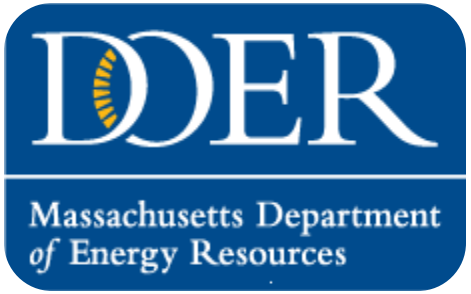
Creating A Cleaner Energy Future For the Commonwealth



Energy Policy Review Commission

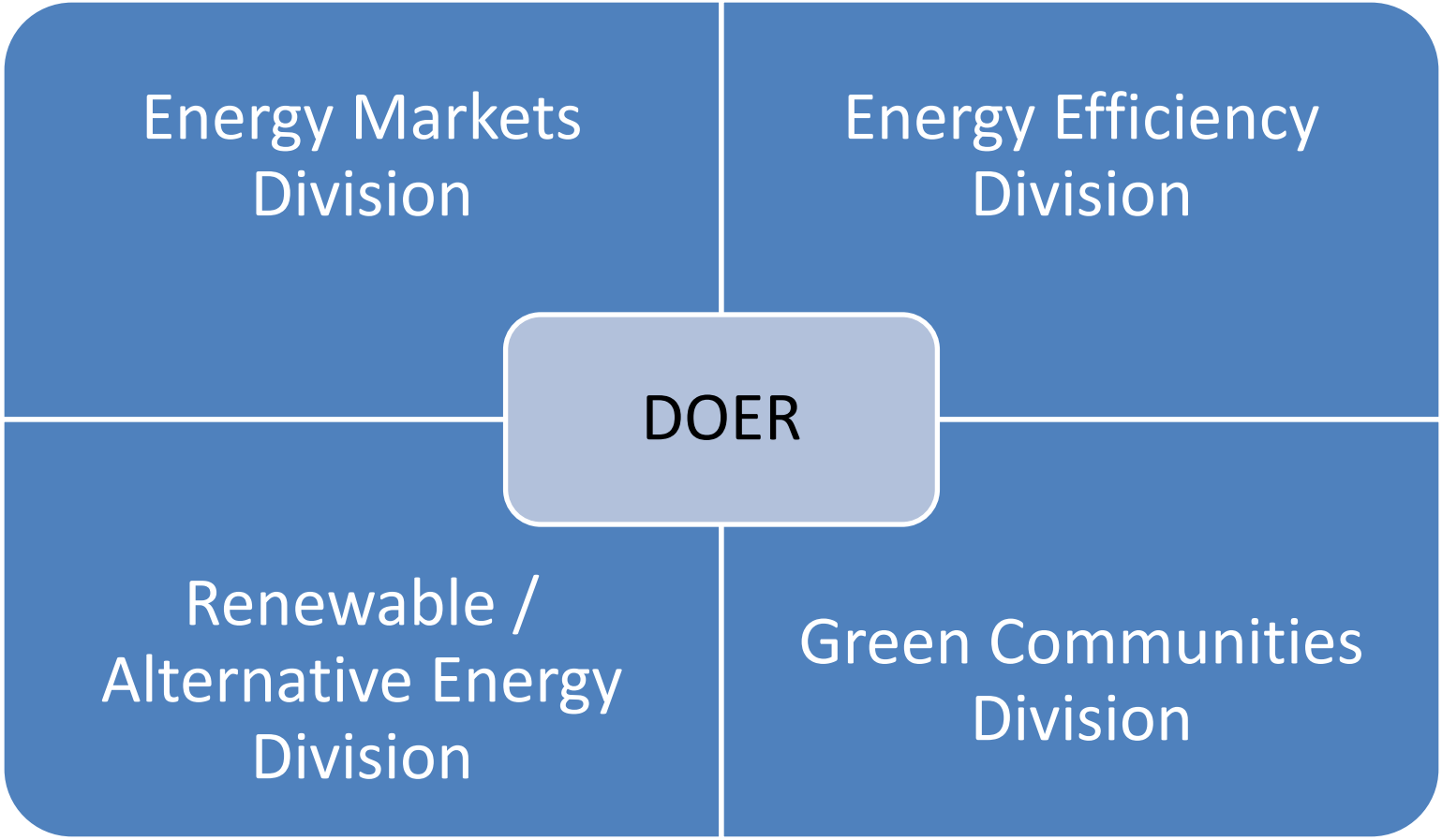
January 17, 2013

DOER Mission

Creating a Cleaner Energy Future for the Commonwealth

- Ensure deployment of all cost-effective energy efficiency
- Maximize development of clean energy resources
- Create and implement energy strategies to assure reliable supplies and improve the cost of clean energy relative to fossil-fuel based generation
- Support Massachusetts' clean energy companies and spur Massachusetts' clean energy employment

DOER Structure



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State Law Drives Investments, Creates Economic & Environmental Opportunity, National Leadership

- **Green Communities Act (GCA)**
  - Green Communities (110/45%)
  - All cost effective energy efficiency
  - Advanced building energy codes (122)
- **Global Warming Solutions Act (GWSA)**
  - Clean Energy and Climate Plan set GHG emission reduction goals at 25% below 1990 Baseline Levels by 2020; 80% reduction by 2050
- **2012 Energy Act (An Act Relative to Competitively Priced Electricity)**

Massachusetts Global Warming Solutions

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Energy Markets

About the New England Electricity Market

- Prior to late 1990's, the New England electricity market was vertically integrated – meaning the industry comprised of utilities that handled every aspect of generation, transmission and distribution of electricity as regulated monopolies.
- Post electric market restructuring, most utilities in New England (all in Massachusetts) were required to sell their generation assets. Regulators believed that competition in generation would spur new investments to replace dirty, old and expensive generators.
- ISO-New England serves as the market monitor for the region. It serves as the regional system operator and regional transmission organization. ISO-NE responsibilities include:
  - Minute to minute reliable operation of regional system, providing centrally dispatched direction for generation and transmission
    - Generation is dispatched based on an economic dispatch model
  - Development, oversight and administration of New England's wholesale electricity market

New England Power Grid at a Glance

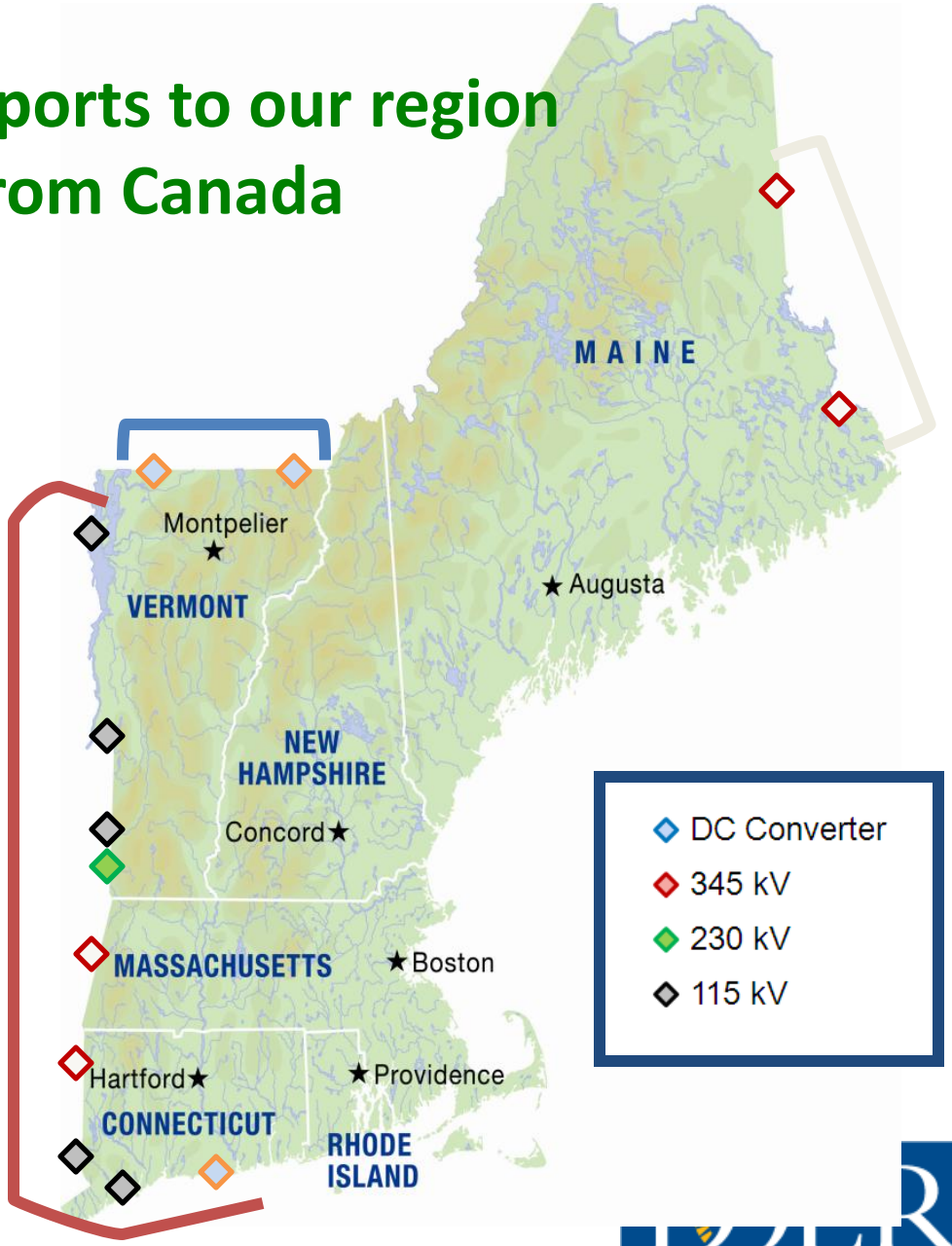
- 6-state region
- 14 million residents; 6.5 million meters
- 350+ generators
- 37,000 MW of resources with capacity supply obligations
  - 32,000 MW generation
  - 2,900 MW demand resources
  - 1,900 MW imports
- 8,400 miles of transmission
- 28,130 MW all-time peak demand

Majority of imports to our region come from Canada

- New York AC Ties
  - 9 @ 625 MW
- Hydro Quebec Ties
  - 2 DC @ 1,600 MW
- New Brunswick
  - 2 AC @ 650 MW

Note:

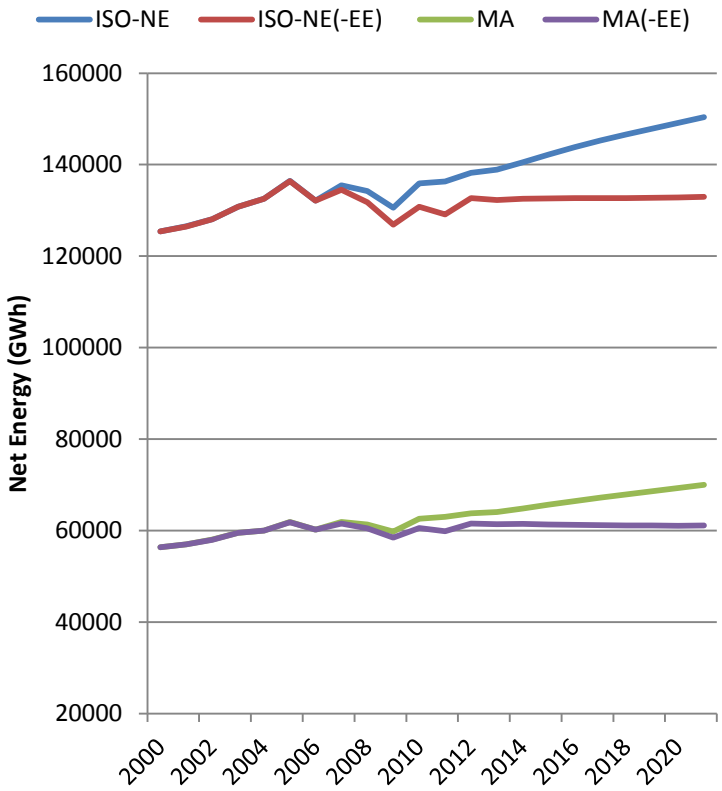
- MWs are estimated import capacity for all lines during system peak
- NY Tie is mainly used for exports
- Total import capability is 2,375 MW (reduced by 500 MW due to operating reserve requirement)



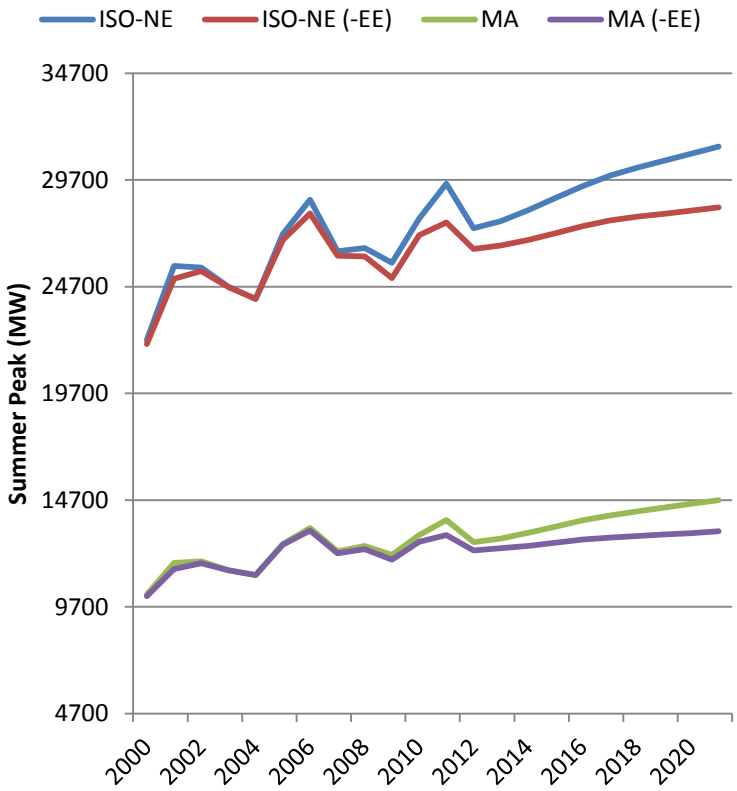
Source: ISO-New England, 2010 US-Canada Clean Energy Dialogue

Energy Demand to Increase w/o EE/DG

Annual Energy Consumption



Annual Peak Demand



Note:
MA (EE) does not include reduction in forecast from active demand response, distributed generation.

Source: ISO-New England

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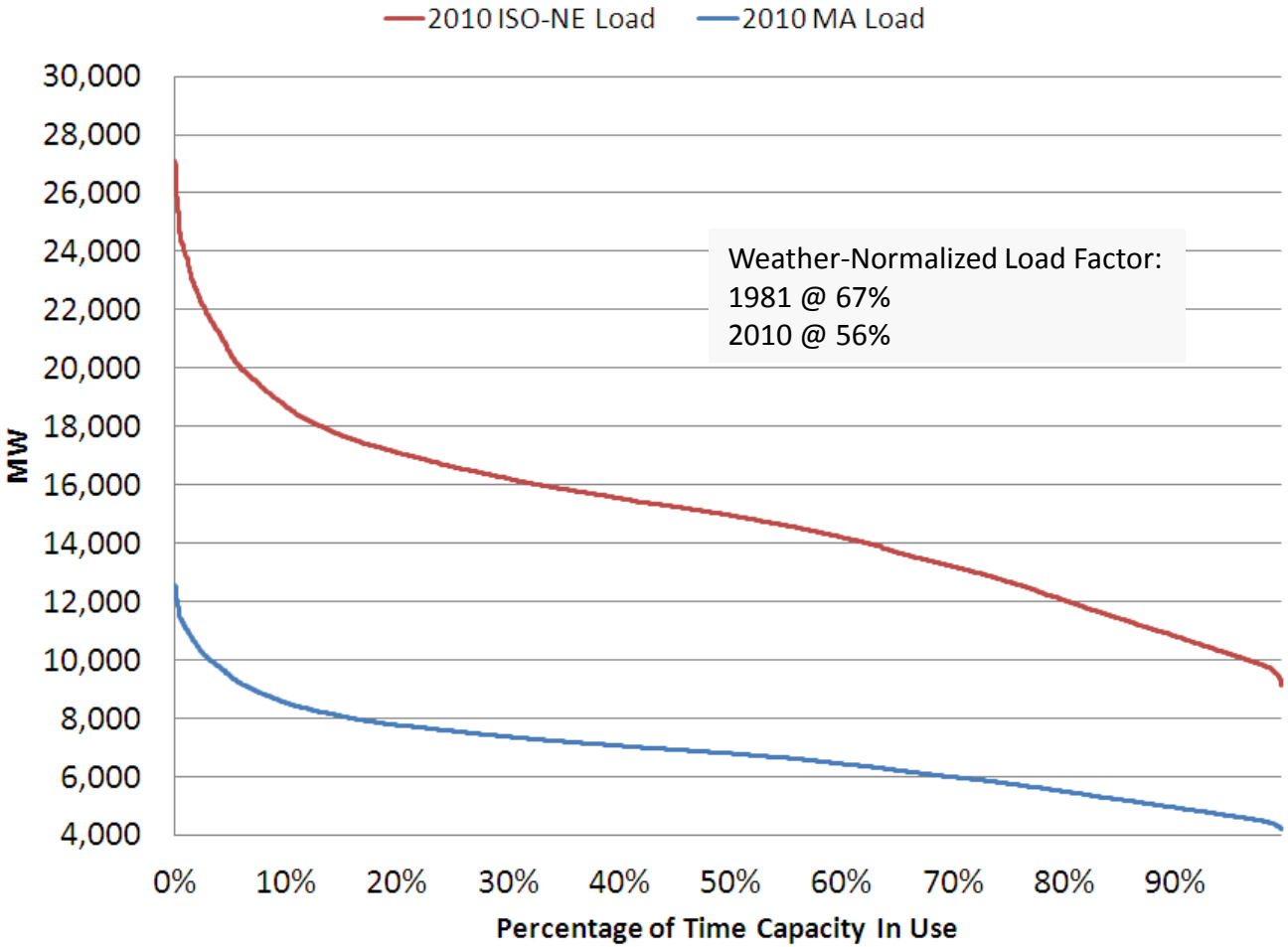
ISO-NE builds capacity to meet 'Peak Demand'



Note: Load curve does not include reconstitution of ISO OP4 or PDRs

Source: ISO-New England

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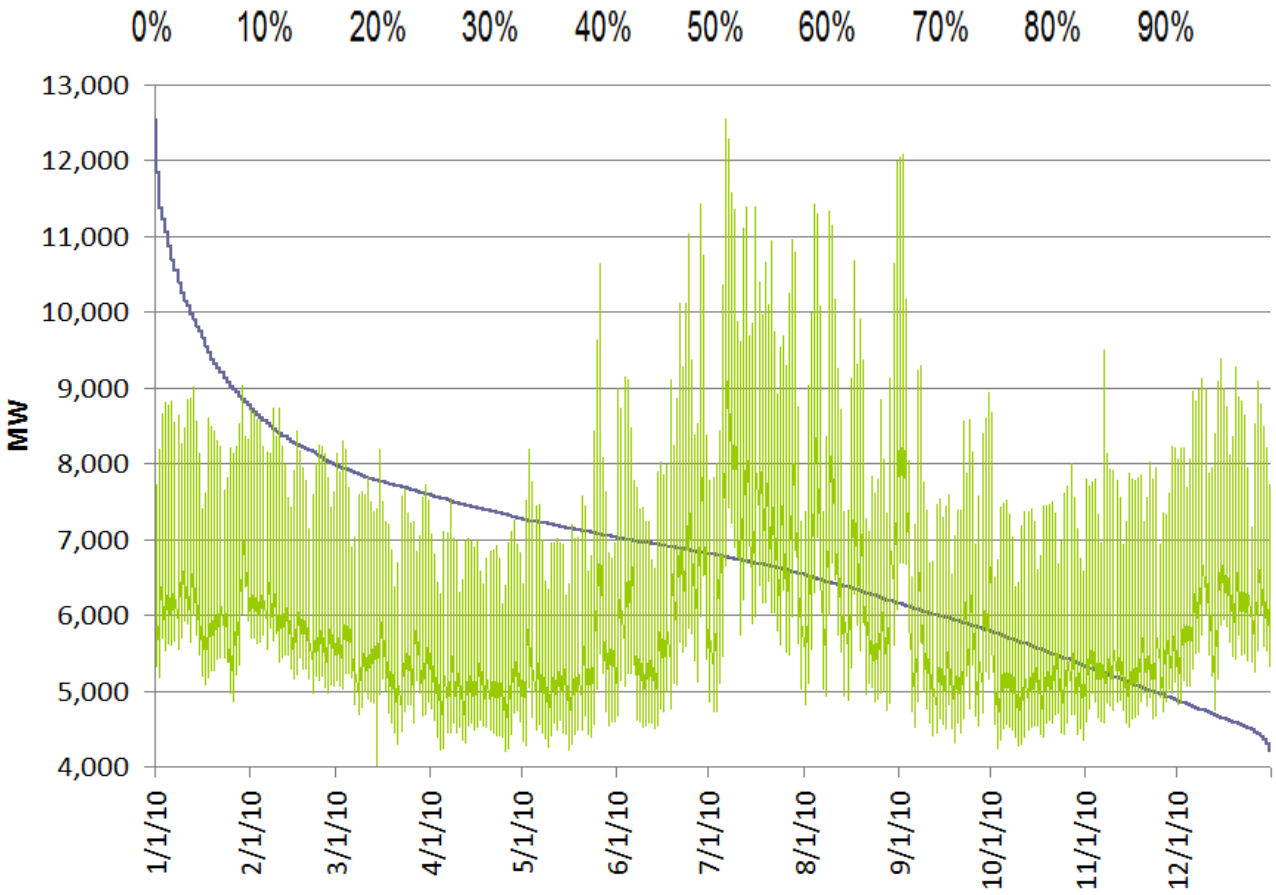
Peaks occur during Summer months



Source: ISO-New England

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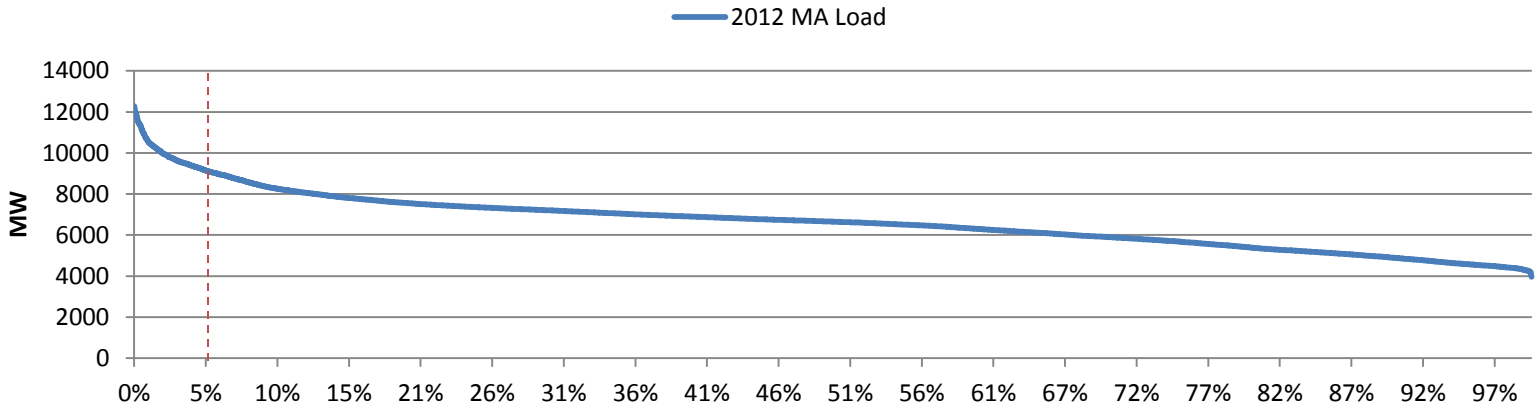
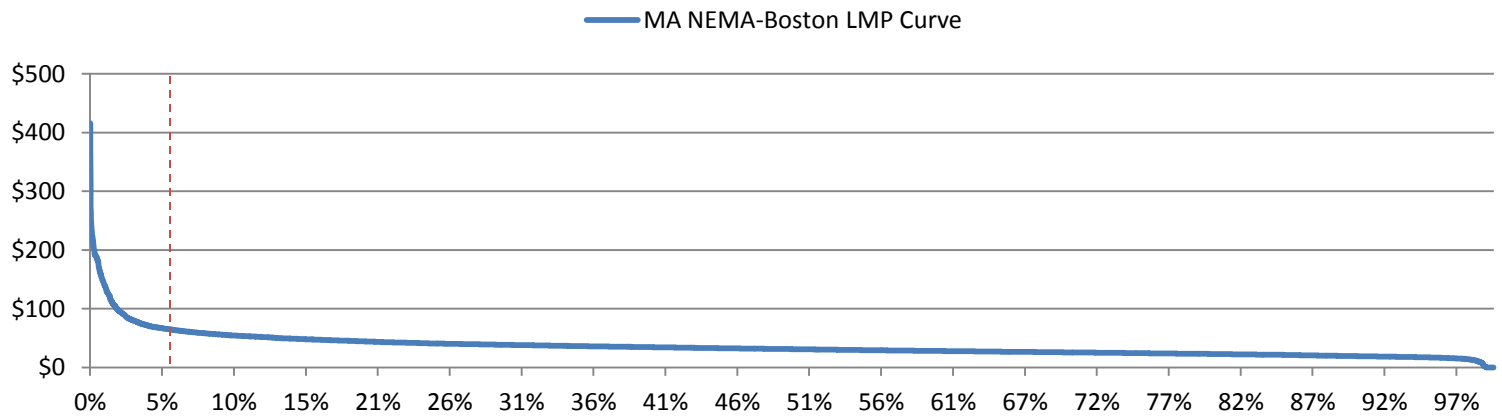
25% of max required capacity used < 5% of time





Source: ISO-New England

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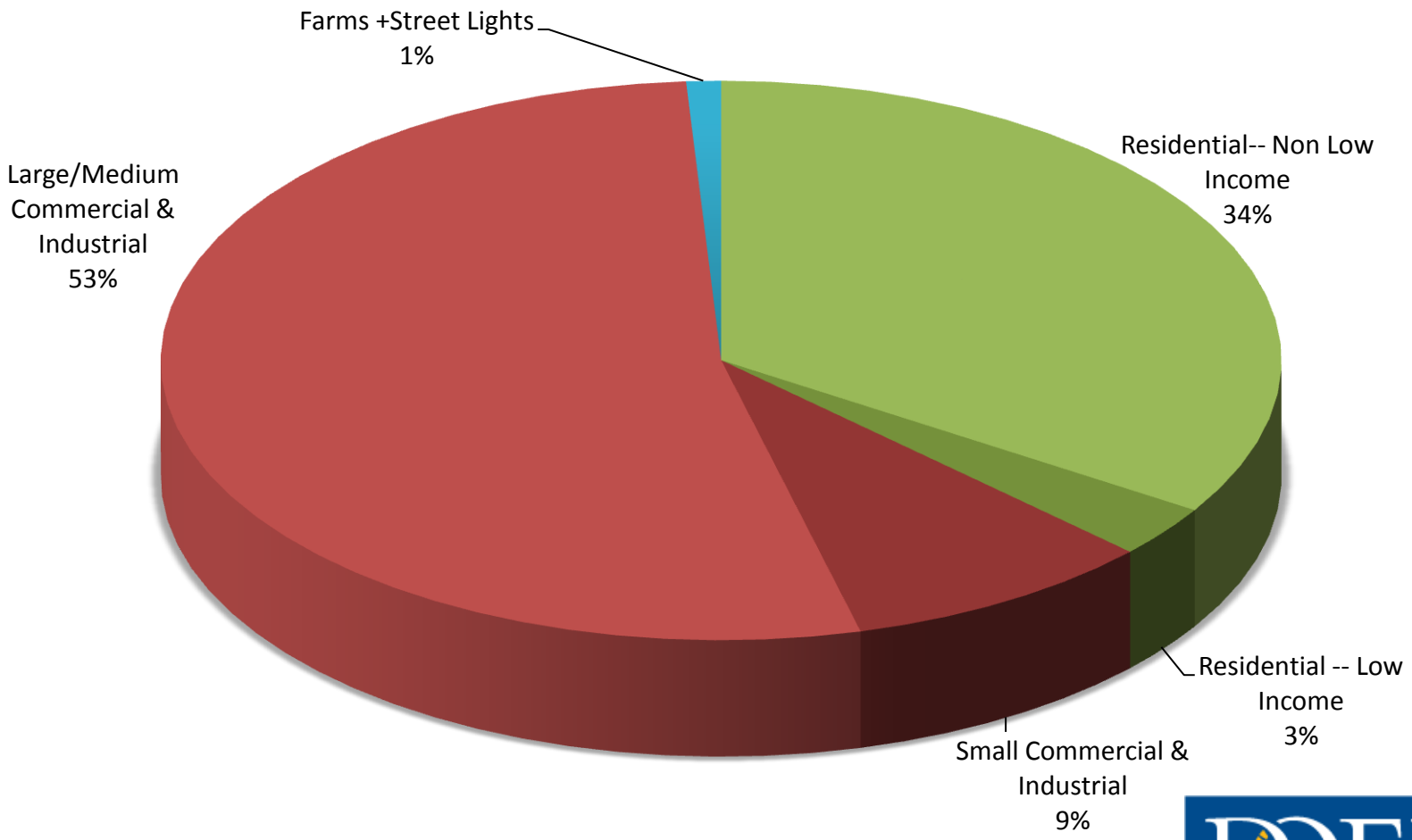
Large C&I dominates Energy Use



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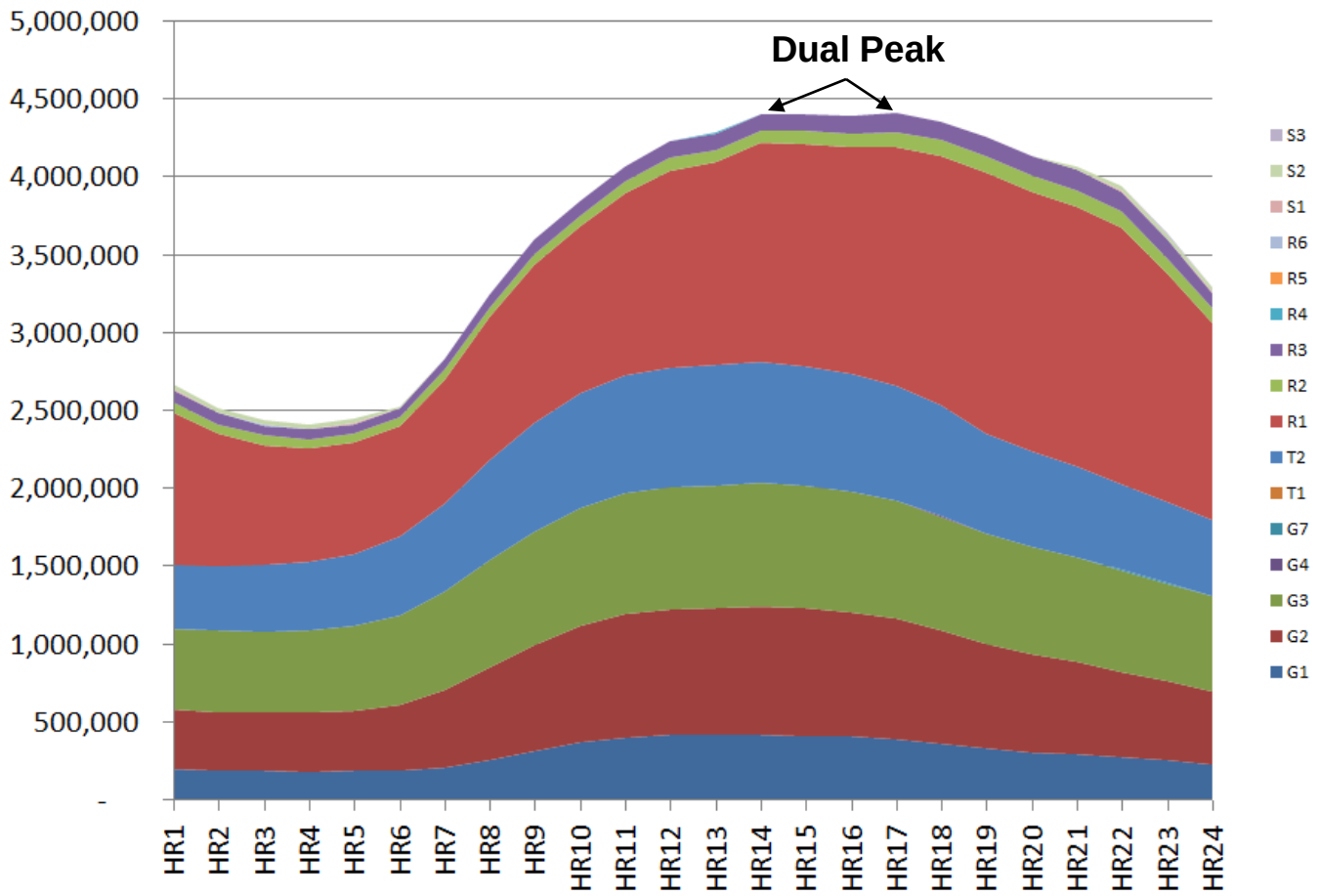
C&I Load greatest during traditional peak hours; Residential Load increasing during non-traditional peak



Source: NSTAR 2010 Load Data, July 6th 2010

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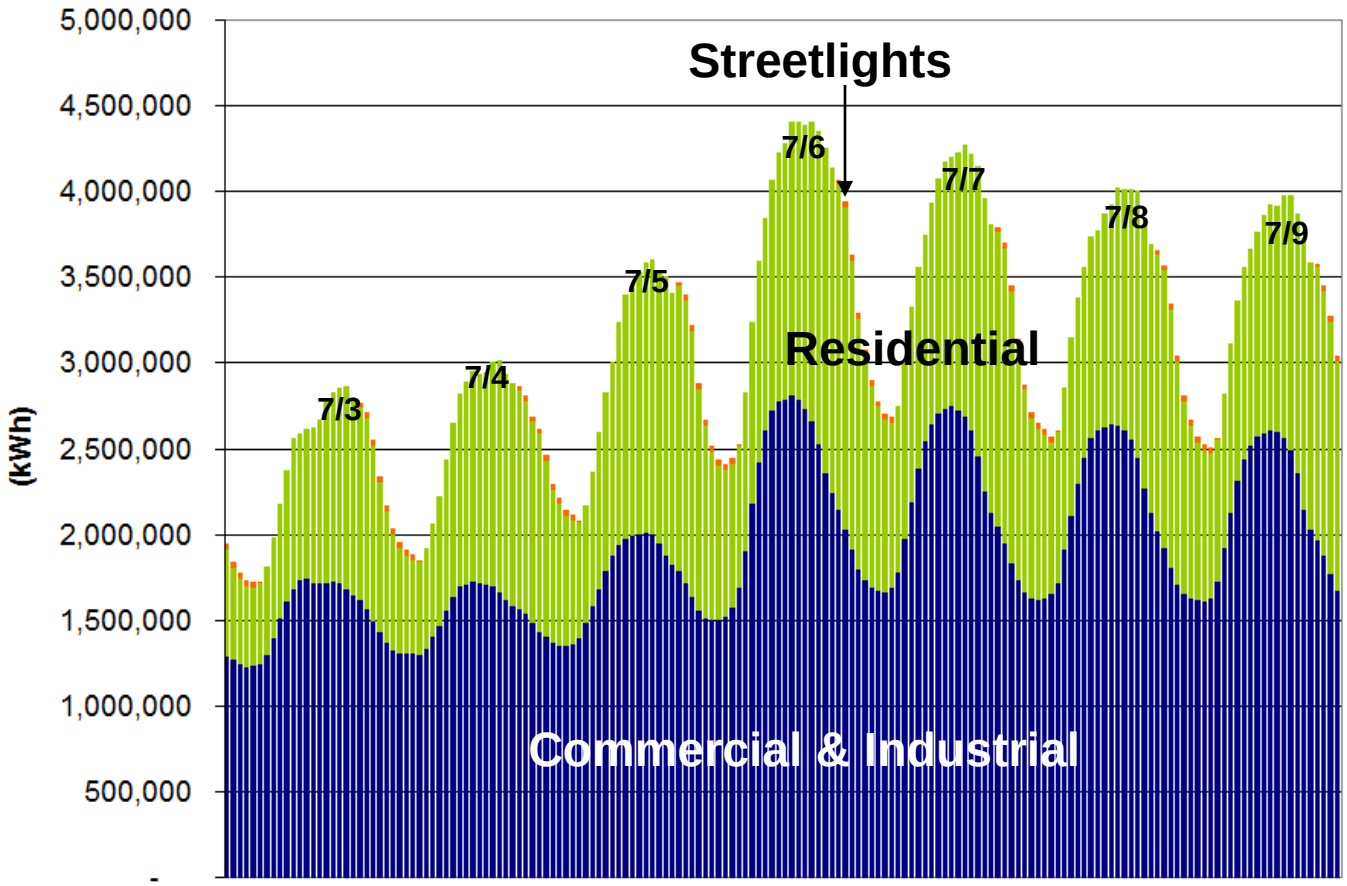
Peak is shifting from afternoon to evening hours



Source: NSTAR 2010 Load Data, July 3rd – 9th 2010

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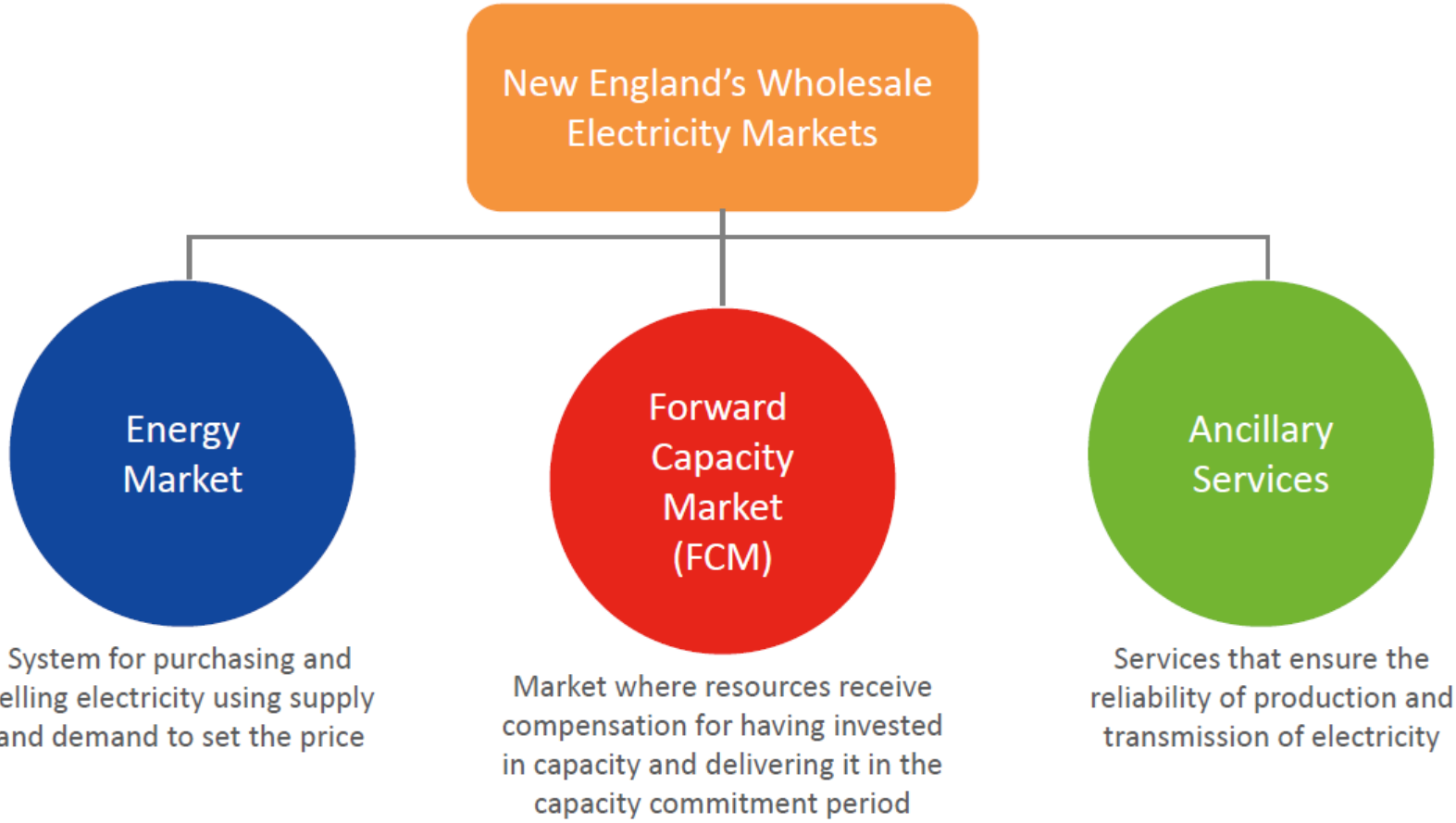
Wholesale Electricity Market



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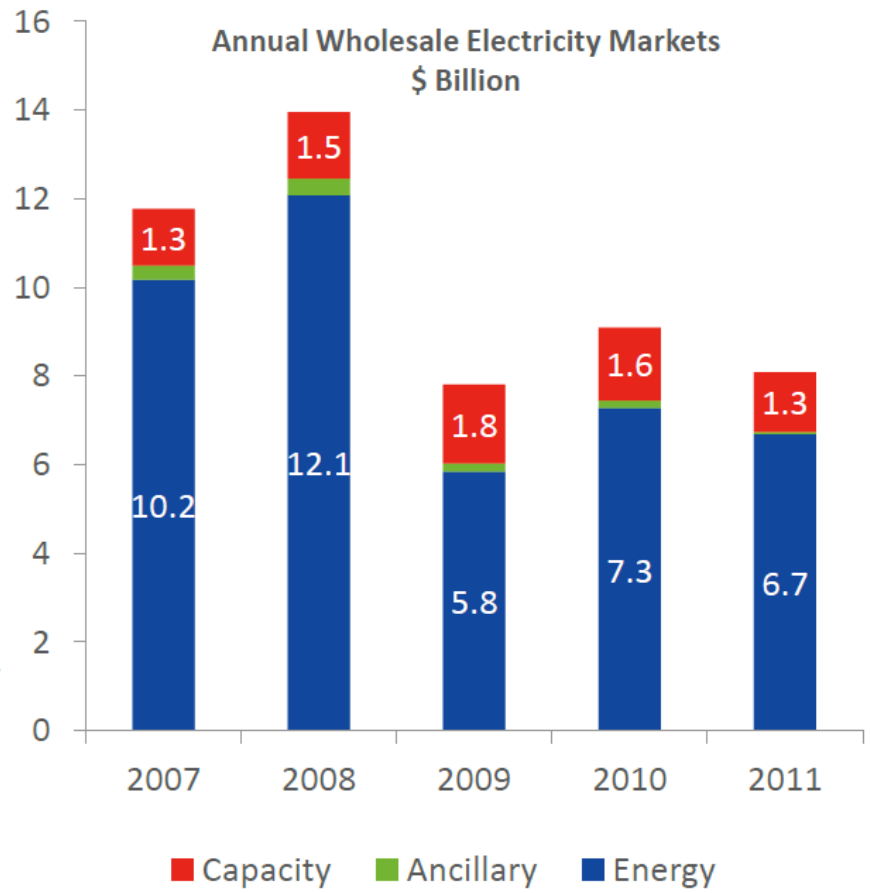
Regional Wholesale Electricity Markets

- Energy market is largest portion of wholesale electricity market
  - 2007-2010: Between $6 billion and $12 billion annually
  - 2011: Approximately $7 billion
- Capacity market
  - 2007-2010: Between $1 billion and $2 billion annually
  - 2011: Approximately $1.3 billion



Source: ISO-New England

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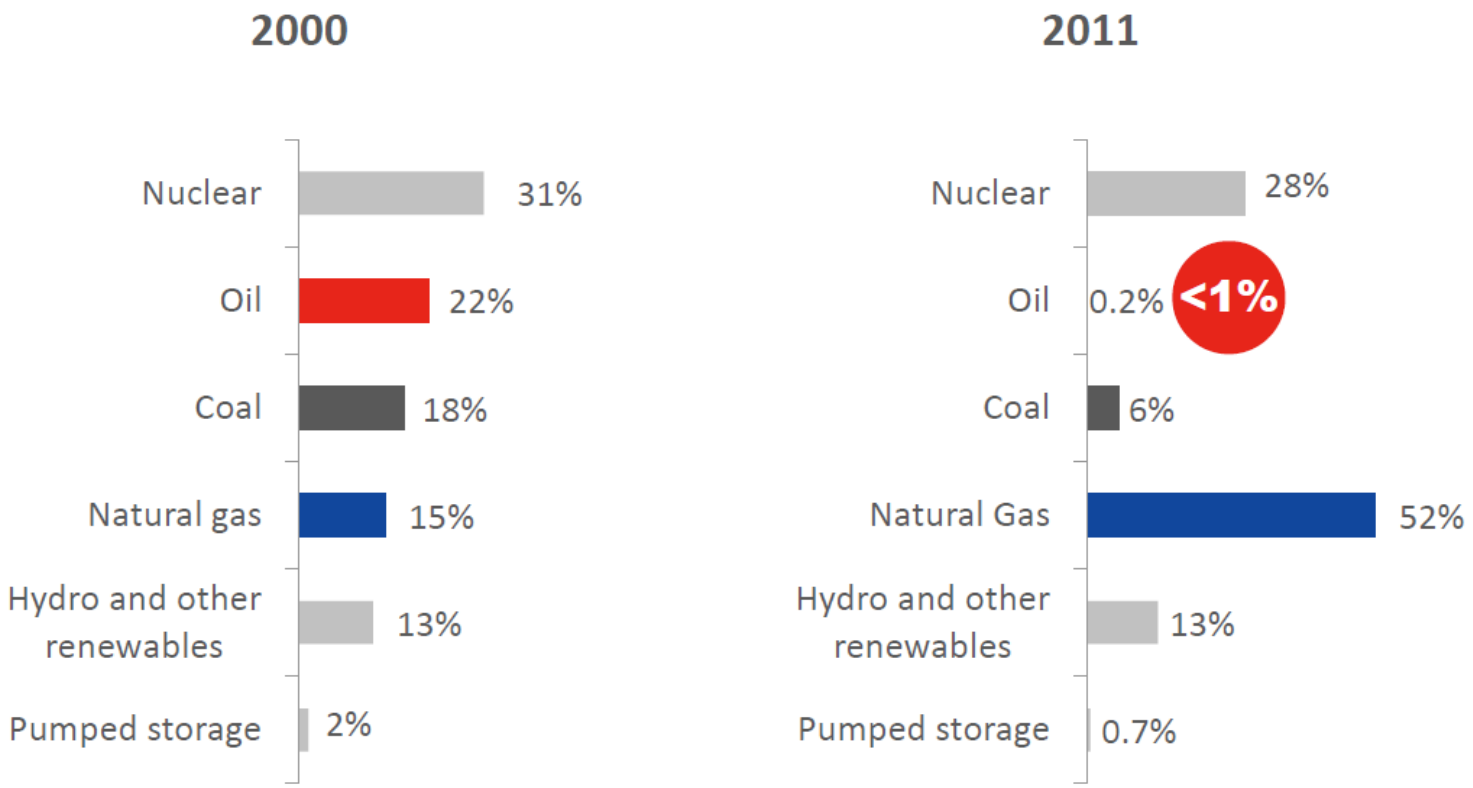
Energy Shift to NG Cause for Concern



Other renewables include landfill gas, biomass, other biomass gas, wind, solar, municipal solid waste, and misc. fuels.

Source: ISO-New England

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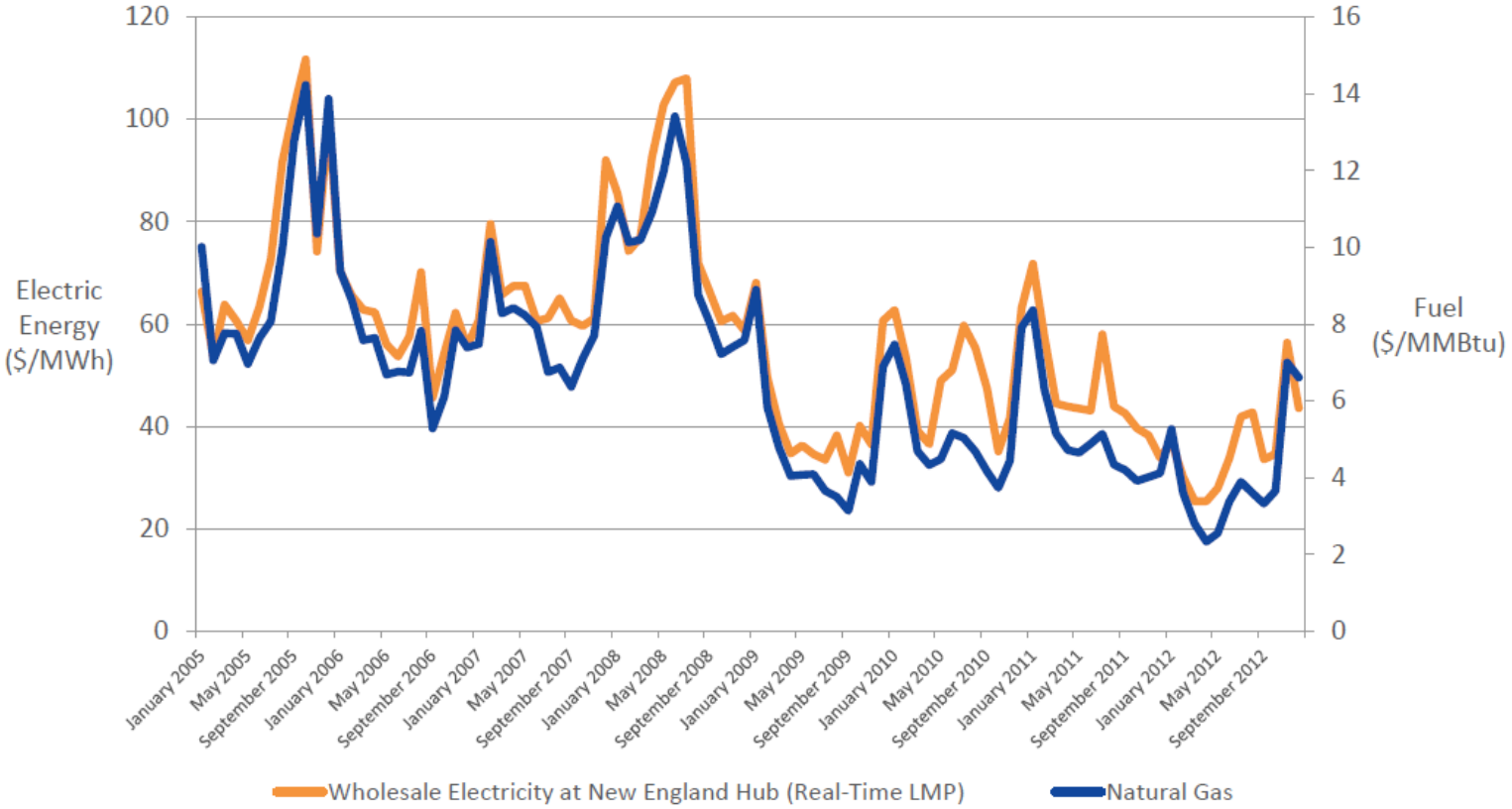
Wholesale Electricity Prices Track NG



Source: ISO-New England

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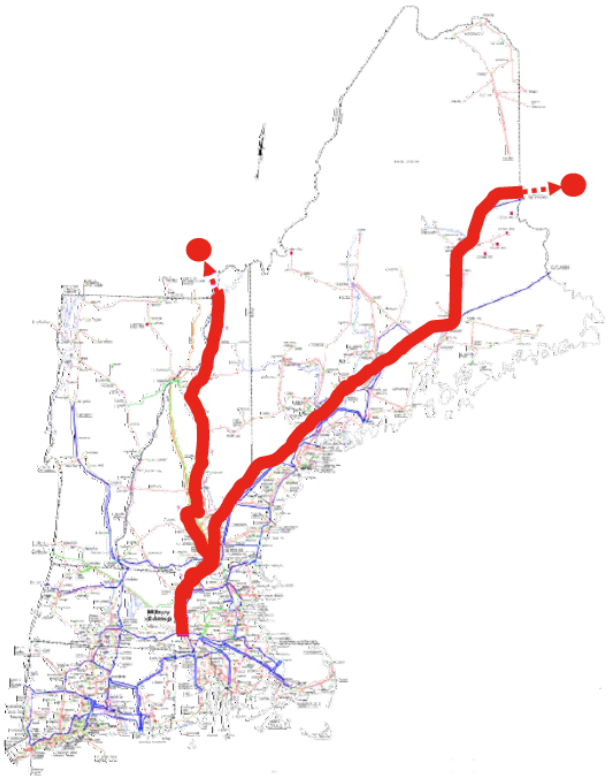
ISO-New England investigating additional imports from Canada

Transmission for 3,000 MW of Imports

- Potential new transmission ties to Eastern Canada
  - Import 1,500 MW from Québec via new +/-450 kV HVDC line
    - Preliminary cost estimate: $1.6 billion
  - Import 1,500 MW from New Brunswick via new +/-450 kV HVDC line
    - Preliminary cost estimate: $2 billion
  - Cost estimates represent only the cost of potential transmission facilities in New England



Source: ISO-New England, 2010 US-Canada Clean Energy Dialogue

Types of Transmission Upgrades

	Funded by Entity Proposing Project	Funded by Region, Localized Costs Excluded
Generation Interconnection	√	
Elective Transmission	√	
Merchant Transmission	√	
Local Benefit Upgrades	√	
Regional Benefit Upgrades (Reliability & Market Efficiency)		√

Regional Transmission Cost Allocation

Source: ISO-New England

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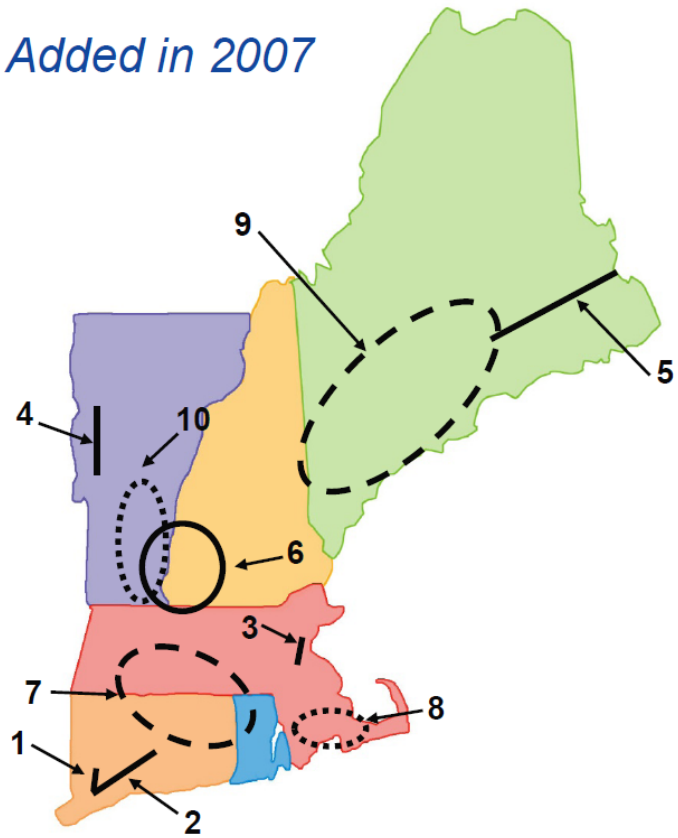
$4B Invested from 2002 – 2010
Another $5B on the Horizon

Transmission Investment Improves Flow of Energy To Load Centers

2nd Maine & New Brunswick Tie Added in 2007

1. Southwest CT Phase I
2. Southwest CT Phase II
3. NSTAR 345 kV Project, Phases I & II
4. Northwest Vermont
5. Northeast Reliability Interconnect
6. Monadnock Area
7. New England East-West Solution
8. Southeast Massachusetts
9. Maine Power Reliability Program
10. Vermont Southern Loop

In service
Under construction
Under study



Source: ISO-New England, 2010 US-Canada Clean Energy Dialogue

Key Supply & Demand Issues for MA

- Natural Gas dominating power and heating fuel
- Oil & Coal out of market & potential generation retirements
- Nuclear capacity reducing overtime
- Fuel diversity an issue
- Transmission development an issue
- Renewables require system balancing; NG is only current source that can energize immediately
- NG displacing oil for heating fuel more rapidly due to price discrepancy causing supply issues
- Demand dependant on economy, as economy increases overtime so will demand

Strategy levers for addressing key issues

- Increase Energy Efficiency & Demand Response
  - Cheapest fuel source, efficiency gains should be a must
- Assess alternative rate structures to reduce peak demand (time-of-use, inclined block, on-peak pricing, etc)
- Address fuel diversity with renewables, hydro power
- Support Distributed Generation and CHP
  - Will help reduce overall production and delivery costs
- Require new oil/NG generators to support multiple fuel source (for reliability)
- Support thermal RE to provide an alternate heating fuel source to NG
- Support transmission investments for renewables and hydro power

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Energy Efficiency

Energy Efficiency as our First Fuel

- Energy Efficiency Advisory Council was created in 2008
- Using less energy is our least expensive option to meet manage energy costs
- Energy efficiency programs are offered by all IOUs to all customer segments
- Accelerated Energy Program will invest in energy improvements in 700 state sites, saving $43M annually
- Massachusetts has been ranked #1 by ACEEE for two consecutive years on energy efficiency policy

Nation-Leading Energy Efficiency Goals

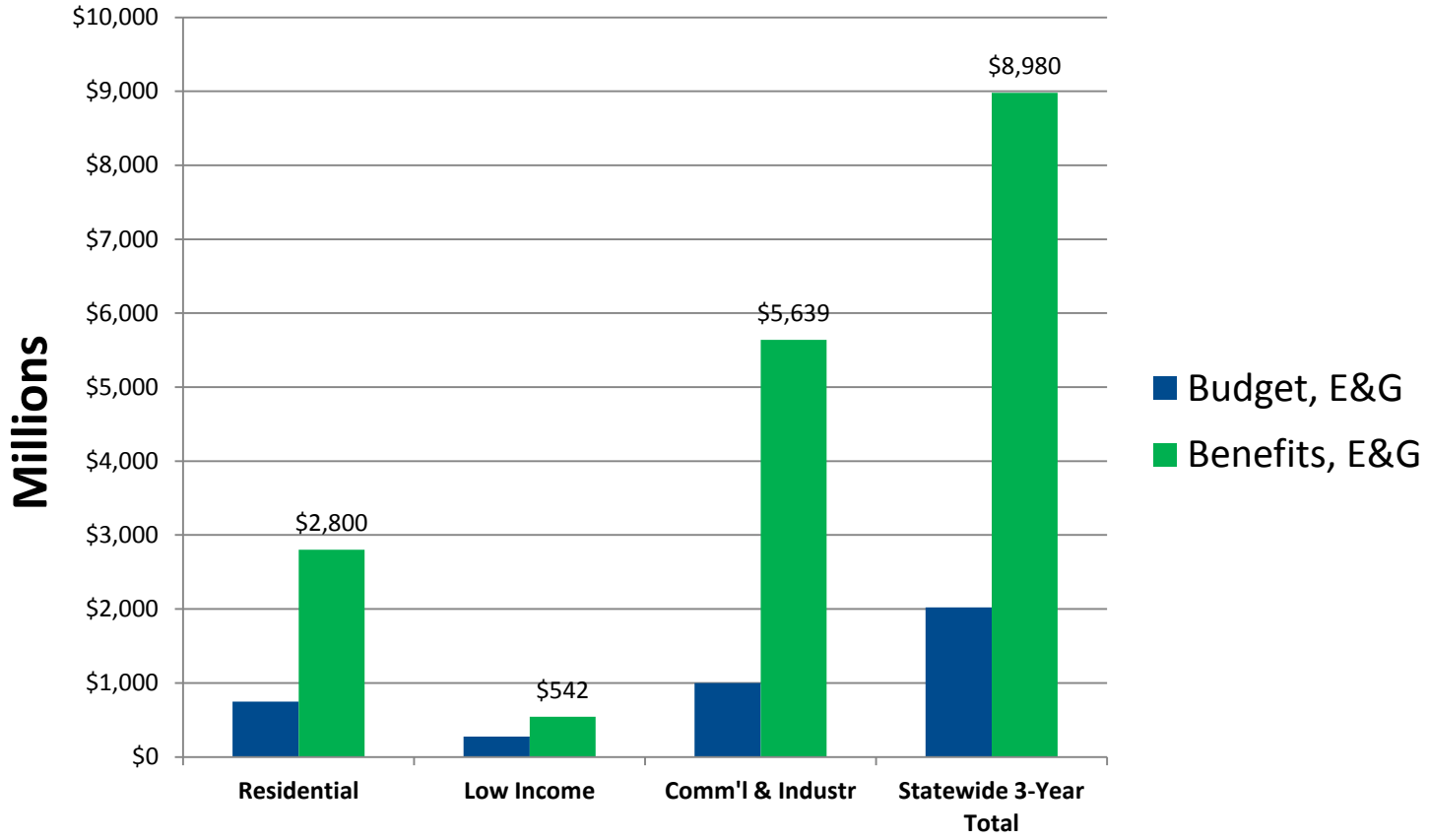
THREE-YEAR PLAN GOALS	2010-2012	2013-2015	% Change
Total Program Investment (million $s)	$1,627	$2,020	24%
Total Benefits (million $s)	$6,039	$8,980	49%
Annual Electric Savings (GWh)	2,625	3,705	41%
Annual Gas Savings (million therms)	57	72	26%

- 2010-2012 savings equal to electricity for 363,000 homes annually and heat for 57,000 annually
- 2013-2015 savings equal to electricity for 514,000 homes annually and heat for 70,000 annually
- Commonwealth remains on the path toward meeting the goals of the Clean Energy and Climate Plan

Three-Year Plan Highlights

- Increase in savings
- Decrease in costs
- Electric combined 3-year average savings as % of sales = 2.55% (highest in the nation)
- Gas combined 3-year average savings as % of sales = 1.11%
- Market segmentation strategies to meet the needs of all residences and businesses
- Goals align with the Clean Energy & Climate Plan

Sector View of Spending & Benefits



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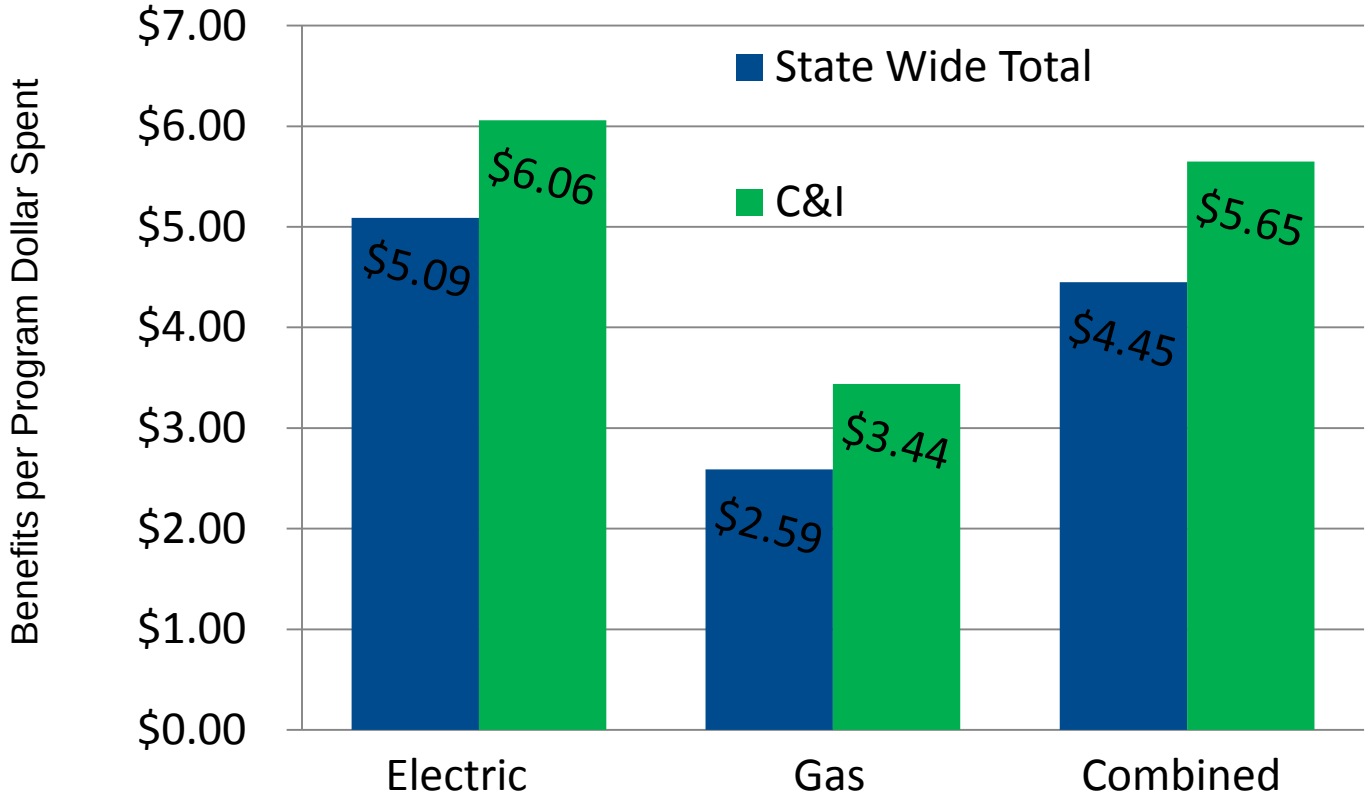
Massachusetts 2013-2015 Energy Efficiency Plans Comparing Benefits: Statewide vs. C&I



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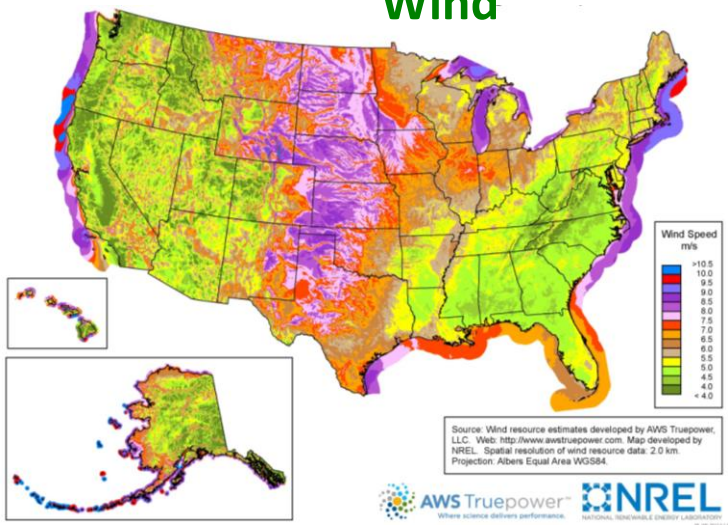
Renewable Energy

Renewable Resources

Wind

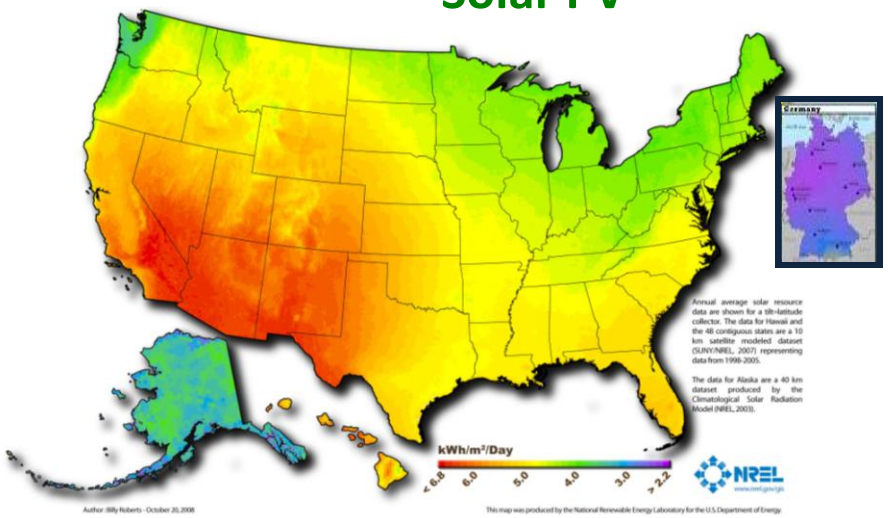


Patrick/Murray Administration Goals

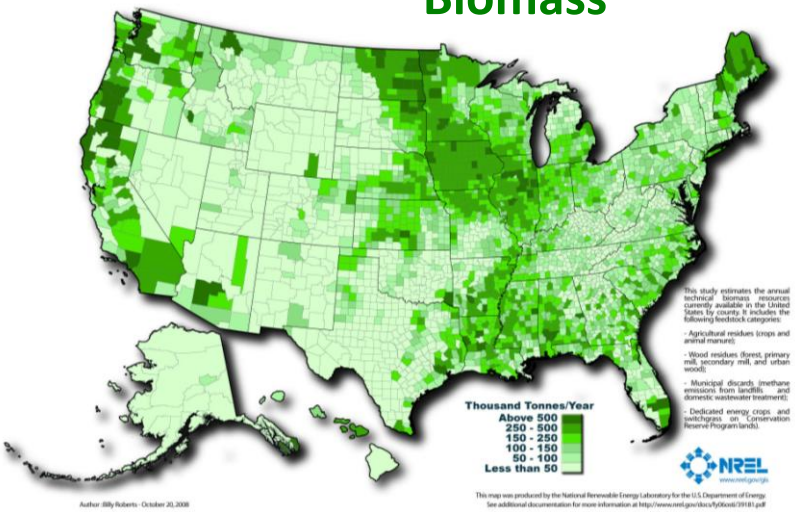
Solar: 250 MW installed by 2017

Wind: 2000 MW installed by 2020

Solar PV



Biomass



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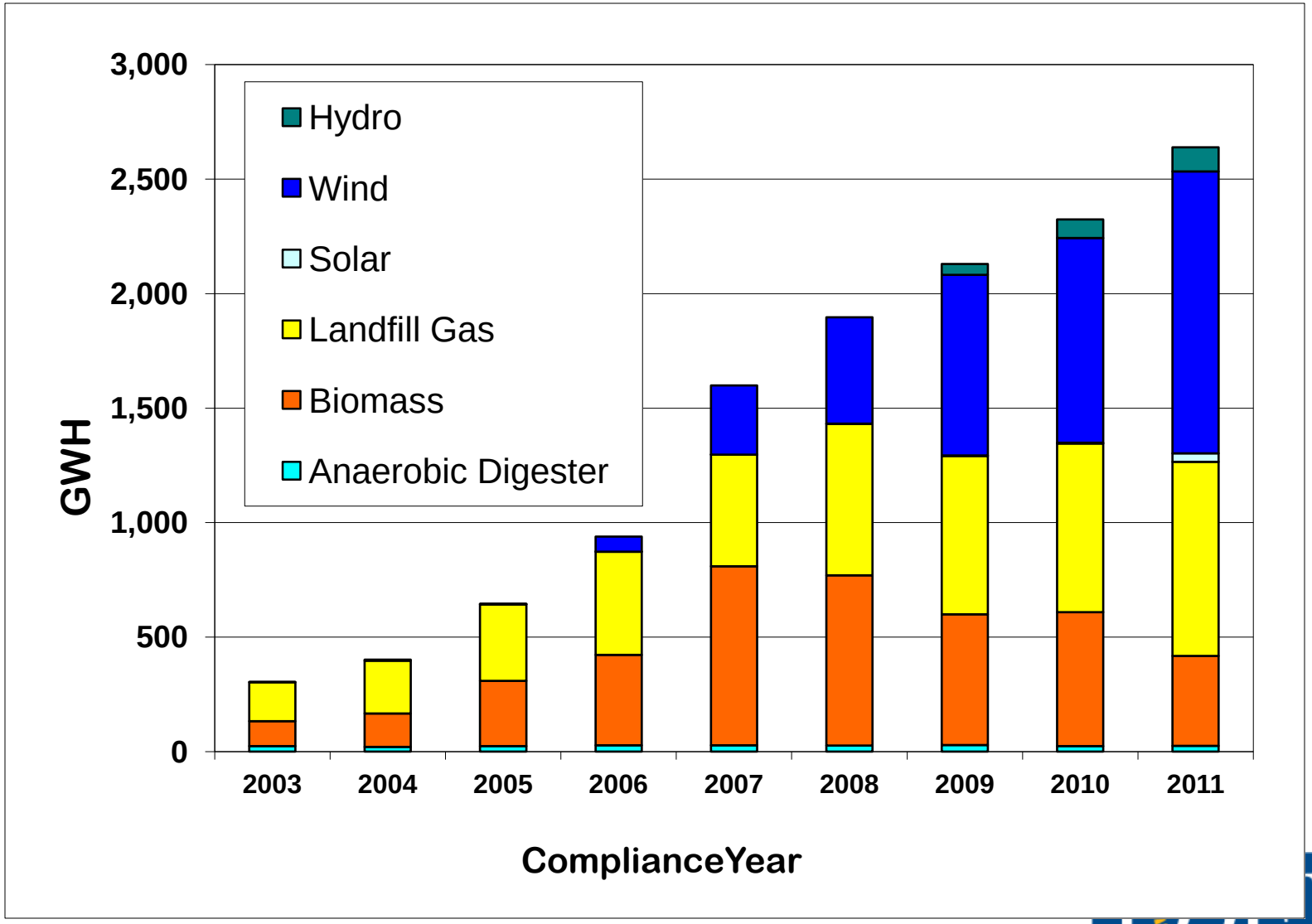
Programs for power generation

- **Renewable Energy Portfolio Standard – Class I & Class II**
  - RPS Solar Carve Out – to grow solar PV sector to 400 MW
- **Alternative Energy Portfolio Standard**
  - Combined heat and power
- **Net metering**
  - Allows on site power generation to run electricity meter backwards – providing an incentive for decentralized generation
- **Study/Investment support**
  - MassCEC and/or DOER administered, funded from Renewable Energy Trust Fund or Alternative Compliance Payments (ACP)

Summary of MA Renewable Energy Portfolio Standard (RPS) Programs

RPS Class	Sub Class	Technology	Minimum Standard	ACP Rate, $/MWh
Class I		Wind, LFG, Biomass, Solar, Small Hydro, etc.	5% in 2010, increases 1%/year	$60.93; increases with CPI
	Solar Carve-Out	Solar PV; 6 MW or less, in MA	set by formula to grow installed capacity to 400 MW	$550; can be reduced by DOER (10 y schedule)
Class II		same as Class I	3.6%, stays constant	$25; increases with CPI
	Waste Energy	MSW Combustors, in MA	3.5%, stays constant	$10; increases with CPI
APS		CHP, flywheels, paper-derived fuel, gasification	0.5% in 2010; increases to 5% in 2020	$20; increases with CPI

RPS Class I Generation by Technology



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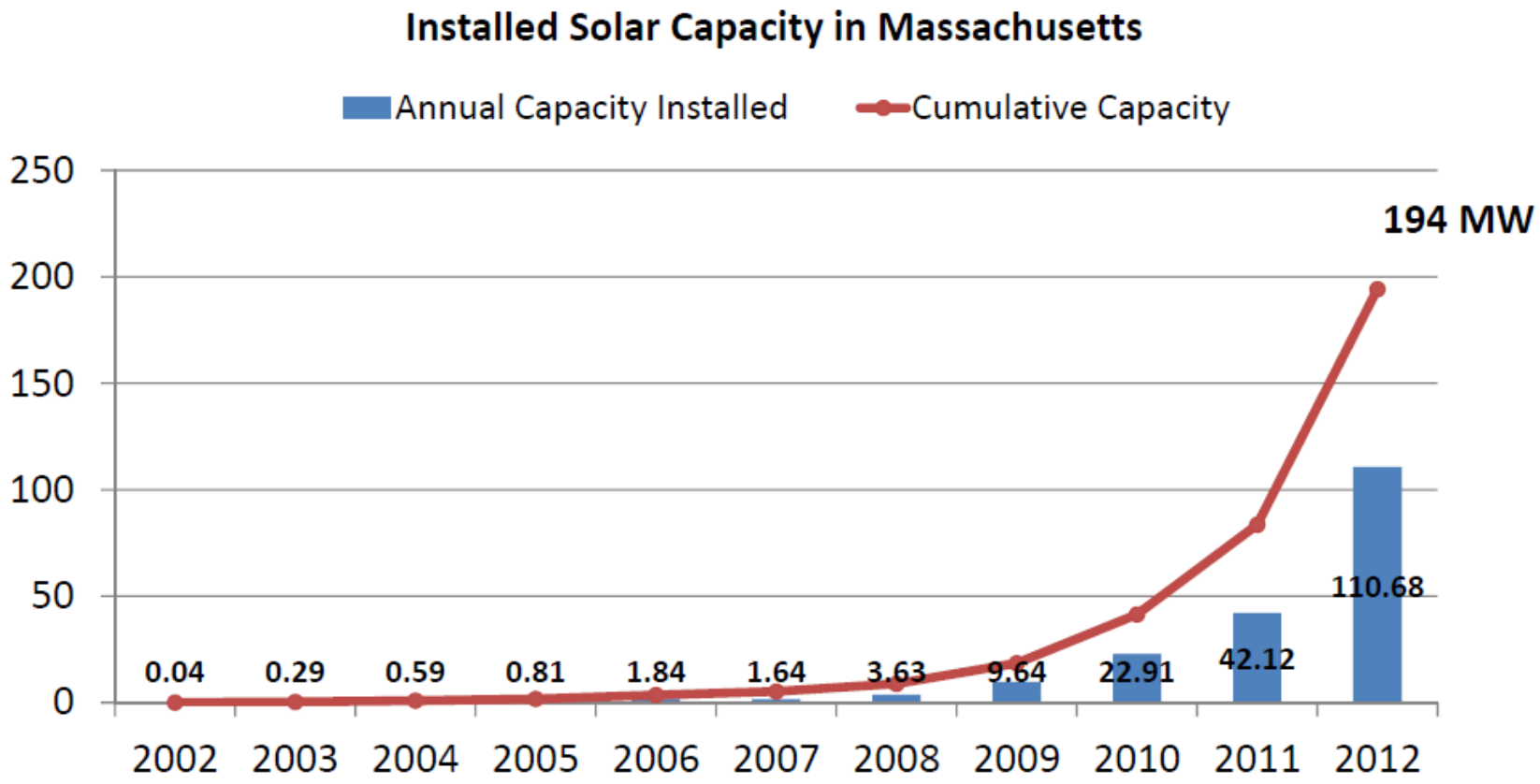
Renewable Energy & Ratepayer

- Renewable energy generation
  - Contributes to shift away from oil, and diversify from natural gas
  - Stabilizes peak prices (price suppression)
- Portfolio Standard = market mechanism selecting lowest cost technology for compliance
  - RPS Class II study of minimum standard
  - APS study to include heating/cooling
- Long term contracts increase investment security
  - Increase REC supply to meet RPS demand
  - Decrease REC prices and dependence on spot market
  - Decrease ACP volume



The Patrick-Murray Administration set a goal to have 250 MW of solar power installed in Massachusetts by 2017. The above figures represent the cumulative amount installed as of January 1, 2013.

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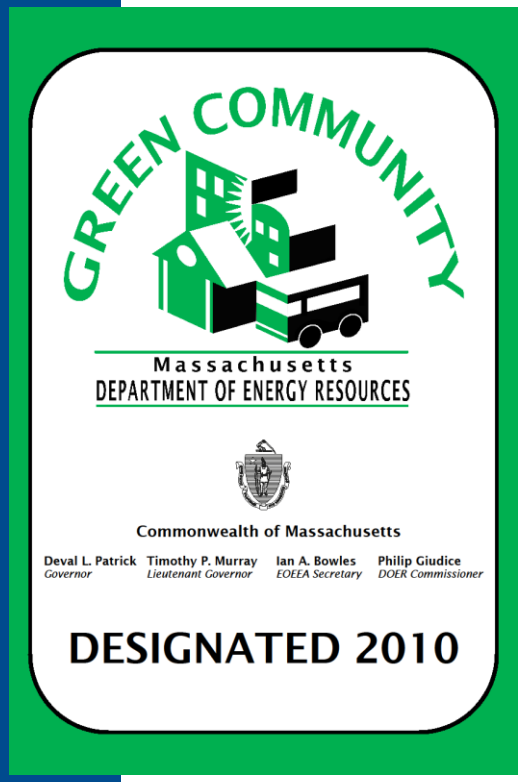
Green Communities

Green Communities Division -
Programs & Resources for Municipalities

- Green Communities Designation and Grant Program
- MassEnergyInsight energy tracking and analysis tool
- Municipal Energy Efficiency Program
- Energy Management Services Technical Assistance
- Partnerships with MA CEC – Solarize MA and Community Energy Strategic Planning
- Owner's Agent Technical Assistance
- Massachusetts Municipal Energy Group (MMEG)
- Website filled with tools & resources www.mass.gov/energy/greencommunities
- Email updates via listserv –

join-ene-greencommunities@listserv.state.ma.us

Green Communities Grant Program



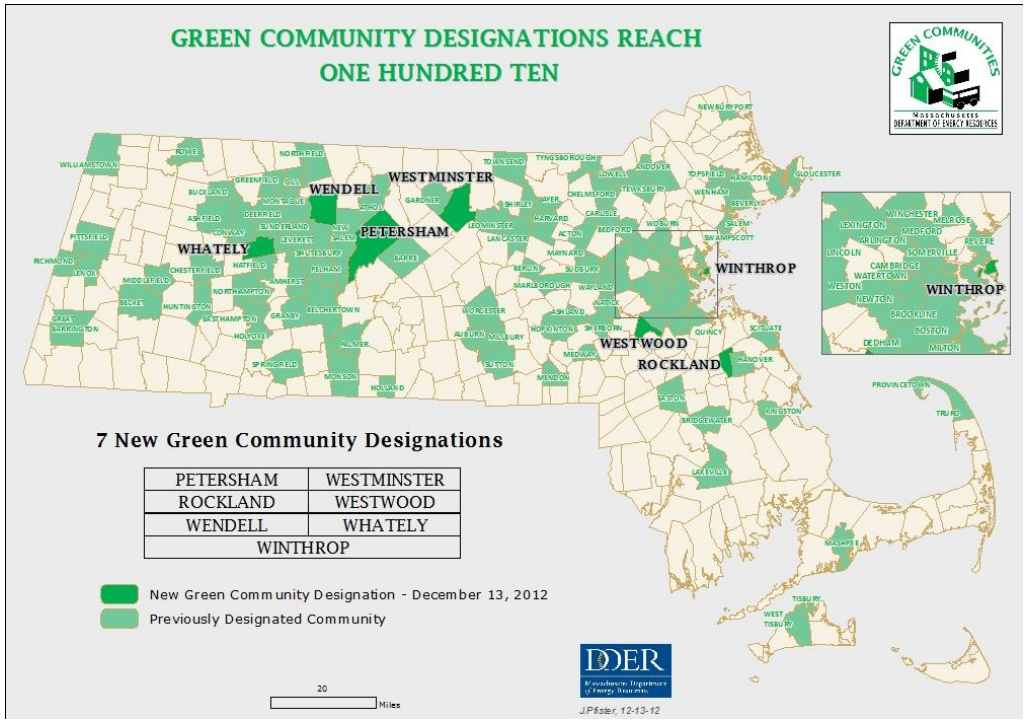
Qualification Criteria

1. Adopt as-of-right siting for RE/AE generation, R&D, or manufacturing
2. Adopt expedited permitting process
3. Create an Energy Reduction Plan to reduce energy use by 20% in 5 years
4. Purchase only fuel-efficient vehicles
5. Adopt Stretch Code or minimize life cycle cost

Green Communities Act, M.G.L. Ch. 25A §10

Green Communities Designation

- 110 cities and towns designated Green Communities
- More than $24 million invested to implement energy efficiency and renewable technologies
- Total reduction of 1,809,059 MMBTUs committed, equivalent to the annual energy consumption of approximately 13,600 Massachusetts households



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Green Communities Designation and Grant Program – the 110

- Grant allocations based on a $125K base plus a population/per capita income formula; maximum $1M.
  - Range from $130,725 in Hatfield to $1M for Boston
- Projects being funded include energy conservation measures, performance contracts, solar PV projects, incremental costs for hybrid vehicles.
  - $21.48M in designation awards to 110 Communities
  - 29 grants complete to date
    - Grants $6.4M
    - Total Projects Costs $9.5M; utility incentives $1.2M
    - Annual savings of $1.4M
- $2.76M in competitive grants awarded to 19 already designated Green Communities – all efficiency

Leading By Example (LBE) Program

- Established in 2007 by Executive Order 484
  - Reduce Greenhouse Gas emissions 40% by 2020
  - Reduce energy consumption 35% by 2020
  - 35% renewable energy goal by 2020
- Administered by DOER, implemented in collaboration with DCAMM
- Some Highlights to Date:
  - Solar PV installations increased from 100kW in 2007 to over 6 MW in 2012
  - Wind power has increased from 600 kW in 2007 to over 11MW installed in FY2013
  - Over $200 million worth of investments in large-scale energy efficiency projects at state facilities initiated by DCAMM
  - $10 million in ARRA funds invested in real time energy metering system across 26 million square feet of state buildings

Massachusetts 'Clean Energy Success Story

Ambitious energy and environmental goals, combined with strong support of clean energy economy

- #1 state for energy efficiency (ACEEE)
- #3 in private clean energy investment
- 2012 Massachusetts Clean Energy Industry Report
  - Nearly 5000 clean energy firms
  - More than 71,000 workers
  - 1.7% of total Mass. Workers
  - 11.2% employment growth

- 110 Green Communities
- 122 Stretch Code Communities
- 174 MW of solar PV installed
- 61 MW of wind generation installed
- Electric vehicle charging stations: over 250 charge points; 124 public EV stations
- Nearly $70 million in clean energy ARRA funding

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