

Elements of a Robust Energy Vision/Agenda for the State of Massachusetts

Prepared for MassInsight
March 2015

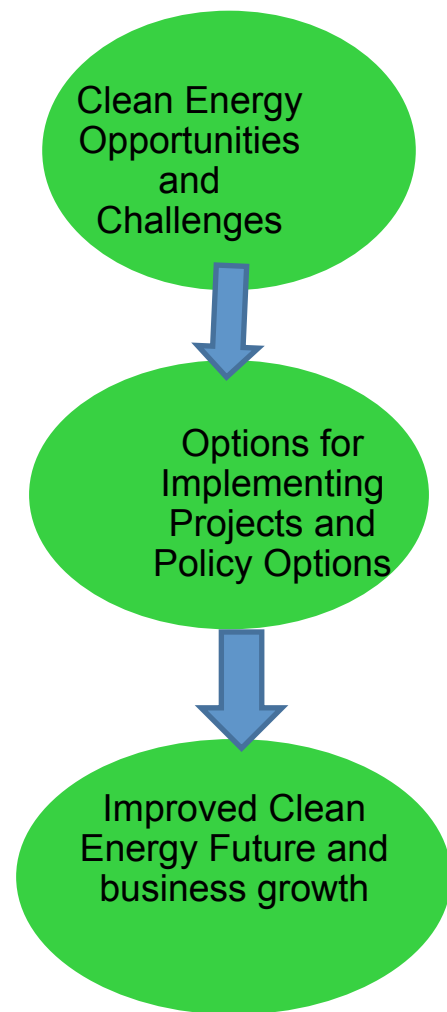
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Why Massachusetts Needs a Robust and Actionable State Energy Agenda

New England, and Massachusetts in particular, enjoy many economic advantages, but low cost and indigenous energy is not one of them.

Massachusetts Energy Landscape

- For decades MA has paid top dollars for the fuels and 10% or more of electricity it imports; this is essentially a constraint.
- Our electricity prices have always been among the highest in the nation. Our viable power plants are limited in number and that number is dwindling.
- A disproportionate share of our building stock is aging. While we have done much to take efficiency measures, much more can be done.



Why Massachusetts Needs a Robust and Actionable State Energy Agenda

The Energy Agenda must look at short-term and long-term energy challenges

- The challenges of determining the right amount of natural gas as coal plants retire, without putting the state at risk of higher prices long term. Other sectors will exhibit a growing need for gas as well, such as industrial CHP, CNG vehicles and building heat
- Need to continue taking efficiency measures, particularly in the industrial sector.
- Electric and natural gas use in vehicles has not been adopted as much as in some other states (except for municipal buses).
- Developing a viable market for homegrown renewables including hydro, solar and wind, which are still well below their potential in kWh produced annually.

Five Critical Elements of a Robust State Energy Agenda

Element	Energy Options and tactics	Rationale
Adopt and nurture clean energy sources which are trending downward in cost, keeping emissions low	<ul style="list-style-type: none">• Large-scale onshore wind, biomass and hydro projects (some out of state) are increasingly cost-effective• Expand Solar and Energy Storage for all distributed generation• Expand biomass to energy• Anaerobic Digestion for waste	Ratepayers Cost must be balanced with environment
Continue to lead the nation in conservation and building efficiency. Do more in demand-response, smart micro-grids, real-time rates and waste energy usage	<ul style="list-style-type: none">• Appliance Efficiency• Low Energy Buildings• Land-Use/intelligent growth• Give occupants key data and choices• Advanced Lighting	Lowering wasted energy is absolutely the lowest cost form of “energy”
Take needed and affordable steps in grid modernization and resilience to potential threats	<ul style="list-style-type: none">• Harden substations• Prepare for rare storm surge events• Protect emergency generators• Grid modernization and resiliency	Infrastructure is a bottleneck and too vital to leave unsecure

Five Critical Elements of a Robust State Energy Agenda

Element	Energy Options and tactics	Rationale
<p>Address natural gas constraints and bottlenecks to enable right-sized use in buildings, industry, power-plants and transportation</p>	<ul style="list-style-type: none"> • Right-sized expansion of pipeline capacity to avoid peak-price impacts • Address gas leaks • CNG for vehicles • EPA GHG implementation plan 	<p>Not only plentiful and low cost, but by far the lowest carbon of the fossil fuel options</p>
<p>Leverage MA leadership in manufacturing renewable energy systems, big data, security, deployment, and innovation to retain and add jobs</p>	<ul style="list-style-type: none"> • Expand jobs in Manufacturing, deployment and innovation • Training at Vocational schools • Training at Community colleges • Local Industry identifies worker skills • Expand co-op programs with industry 	<p>MA is a magnet and a had 11 companies in the Global Cleantech 100</p>

EPA Scenario for GHG Reduction- Power Generation Sources in MA

Metric
Tons CO₂e

16000
14000
12000
10000
8000
6000
4000
2000
0

Year 2012

Year 2020

Year 2030

Coal Plant Efficiency

Shift to NG

Add Renewables

Demand Reduction

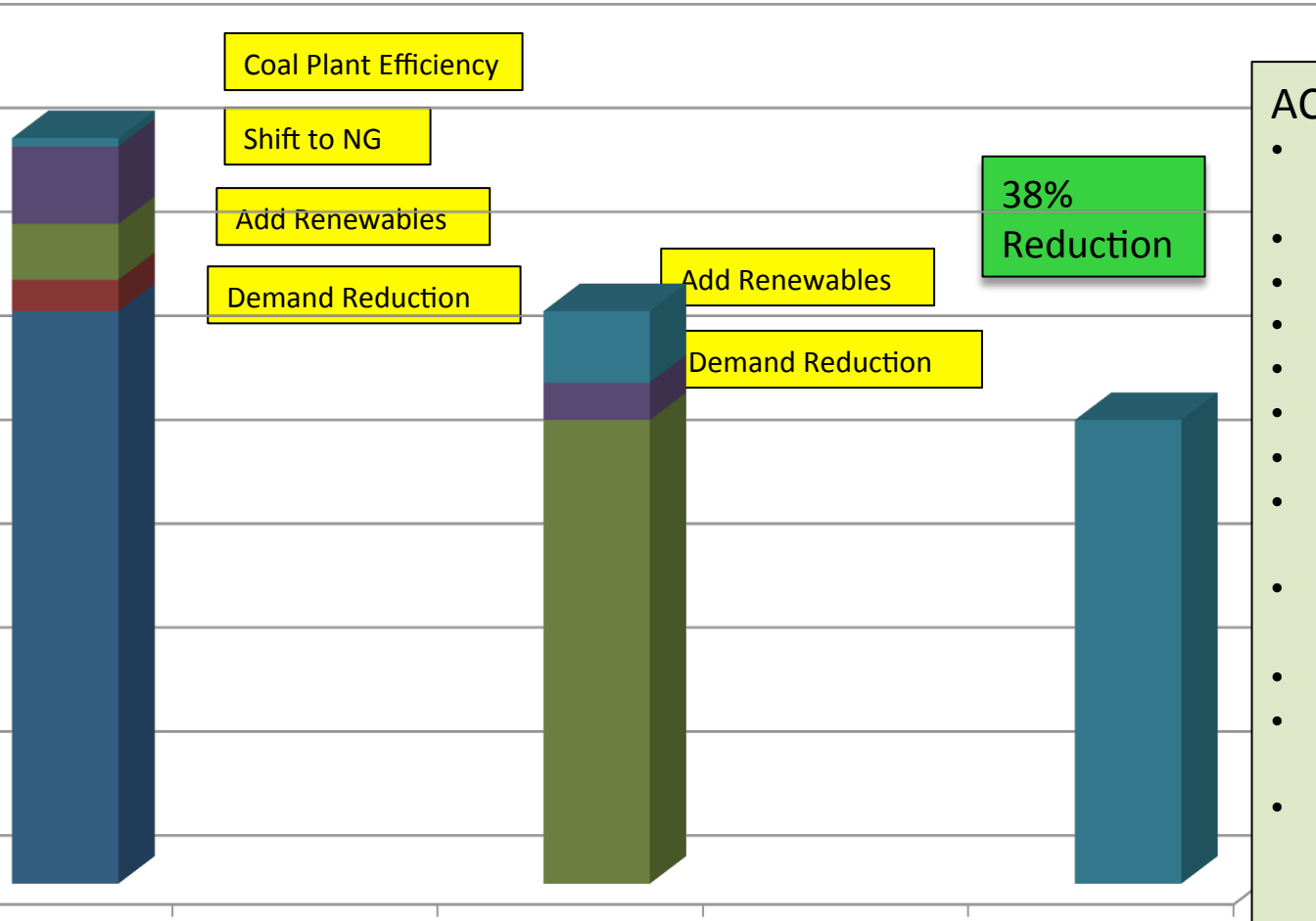
38%
Reduction

Add Renewables

Demand Reduction

ACTIONS

- Dispatch to Gas Units
- Gas Pipeline
- Salem Gas Unit
- Biomass
- Solar
- Wind
- Hydro
- Building Conservation
- Appliance upgrades
- Thermostats
- Occupancy Sensors
- Lighting



Summary of Key Options for the Next Governor

Top Options:

- Facilitate the transition to the new mix of electric generation sources. Build upon MA's clean energy foundation to chart a path to an affordable and sustainable energy future.
- Invest in right-sized natural gas pipeline capacity for mid-term energy needs, avoiding putting MA on the path to higher and volatile long-term costs
- Invest in hydroelectric and other renewables with the needed transmission, establishing a competitive procurement process for cost-effective clean energy and infrastructure.

Other Options

- Keep MA as the leading state in energy efficiency (ACEEE Ranking #1)- Expand efforts through deeper retrofits and tools like aggressive "HERS" building codes
- Take a fresh look at incentive and procurement structures for solar and wind so that the most cost-effective capacity additions are undertaken (affordable to ratepayers on a cost-benefit basis, including offshore wind and promoting continued cost reduction by developers to make renewables more competitive).
- Promote on-site distributed generation and CHP
- Promote and invest in energy storage, the necessary complement to solar, wind and hydro.
- Lower carbon transportation fuels and power sources (EV, CNG, biomass)
- Advance smart-grid modernization and distributed generation for resiliency and customer control

**SOME ISSUES IN IMPLEMENTING
EACH AGENDA PRIORITY ITEM**

1- Adopt and nurture clean energy sources which are trending downward in cost, keeping emissions low

Wind and solar- Our homegrown energy resources wind and solar have grown to meet 0.6% and 0.3 % (310,000 Mwh) of total demand, are increasingly cost effective, but have a long way to go and will continue to rely on significant subsidies and tax credits (e.g. “RECs”) ultimately borne by taxpayers. Large scale onshore wind combined with transmission projects are the most cost effective today, with solar costs coming down fastest.

- ***Specific challenges*** - Offshore wind must be developed in stages following the success of onshore wind progress, to move on from the Cape Wind challenges. On-site energy storage is sorely needed to avoid wasting off peak wind and solar
- ***Options for the next Governor*** - “Rightsize” the rate of solar and wind ramp up, as decreasing costs reduce the need for subsidies. Manage the impact of REC incentives on electric rates
- Longer term by 2050 the state will need to have executed a game-plan to grow these resources

1- Adopt and nurture clean energy sources which are trending downward in cost, keeping emissions low

Orderly phase out of remaining NE coal plants- Salem Harbor is an example of the orderly transition of a coal plant to either clean, efficient natural gas combined cycle or to redevelopment of the site. As other New England coal plants retire, MA must coordinate replacement generation with our neighbor states

- ***Specific challenges*** - How to prevent MA from being over-dependent on gas and vulnerable to price increases?
- ***Options for the next Governor*** - Roadmap and policy for future New England mix of natural gas generation

Nuclear- Put next generation failsafe nuclear plans on the table for longer term capacity planning. Not a high priority now.

1- Adopt and nurture clean energy sources which are trending downward in cost, keeping emissions low

Expand Hydro and Ocean Energy- Harvest underutilized in-state hydro (see DOE report). Open up out-of-state hydro to the optimum level without displacing homegrown renewables. Over 80% of MA electricity users are located within 25 miles of the coastline, and technology for capturing ocean energy is rapidly evolving. Is it ready for prime-time? What steps should be taken proactively?

- ***Specific challenges*** - Hydro projects combined with transmission are cost effective but raise right of way issues.
- ***Options for the next Governor*** - Monitor demonstrations first

1- Adopt and nurture clean energy sources which are trending downward in cost, keeping emissions low

Biomass Heat and Power- The DOER has concluded that there is an underutilized sustainable supply of waste biomass from forest cuttings, agriculture, food processing, urban organics, and construction waste. Crops for fuels are also an option. Job growth prospects are very significant from harvesting and delivering feedstock. Are we missing the boat as a region by not more aggressively installing biomass to energy systems including anaerobic digesters for solid waste?

- *Specific challenges* - Biomass is currently 1% of electric power but could supply 4%
- *Options for the next Governor* - Policy options to foster sustainable biomass usage

1- Adopt and nurture clean energy sources which are trending downward in cost, keeping emissions low

Reinvestments of SBC revenue - The Mass Clean Energy Center (MassCEC) handles over \$25 million in System Benefit Charge (SBC) revenue from electric rate surcharges. MassCEC has implemented programs to foster renewable energy in solar, wind, hydro, biomass, and clean heating and cooling.

- ***Specific challenges*** - Is the current portfolio of programs optimal, considering the energy issues facing MA and NE outlined in this position paper and the policy objectives of DEP and DOER?
- ***Options for the next Governor*** - Fresh plans under new administration

2. Continue to lead the nation in conservation and building efficiency. Do more in demand-response, smart micro-grids, real-time rates and waste energy usage

Combined Heat and Power (on site power) for industry- The heyday of large central electric plants is a thing of the past; new power plants will be ultra-clean and small, located at factory and building sites. As demonstrated by the Kendall Square power plant, the waste heat can be readily used through steam and hot water piping. President Obama has set a national goal of 20% electricity production by distributed generation (CHP and on site power) by 2020.

- ***Specific challenges*** - What subsets of towns, buildings and industries take priority in the state and what can be done to ramp up these activities?
- ***Options for the next Governor*** - Policies to promote on-site power

2. Continue to lead the nation in conservation and building efficiency. Do more in demand-response, smart micro-grids, real-time rates and waste energy usage

Policies to support electric cars and EV Infrastructure - Electric cars are relatively popular in MA and NE. Studies have shown that 2-5% of cars going electric and/or plug-in HEV can be handled by the grid. Utilities are planning to add electric storage near likely charging stations.

- ***Specific challenges*** - Cost of recharging stations to be installed at malls and office complexes to distribute the load?
- ***Options for the next Governor*** - Policies for building up recharging stations in parking garages and other spots. Implement the MOU on EV signed by eight governors (CA,CT,MD,MA,NY,OR,RI, and VT).

2. Continue to lead the nation in conservation and building efficiency. Do more in demand-response, smart micro-grids, real-time rates and waste energy usage

Building Efficiency and Retrofits- Keep MA as the leading state in efficiency and building conservation (ACEEE Ranking #1)- don't accept the status quo and ramp up deeper retrofits. NE and MA in particular have a large population of older buildings dated from a time when energy costs were low. Again, job growth and local equipment manufacturing prospects are very significant from HVAC heat pump and lighting retrofit programs. More can be done with HERS building codes.

- **Specific challenges** - What subsets of towns, buildings and industries take priority and what can be done to ramp up these activities?
- How do we support the adoption of new heat pump technology?
- **Options for the next Governor** - Apply statewide the building energy reporting system used by the City of Boston and explore innovative ways to finance EE.

3- Take needed and affordable steps in grid modernization and resilience to potential threats

Grid Modernization as a tool to enable energy conservation- Support the upcoming grid modernization ten-year plans to be rolled out this summer under DPU oversight.

- Demand Response and Smart metering with real-time rates and net metering- all attractive.
- District energy and micro-grids with on-site CHP add to resiliency

3- Take needed and affordable steps in grid modernization and resilience to potential threats

Address Grid load “Hotspots” to lower rates- Where are the locations most vulnerable to brown-outs in the Boston area and NE? Are any of these areas likely to host significant new building of commerce and housing? How can new businesses relocating in MA be guaranteed reliable infrastructure?

- ***Specific challenges*** - Are the electric supply plans for the new casinos viable? What are the capacity addition plans for these “hotspots”?
- ***Options for the next Governor*** - Policies to coordinate with Distribution companies and PUC

3- Take needed and affordable steps in grid modernization and resilience to potential threats

Protect and “event-proof” our electric substations- Implement recommendations of the North American Reliability Council (NARC)

- ***Specific challenges*** - Substations are currently vulnerable to various risks
- ***Options for the next Governor*** - Support distribution company initiatives to harden substations

3- Take needed and affordable steps in grid modernization and resilience to potential threats

Protect against storm surge events - Take applicable lessons from Hurricane Sandy and other storm impacts

- ***Specific challenges*** - Low lying infrastructure and emergency generators are currently vulnerable to various risks
- ***Options for the next Governor*** - Ramp up the existing Working Group on Infrastructure protection

4. Address natural gas constraints and bottlenecks to enable right-sized use in buildings, industry, power-plants and transportation

In the near-mid term, right-size and accelerate the necessary and sufficient natural gas transmission capacity for NE - Add additional capacity while rightsizing the total to meet future needs (don't overbuild; consider scenarios for 15 year and 40 years, avoiding stranded costs). Consider using more LNG, gas storage depots and use of oil on dual-fired units to alleviate hourly gas-price volatility during cold snaps.

- ***Specific challenges*** - What size pipeline should be built for the long term to best serve NE needs? How to avoid over-dependence under future gas price scenarios.
- ***Options for the next Governor*** - Cost containment policies in line with the ISO

4. Address natural gas constraints and bottlenecks to enable right-sized use in buildings, industry, power-plants and transportation

Devise a long term plan for natural gas supply and demand going forward - We have enjoyed a sustained period of moderate NG prices in the \$3-5 per million BTU wholesale range (\$8 to 12 after distribution). Almost all new power-plants in the east coast are electing natural gas as the fuel source. CNG is increasing being used for vehicles. Conversions from oil to gas heating are still underway. So gas use will rise for several years.

- ***Specific challenges*** - Is a price escalation coming and if so how will this impact MA and NE?
- ***Options for the next Governor*** - Roadmap for striking the optimum balance between natural gas and using solar, wind, hydro, biomass; other power sources in 2020-2050.

4. Address natural gas constraints and bottlenecks to enable right-sized use in buildings, industry, power-plants and transportation

Natural Gas Vehicles- Heavy trucks such as delivery vans and refuse collection already rely on NG. Rail use of LNG is increasing. There is a huge potential for NG use in automobiles if home refueling systems become available and a network of highway NG refueling is set up. Widespread NG use in cars could cut carbon and save costs. Already the range of NG cars far exceeds electric cars of the same size and weight.

- ***Specific challenges*** - how to build up NG refueling stations; how to develop and manufacturing innovative technology for NG automobiles
- ***Options for the next Governor*** - state policy incentives for CNG refueling

4. Address natural gas constraints and bottlenecks to enable right-sized use in buildings, industry, power-plants and transportation

Gas Conversion - Have we hit a plateau in converting buildings from oil and electric resistance heating to natural gas? How do we ramp up the gas distribution network to make gas available for the other 20-30% of buildings?

- **Specific challenges** - Are there infrastructure roadblocks in installing gas pipeline? What particular towns and neighborhoods are the most sensible to offer gas?

5- Leverage MA leadership in renewable energy systems, big data, security, and innovation to retain and add jobs

Clean Energy Manufacturing and Jobs - (See MassCEC's Clean Energy Industry reports for 2012, 2013, and 2014 on this topic)

- MassCEC Findings:
 - Number of Clean Energy Businesses: 5,985
 - Workers with some involvement in clean energy: 88,372
 - 10% annual job growth 2011-2014
 - \$10 billion industry
- **Specific challenges** - Clean tech innovation. How can MA and NE get its fair share (or an unfair share!) of the new manufacturing and job growth surrounding Clean Energy? Also, Clean Energy R&D, Construction, Development, Supply chain and Finance jobs?
- **Options for the next Governor** - Roadmap for clean energy advanced manufacturing economic activity