

Senator Michael J. Barrett  
Chair, Joint Committee on Telecommunications, Utilities and Energy  
Massachusetts General Court

Representative Thomas A. Golden, Jr.  
Chair, Joint Committee on Telecommunications, Utilities and Energy  
Massachusetts General Court

July 23, 2019

Dear Chair Barrett, Chair Golden, and members of the Joint Committee on Telecommunications, Utilities and Energy,

As academics, researchers, industry leaders, and energy experts, we ask you to report favorably on the 100% Renewable Energy Act (H.2836, S.1958)

Our reliance on burning fossil fuels is harming our health and changing our climate in dangerous ways. While solar and wind energy are growing rapidly, we are still not doing enough to protect our communities from harmful pollution and ensure a safe, livable climate for future generations.

The 100% Renewable Energy Act sets out a clear pathway toward 100% renewable energy, on a timeline that is achievable with support from state leaders and continued innovation in the private and public sectors. By enacting this legislation, Massachusetts can take the steps necessary to avoid the worst impacts of climate change, while building healthier and more prosperous communities.

## **Why 100 percent renewable energy is a necessary goal**

### **Climate change**

For decades, we have known that emissions of carbon dioxide and other greenhouse gases from the production and burning of fossil fuels are the major driver of climate change. Many of the impacts that scientists have predicted from greenhouse gas emissions are already happening, including rising sea levels and more frequent and severe storms.

Unless we move quickly to phase out the burning of fossil fuels, we will see these impacts become much worse. Sea levels could rise by an additional 7-10 feet in the Boston area by the end of this century. By

2070, residents could experience up to 90 days each year with temperatures greater than 90 °F, and 33 days with temperatures above 100 °F.<sup>1</sup>

Since the last legislative session, new information has underscored the necessity and urgency of mobilizing quickly to reduce greenhouse gas emissions. Last year's *Global Warming of 1.5 °C* report from the Intergovernmental Panel on Climate Change (IPCC) explained why we must bring global carbon emissions down to zero by mid-century, or sooner, to prevent the worst impacts of climate change.<sup>2</sup> More importantly, this report put a spotlight on the year 2030 as the time by which “global net anthropogenic CO<sub>2</sub> emissions [must] decline by about 45% from 2010 levels” in order to prevent “overshooting” 1.5 degrees Celsius (2.7 degrees Fahrenheit) with catastrophic effects.

Since many places are lagging in meeting these goals, Massachusetts and other leading states and municipalities must eliminate greenhouse gas emissions even *faster* than the national or global averages. Given the risks of irreversible and “runaway” climate tipping points leading to even greater harm and cost than those addressed in the IPCC report, emissions must be reduced as fast as possible by those with the ability to lead.<sup>3</sup>

## Public health

Renewable energy strategies that reduce emissions of greenhouse gases also reduce other forms of air pollution that can affect public health. Pollution from the combustion of fossil fuels is linked to a wide range of health problems, including asthma, cardiovascular disease, and premature death. Many of these impacts are felt disproportionately by low-income communities and people of color, as well as residents of neighborhoods that are located near highways, airports, and other highly polluting infrastructure. These vulnerable communities are also particularly subject to the risks associated with climate change, including the spread of insects and diseases into new areas, the widespread flooding of communities and people's homes, and allergic reactions to mold growing in people's houses due to higher humidity.

Reducing air pollution generally leads to immediate improvements in public health, providing a near-term and local rationale for strategies that will also have long-term and global benefits. A 2017 study showed that the growth in wind and solar energy from 2007–2015 in the United States had resulted in \$29.7–\$112.8 billion in health benefits and saved 3,000–12,700 lives.<sup>4</sup> These savings are related to reductions in particulate matter and ozone concentrations, with corresponding reductions in premature deaths, cardiovascular and respiratory hospitalizations, and heart attacks. This is a conservative estimate, as it does

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<sup>1</sup> *Climate Ready Boston: Climate Projection Consensus*, City of Boston, December 2016, <[https://www.boston.gov/sites/default/files/02\\_20161206\\_executivesummary\\_digital.pdf](https://www.boston.gov/sites/default/files/02_20161206_executivesummary_digital.pdf)>.

<sup>2</sup> *Global Warming of 1.5 °C*, Intergovernmental Panel on Climate Change, October 2018, <<https://www.ipcc.ch/sr15/>>.

<sup>3</sup> “Climate ‘Tipping Points’ Could Add Trillions to the Costs of Warming,” Chelsea Harvey, E&E News, 24 April 2019, <<https://www.scientificamerican.com/article/climate-tipping-points-could-add-trillions-to-the-costs-of-warming/>>. “‘Tipping points’ could exacerbate climate crisis, scientists fear,” Fiona Harvey, The Guardian, 9 October 2018, <<https://www.theguardian.com/environment/2018/oct/09/tipping-points-could-exacerbate-climate-crisis-scientists-fear>>.

<sup>4</sup> “The climate and air-quality benefits of wind and solar power in the United States,” Dev Milstein et al., *Nature Energy* 6, 14 August 2017, <<https://www.nature.com/articles/nenergy2017134>>.

not consider other benefits from reducing air pollution, such as a decline in asthma attacks, lost days of school and work, and premature births.

## Our renewable energy potential

Recent progress on renewable energy gives us confidence that we can go much further and faster in reducing greenhouse gas emissions. Nationally, solar and wind energy are expected to account for the majority of electric generating capacity added to the grid in 2019.<sup>5</sup>

The Commonwealth's first offshore wind farm, Vineyard Wind, will provide about 6% of our electricity consumption, with other projects soon to follow.<sup>6</sup> Massachusetts has the potential to generate more than 19 times as much electricity from offshore wind as the entire state consumes each year. Even when all heating and transportation are converted to run on electricity — a necessary step to achieve 100% renewable energy economy-wide — offshore wind can still provide eight times as much electricity as Massachusetts needs.<sup>7</sup>

Since 2008, the amount of solar energy capacity installed in Massachusetts has increased more than 240-fold.<sup>8</sup> By installing photovoltaic panels on every suitable rooftop, we could generate 47 percent of Massachusetts' electricity from solar.<sup>9</sup> With larger, ground-mounted solar installations, our solar energy potential is even greater.

In recent years, we have seen rapid declines in the costs of other technologies that will facilitate an economy-wide transition to 100% renewable energy, including energy storage, electric cars, heat pumps and LED light bulbs.

Electric vehicles (EV) are more efficient than internal combustion engine vehicles, resulting in EV operating costs per mile that are one-third of those of operating an internal combustion vehicle.<sup>10</sup> Air source heat pumps have made significant improvements in energy efficiency over a much wider range of operating temperatures, now working below -10° F, and can cost less to install in new homes than a fossil fuel heating system.<sup>11</sup>

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<sup>5</sup> "New electric generating capacity in 2019 will come from renewables and natural gas," Cara Marcy, U.S. Energy Information Administration, 10 January 2019, <<https://www.eia.gov/todayinenergy/detail.php?id=37952>>.

<sup>6</sup> "Project Update: Submarine Cable Contract Awarded to Prysmian Group, with Commitment for 100 Workers from Massachusetts and New England States," Vineyard Wind, 17 May 2019, <<https://www.vineyardwind.com/press-releases/2019/5/20/project-update-submarine-cable-contract-awarded-to-prysmian-group-with-commitment-for-100-workers-from-massachusetts-and-new-england-states-nbsp>>.

<sup>7</sup> *Wind Power to Spare: The Enormous Energy Potential of Atlantic Offshore Wind*, Gideon Weissman, Rachel J. Cross, and Rob Sargent, Frontier Group and Environment America Research & Policy Center, March 2018, <<https://environmentmassachusetts.org/reports/mae/wind-power-spare-enormous-energy-potential-atlantic-offshore-wind>>

<sup>8</sup> *Renewables on the Rise*, Gideon Weissman, Rob Sargent, and Bret Fanshaw, Frontier Group and Environment Massachusetts Research & Policy Center, July 2017, <<http://environmentmassachusetts.org/reports/mae/renewables-rise>>.

<sup>9</sup> *Rooftop Solar Photovoltaic Technical Potential in the United States: A Detailed Assessment*, Pieter Gagnon et al., National Renewable Energy Laboratory, January 2016, <<https://www.nrel.gov/docs/fy16osti/65298.pdf>>.

<sup>10</sup> UBS Evidence Lab Electric Car Teardown – Disruption Ahead?, Patrick Hummel et al., UBS, 18 May 2017, <[http://www.advantagelithium.com/\\_resources/pdf/UBS-Article.pdf](http://www.advantagelithium.com/_resources/pdf/UBS-Article.pdf)>.

<sup>11</sup> "The Future of Housing in America," Kevin Ireton, *The Best of Fine Homebuilding* (ISSN: 1936-8135), Winter 2014.

## Getting to 100% renewable energy

There are no insurmountable technological or economic barriers to powering our electric grid, our buildings, and our transportation system with 100% clean and renewable sources of energy.

In recent years, many studies have established the feasibility of fully renewable systems. A review published in May analyzed 180 relevant studies.<sup>12</sup>

In order to reach 100% renewable energy across all sectors of the Massachusetts economy, we must:

- Reduce our total energy consumption by taking advantage of the many remaining cost-effective opportunities for energy efficiency improvements;
- Replace all fossil fuel power plants with non-emitting renewable generation like wind and solar;
- And electrify all energy used for transportation and for all residential and commercial buildings (e.g., space heating and hot water).<sup>13</sup>

In order to convert all electricity generation to renewable resources by 2035, Massachusetts' renewable portfolio standard (RPS) will have to increase by an average of about 5.5 percentage points per year from the 2019 level of 14 percent. In order to achieve 100 percent renewable energy economy-wide by 2045, about 4 percent of the fossil fuels now used for heating, hot water, and vehicles will have to be replaced every year by electricity. These rates of increase are not at all unrealistic if Massachusetts makes a commitment to 100 percent renewable energy in this legislative session. All of these trends are now underway but need to be dramatically accelerated.

## Massachusetts must lead the way

### Growing momentum for 100% renewable energy

To date, more than 120 municipalities in the United States have committed to a goal of 100% renewable electricity or 100% renewable energy economy-wide.<sup>14</sup> At least twelve cities and towns in Massachusetts – Salem, Lowell, Leverett, Northampton, Beverly, Cambridge, Greenfield, Natick, Windsor, Watertown, Marblehead, and Amherst – have made this commitment, with other municipalities weighing similar targets.

Additionally, more than 180 leading global companies have pledged to switch to 100% renewable energy as part of the RE100 initiative. Several of these companies are based in or have significant operations in Massachusetts, including Biogen, Google, Microsoft, and P&G.<sup>15</sup>

<sup>12</sup> "Status and perspectives on 100% renewable energy systems," Kenneth Hansen, Christian Breyer, and Henrik Lund, *Energy* 175, 15 May 2019, <<https://www.sciencedirect.com/science/article/abs/pii/S0360544219304967>>.

<sup>13</sup> For some transportation applications, electricity may be converted to hydrogen or liquid fuels in addition to being used directly in vehicles.

<sup>14</sup> "100% Commitments in Cities, Counties, & States," Sierra Club, <<https://www.sierraclub.org/ready-for-100/commitments>>.

<sup>15</sup> "Companies," RE100, <<http://there100.org/companies>>

Major institutions in Massachusetts are also moving to purchase their energy from renewable sources. Boston University and Harvard University have committed to 100% renewable energy goals. Partners HealthCare is purchasing energy from a 28-megawatt wind farm in New Hampshire, part of its overall strategy to achieve 100% renewable energy by 2025.<sup>16</sup>

Momentum is building for state-level commitments to 100% renewable energy as well. Six states – Hawaii, California, New Mexico, Washington, Maine, and New York – have committed to 100% renewable or carbon-free electricity targets, along with Puerto Rico and the District of Columbia.

### **Massachusetts' legacy of leadership**

For decades, Massachusetts has been a national leader in efforts to reduce fossil fuel pollution and expand clean energy production.

In 2001, Massachusetts adopted the nation's first binding limits on carbon pollution from power plants. Massachusetts was also among the first states to adopt stronger vehicle emissions standards in the 1990s. More recently, the Commonwealth has emerged as one of the top states in the country for solar energy.

With the federal government moving in the wrong direction, it is up to states like Massachusetts to lead the way forward. Our climate and our health can't wait.

Please report favorably on the 100% Renewable Energy Act, including commitments to achieve 100% renewable electricity by 2035 and 100% renewable energy for heating and transportation by 2045. With your leadership, we can take bold steps toward a future powered entirely by renewable energy, and help ensure that our children inherit a safe, healthy, and livable planet.

Sincerely,

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Daniel Faber  
Director, Northeastern Environmental Justice Research Collaborative  
Northeastern University

Rich Rosen  
Tellus Institute (retired)

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<sup>16</sup> "Partners HealthCare signs contract with Walden's New Hampshire wind farm," Partners HealthCare, 13 April 2017, <<https://www.partners.org/Newsroom/Press-Releases/Wind-Farm-Press-Release.aspx>>.

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