of an 80% reduction in greenhouse gas emissions by 2050.

The "Carbon Free Boston" initiative will signal the need to transition from old, dirty carbon-based fuels to 100% clean and renewable energy sources in every sector of the economy. It will require us to change how we create and distribute electricity, how we heat our homes and offices, how we transport people and goods, and how we handle waste.

The initiative will have four phases through the end of 2018 and will develop detailed strategies to guide Boston's transition to a renewable energy future. It will require extensive collaboration with state and regional players who control key energy, transportation and building decision-making.

The Carbon Free Boston initiative will:

- Establish a long-term framework for a carbon-free Boston that supports medium-term choices. Although we cannot know precisely how technology, the economy, and political choices will evolve toward the de-carbonization of our energy supply, it is possible to develop analytical models that identify the rough boundaries of feasible 2050 scenarios. To be meaningful, such a framework will need to work at city, state, and regional scales. Initially, its development only needs to be sufficient to inform the choices that the Boston community will make over the next 10 to 15 years. However, it will also benefit all stakeholders by providing a common basis for an expansion of its depth and detail that would allow city, state, and regional stakeholders to explore their policy choices over wider geographical scales and longer time periods.

- Propose interim goals and initiatives (through 2030) that advance the long-term framework. These interim goals and initiatives will be developed in collaboration with stakeholders from key sectors of the Boston economy – energy supply, buildings, transportation and waste management.

Why It Is Urgent to Start This Work Now

Although 2050 is 34 years away, it is important to start this work now, because we will be making choices in the next 10-15 years that will affect our ability to achieve our 2050

targets. We need to have clarity about the "end state" we are trying to achieve so that we can make mid-term choices that are aligned with that end state.

Large uncertainties remain about how our carbon free future will evolve. The rate of technology change and innovation is expected to accelerate over the coming decades, and this will create challenges and opportunities we can't yet anticipate. Moreover, in some areas, the City has limited influence. Nevertheless, there are still important choices it can make, and it is possible to establish a framework for specific 2030 strategies that the City can pursue, in the context of the ultimate goal of a clean energy region by 2050.

The Carbon Free Boston initiative will look at a range of pathways possible at state and regional scales to determine the viable city pathways to 2050 that can inform the best 2030 choices. Below are some examples of carbon free choices that this initiative will seek to clarify.

- Electricity de-carbonization. What level of de-carbonization do we need to target for our electricity system in 2030 to hit our 2050 emissions targets?
    - What investment decisions do we need to make in the next 10-15 years to make that happen?
    - What are likely to be "stranded assets" – carbon-based assets in use that have an expected lifecycle that extends beyond 2050?
    - What policy and decision-making frameworks do we need to change to implement this transition (e.g. how FERC and ISO-NE take into account GHG goals in their decision-making; transmission alternative pricing; rate restructuring; etc.)

- Heating and transportation electrification. What is the impact on the grid if we electrify our entire heating load and all of our vehicle fuel sources? What should our goals for this be in 2030? How do the generation, distribution and storage of electricity change with high levels of EV adoption? What levels of demand reduction are needed to make this feasible with our current grid infrastructure?

- Natural gas. What is the scenario for the role of natural gas use in 2030 and then in 2050?
    - How do we manage the technical transition from fossil fuel combustion to carbon-free fuel in this sector?
    - What is the policy framework for managing stranded asset decisions? If we need to invest in a natural gas asset now that has a life longer than 35 years, how do we compensate investors (or not compensate them) for the lost ROI on those assets, assuming we have to decommission that asset by 2050?

- Building and zoning codes. What energy efficiency goals should we have for 2030? What is the schedule of building energy code upgrades that will be required to achieve building energy efficiency targets? At what points of transaction will those requirements need to be imposed? How can these actions interact with the City's zoning authority? How can we use the forthcoming proposals from Imagine Boston 2030 to set a land use framework for 2050?

- Managing the resilience vs. de-carbonization balance. Many power supply decisions that will create GHG reductions in the short run also have very positive resilience outcomes (e.g. micro-grids, district energy, CHP). But they also are based on lower-carbon, not carbon-free fuel sources (e.g. natural gas). What is the 2030 and 2050 transition plan for these assets? How do you convert district energy systems to renewables at scale?

- Transportation. Go Boston 2030 has adopted aggressive GHG and VMT reduction goals, and more concrete proposals will be proposed by early next year. How will these proposals interact with energy choices?

- Prioritized carbon fuel use. The 2050 scenario is not yet a total carbon-free scenario. What are the prioritized uses for carbon-based fuels in 2050 – those uses that are critical to the functioning of society and our economy, but are difficult to de-carbonize (e.g. heavy duty freight hauling, air transport, plastics and chemical production, etc.)?

Initiative Phasing and Timing

The table below summarizes the potential phases and timing on the Carbon Free Boston Initiative.

The Carbon Free Boston Initiative Phasing, Timeline, and Deliverables	
Phases	**Deliverables**
Phase 1: Initiative Design *(January – June 2016)*	• Initiative design and key partner engagement • Initiative fund raising • Initiative launch at the June 2016 GRC meeting
Phase 2: Pathways Model Development *(June 2016 – June 2017)*	• Development of a deep de-carbonization modeling platform to support City strategy development • Creation of deep de-carbonization pathway scenarios • Analysis of the economic impact of different pathway scenarios
Phase 3: Sector Strategy Development for Boston *(July 2017 – June 2018)*	• Development of strategy recommendations for Boston's renewable energy transition on a sector by sector basis
Phase 4: Climate Action Plan Recommendations *(July 2018 – December 2018)*	• Presentation of recommendations to the City of Boston • Inclusion of recommendations in the Climate Action Plan update

Phase 1 – Initiative Design

The deliverables from this phase would include:

- Design specifications for a carbon-free decision-making platform (what it needs to include to be effective).
- Analysis of the alternative modeling technologies and their pros and cons, and a recommendation on which modeling platform(s) to use.
- Feedback from key regional, state and municipal stakeholders:

  - What they are already doing on long-term de-carbonization analysis
  - Interest in participating in a regional process
  - What it would take to get them engaged – their "quality requirements" for the process
- Recommendations on detailed project design and timing, including the process for stakeholder engagement and input.
- Commitments from key stakeholders to participate in the pathways modeling process and use the model to support decision-making on 2030 and 2050 de-carbonization strategy options.

Phase 2 – Pathways Model Development

- **Modeling.** Build capacity to test the GHG impact of different policy and investment choices on a sector-by-sector basis. The modeling capacity should be designed to address regional (ISO-NE), state and city scales, so that City of Boston scenarios can be aligned with state and regional scenarios. The process will proceed with the input of key sector stakeholders to ensure validity and transparency of both methodology and data used.

- **Targets.** Proposal of 2030 GHG reduction targets for the City, and, where appropriate, differentiation of those targets on an emissions sector basis.

- **Scenario Analysis.** High-level wedge analysis showing the scenario options for getting to the interim and long-term targets. This would include a vision of how these emissions sectors will need to be transformed by 2050 to hit our targets. Examples:
  - 80-100% de-carbonization of electricity supply
  - Electrification of heating and cooling
  - 100% ZEV vehicles; Radical mode shift
  - Aggressive Energy Efficiency
  - Zero waste

- **Economic Analysis.** Making the link between de-carbonization and long-term economic prosperity. A component of the project will be to build on the MassCEC Clean Energy Industry Report and develop the capability to model the positive economic impacts of moving towards a carbon-free future at a granular enough level to make the benefits tangible to the business community and political leaders.

Phase 3 – Sector Strategy Development for the City of Boston

The third stage in the initiative will be the development of a set of stakeholder-led sector working groups to recommend the mix and timing of strategies to achieve interim (2030) goals for a renewable energy future. The working groups will use the scenario modeling tool to help make choices about paths to deep emissions reductions, and which policy levers will be needed to implement those paths.

The sector working groups will include:

a. Electricity supply (utilities, regulators, alternative energy providers, system operators)
b. Buildings (this stakeholder group would have a close relationship to the existing GRC sector working groups)
c. Transportation (this would be coordinated with the Go Boston 2030 process, but focused specifically on the GHG reduction strategy)
d. Waste/Water
e. Leading by Example (it will be important to have a very focused strategy for the City of Boston to achieve carbon neutrality in its own operations)
f. Community Stakeholders (we need to begin thinking about what the impact of deep de-carbonization strategies is on community and neighborhood design, and how equity issues can be integrated into the strategies from the ground floor)

The City and the GRC will identify a lead partner to manage the stakeholder groups for each of these areas.

The steps in this stage of the project would include:

- Select stakeholder group members
- Define the working group scope
- Summarize existing data and information on:
    - Current sector emissions levels and trends
    - Mitigation options
    - Current initiatives underway
    - Level and location of authority necessary to achieve implementation (Boston vs. state vs. federal)
- Develop prioritized strategies and timing
- Identify short term decisions that impact long-term targets
- Summarize recommendations for inclusion in CAP update

Phase 4 – Final Report and Recommendations

The final stage of the project will be the development of a written report with recommendations to the City on goals and strategies for 2030 that are consistent with achieving the 80% by 2050 GHG reduction targets. These recommendations will be integrated into the next update of the Climate Action Plan, which is scheduled for 2018.

If successful, the Carbon Free Boston initiative will create the foundations to support rapid action towards our long-term de-carbonization goals:

- A shared positive vision of our carbon-free future;
- Shared understanding of the options for achieving that future and the trade-offs involved in them;
- Stakeholder groups that are committed to working on strategy implementation; and
- A sense of urgency and willingness to make tough shorter-term choices to enable a carbon-free future.

Attachment 1 – Relevant Deep De-carbonization Strategies in the Boston CAP (Focused on actions that can be taken in the next 10 years.)

80X50 Topic	Climate Action Plan References
Carbon Taxes	Large Buildings and Institutions **1.86 – Study policies on carbon fees in other cities** Evaluate the potential for a municipal or regional carbon tax or fee 80X50 The City will also work with the Commonwealth and other governmental bodies and stakeholders to explore…a citywide or regional carbon tax.
Clean Energy Purchasing	Large Buildings and Institutions **1.82 Promote green power purchasing** Promote renewable energy purchasing, including buildings that have linked off-site renewables projects
De-carbonizing the Grid	80X50 In the next ten years, the City will explore the following: • A carbon-neutral district energy system • The feasibility of district cooling, particularly through the use of ocean water • Expanded funding mechanisms for district energy • District heating and cooling for municipally owned facilities The City will also work with the Commonwealth and other governmental bodies and stakeholders to explore: • Removal of any legal and regulatory impediments to district energy and renewables… • Continued lowering of the cap on GHG emissions through RGGI… • Measures to ensure PV owners can interconnect to the grid…
Widespread Alternative Vehicle Adoption	80X50 In the next ten years, the City will explore the following: • Expanded public and private infrastructure to support electric vehicles… • Other zero-carbon vehicles (for example, hydrogen-powered) and associated infrastructure to support them…
Net Zero Buildings	Large Buildings and Institutions **1.31 Pilot net-zero buildings** Utilize incentives, vacant city land, and current programs for pilots of net-zero buildings across different sectors **1.62 Evaluate performance based standards for net-zero goals** Explore the role of energy-use intensity standards, with the goal of net-zero buildings by 2030 in most sectors
Zero Waste	Neighborhoods **3.11 Launch a zero waste planning process** A comprehensive planning process will identify strategies to move the city towards zero-waste