Massachusetts Clean Energy & Climate Plan for 2020

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New England Clean Energy &
Transmission Summit
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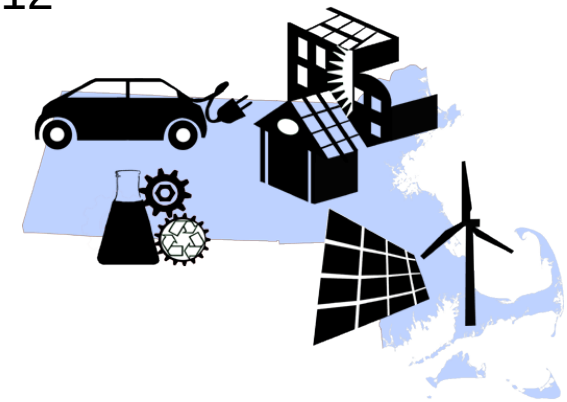


Remember Climate Change?

- NASA's Goddard Institute for Space Studies (GISS) in New York monitors global surface temperatures on an ongoing basis. GISS issued press release last week with worrisome findings
  - The global average surface temperature in 2011 was the ninth warmest since 1880
  - The finding continues a trend in which 9 of the 10 warmest years in the modern meteorological record have occurred since the year 2000
  - Earth continues to experience warmer temperatures than several decades ago. The average temperature around the globe in 2011 was 0.92 degrees F (0.51 C) warmer than the mid-20th century baseline
  - "We know the planet is absorbing more energy than it is emitting . . . So we are continuing to see a trend toward higher temperatures. Even with the cooling effects of a strong La Nina influence and low solar activity for the past several years, 2011 was one of the 10 warmest years on record.“ - GISS director, James E. Hansen. "

Source: NASA

Harvard University Coal Study

- True cost of using coal: $175B-$523B annually
- Adds an additional 9-27 cents per kWH to price of coal
- Lung disease: Particulates and oxides of nitrogen and sulfur kill over 24,000 people annually, including 2,800 from lung cancer.
- Heart disease: 38,200 non-fatal heart attacks annually.
- The 1,550 MW of coal generation in MA is half of all coal in ISO-NE, and approx. 11% of generation in MA

Source: Harvard University Medical School

Massachusetts
Leadership in Climate and Clean Energy

Since 2007 – An integrated approach

- Creating clean energy jobs and businesses
- Improving energy security and lowering energy costs
- Reducing Greenhouse Gas (GHG) emissions associated with climate change

Energy Costs & Volatility; Energy Independence

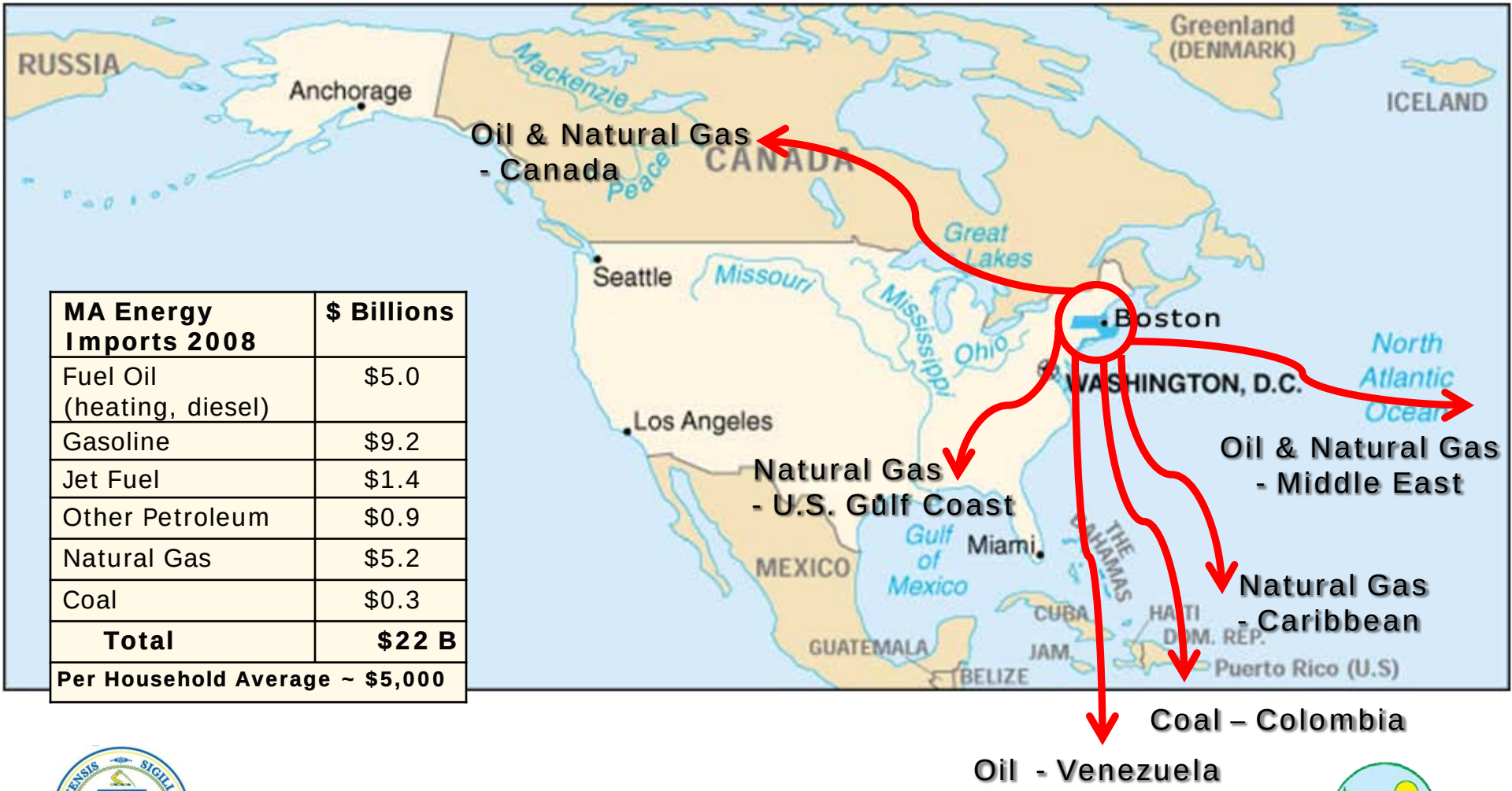
– Massachusetts at end of energy pipeline, no domestic fossil fuel

– $22 billion coal, oil and natural gas imported per year

– $5,200 direct spending on energy by average household

- Residential and business customers see volatile and increasing prices

Energy Dollars Flowing Out of MA



MA Energy Imports 2008	$ Billions
Fuel Oil (heating, diesel)	$5.0
Gasoline	$9.2
Jet Fuel	$1.4
Other Petroleum	$0.9
Natural Gas	$5.2
Coal	$0.3
Total	**$22 B**
Per Household Average ~ $5,000	

Regional Generation Fuel Mix

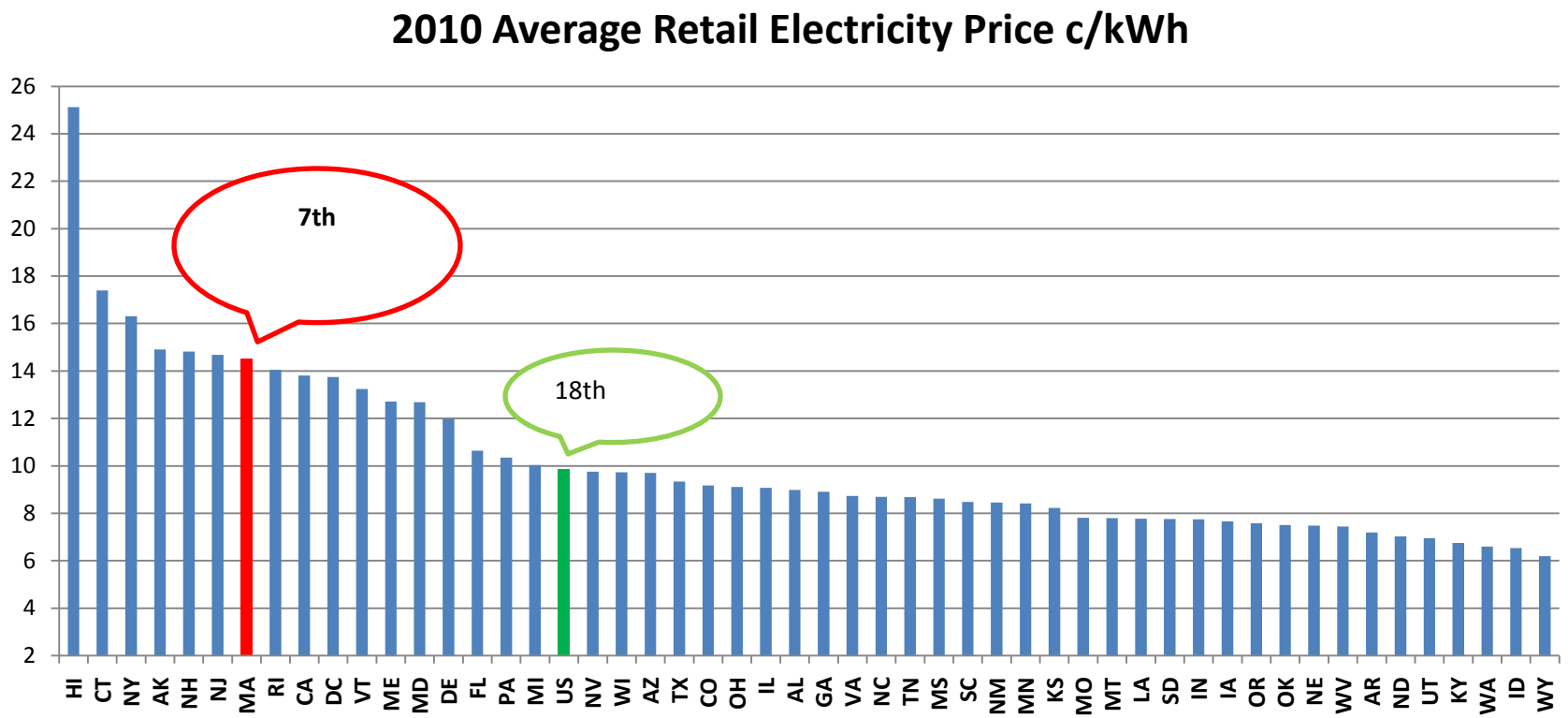
New England Generation by Fuel Type, 2010	
Fuel Type	**Percentage**
Gas	34%
Nuclear	31%
Oil/Gas	12%
Coal	11%
Hydro	7%
Wood/Refuse	5%
Oil	1%
Other (incl. steam, wind, solar, methane)	1%

Source: ISO-NE

Average Energy Costs for Mass. Households in 2008

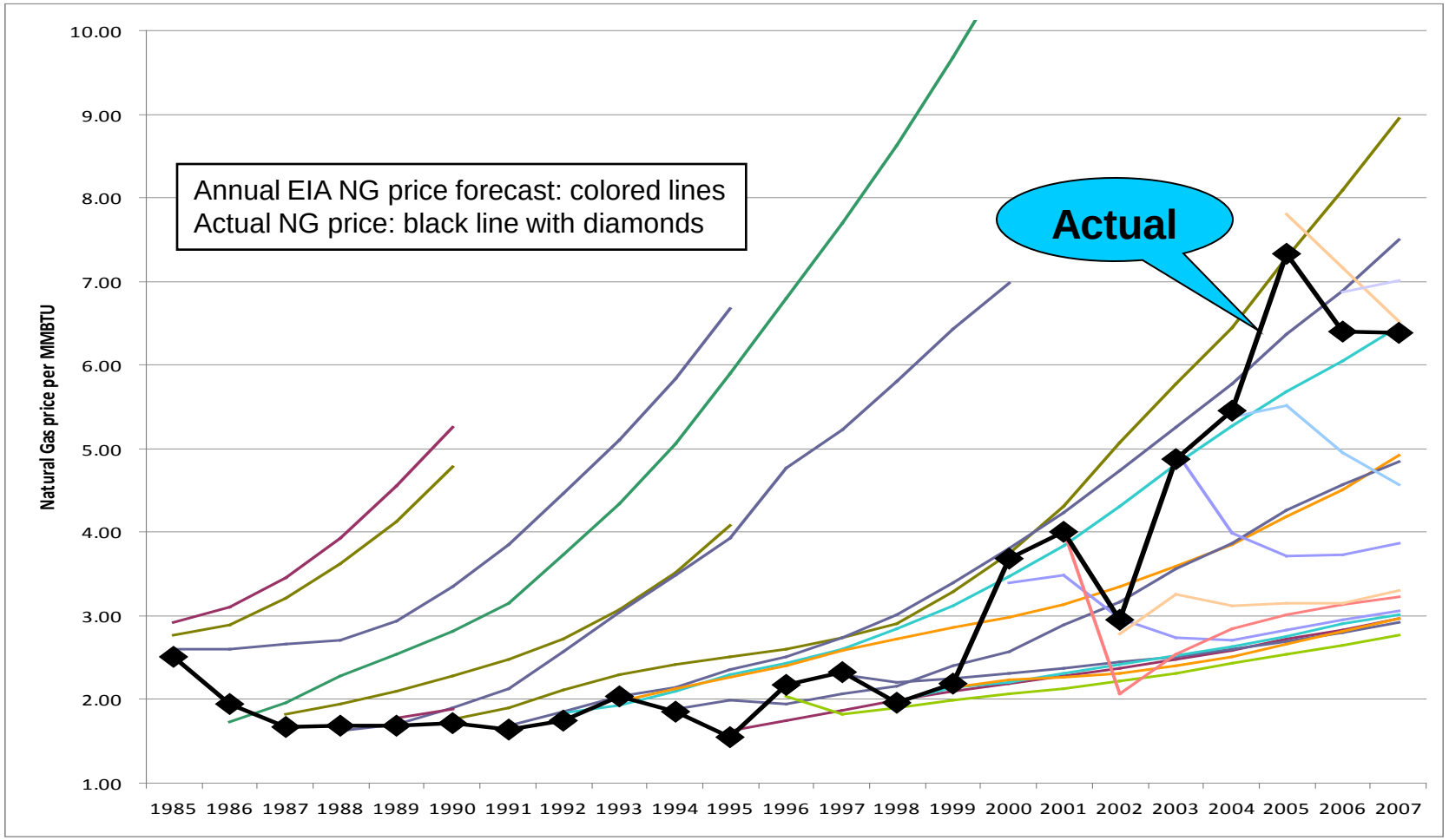
Space and Water Heating	$1,700
Electricity	$1,300
Gasoline	$2,200
Total energy costs	**$5,200**

MA has High Electricity Prices



Source: EIA

Difficult to Predict Future Energy Prices



Source: EIA

2008 Global Warming Solutions Act

- Create an economy-wide program to reduce GHG emissions:
  - 80% below 1990 levels by 2050; and
  - 10% - 25% below 1990 levels by 2020;
- Dec. 2010 Clean Energy & Climate Plan sets 2020 emission reduction requirement at 25% below 1990 levels

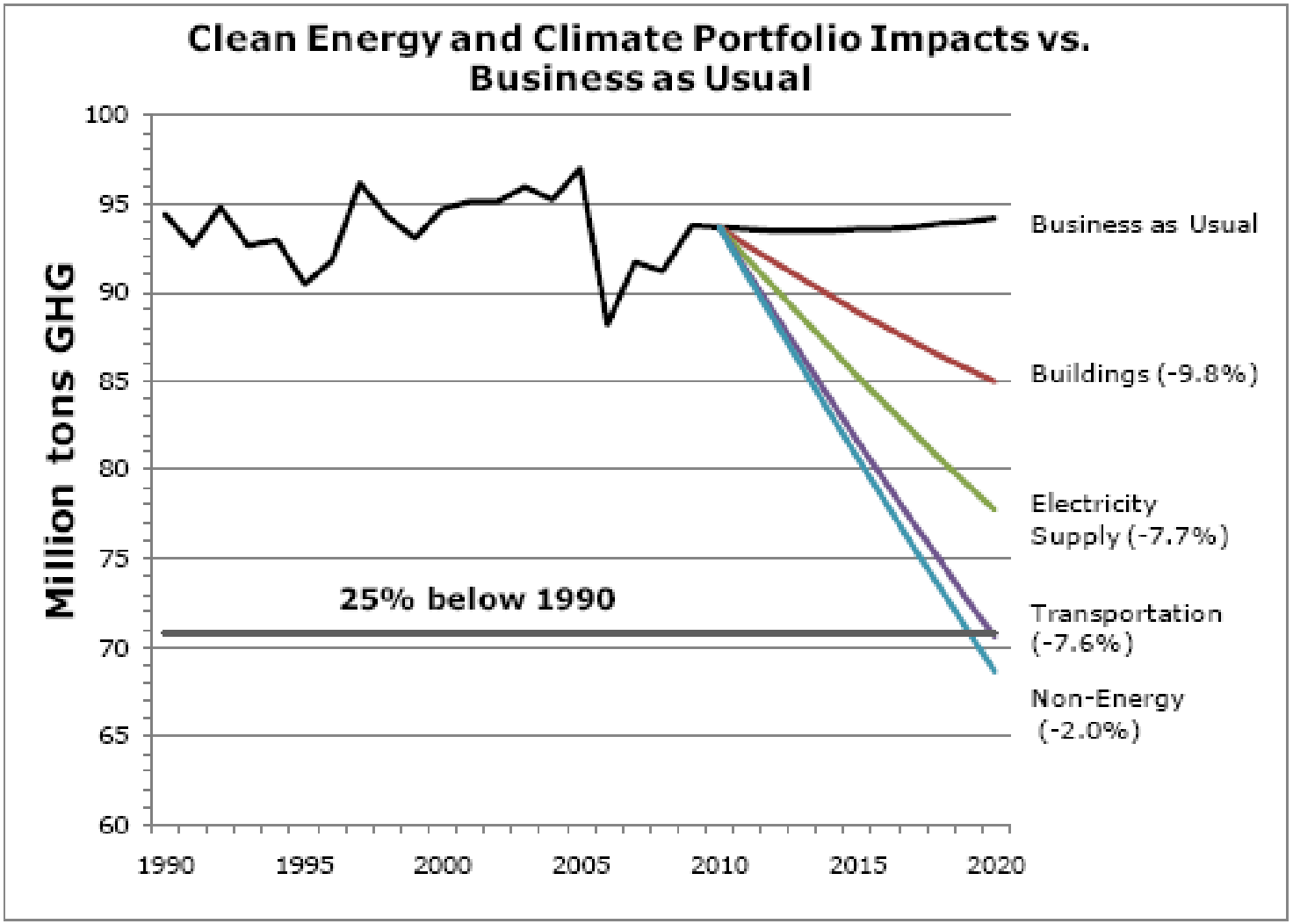


Figure ES-5. Emissions reductions by sector for the portfolio of policies, at the mid-range estimate of 27 percent below 1990 levels by 2020.

Job increases in 2020, direct and indirect, from the Mass. *Clean Energy and Climate Plan*

Federal, Calif. vehicle efficiency and GHG standards	6,000
Federal efficiency standards for medium and heavy duty vehicles	1,000
Mileage-based auto insurance	3,000
Clean car consumer incentives	2,000
Smart growth policy package	1,000
subtotal — transportation	13,000
Electric efficiency programs	10,000
Natural gas, heating oil efficiency programs	9,000
Advanced building energy codes	3,000
Federal appliance & product standards	1,000
subtotal — buildings efficiency	23,000
Renewables (solar, wind, biomass, biofuels)	6,000 - 12,000
Total	42,000 - 48,000

Consumer, Business Savings from Policies in Plan

$ millions energy cost savings in 2020	
Electric efficiency	$2,500
Natural gas efficiency	$800
Fuel oil efficiency	$200
Building codes	$100
Appliance & product standards	$400
Federal & Calif. vehicle efficiency standards	$1,700
Clean car incentives	$200
Pay-by-the-mile auto insurance	$400
Overall total	$6,300

MA Clean Energy Legislation 2008

- **Green Communities Act**
  - Expands EE delivery mechanisms and goals
  - RPS – expansion and strengthening targets of 1997 Act
  - Net metering provisions
  - Establishes DOER's Green Communities Program
  - Requires utilities to issue at least 2 RFPs within 5 years for Long Term Contracts (LTC) for RPS eligible renewables
- **Global Warming Solutions Act**
  - 2020 commitments – 25% below 1990 levels
  - 2050 commitments – 80% or more below 1990 levels
- **Oceans Management Act**
  - Provides zoning-like planning of state waters
  - Identifies presumptive areas for wind development
- **Clean Energy Biofuels Act**
  - Mandate for advanced biofuels
  - Paves way for transition to LCFS

Economic Benefits from Clean Energy

- Reduce energy costs for residents, businesses, and institutions
- Cut imports of fuel, keep more money in the state
- Cut capital costs for new power generation and transmission
- Create jobs – direct in efficiency & renewables industries; “indirect” by leaving people with more money to spend on non-energy living costs

Launching the Clean Energy Revolution

- MassCEC 2011 clean energy report
  - over 64,000 employed by nearly 5,000 companies in clean energy sector
  - 6.7 percent growth in clean energy jobs in FY10, compared to 1% growth overall
  - Companies leading the charge: A123, CSG, FloDesign, TPI Composites; Boston Power, Siemens, American Superconductor, Nexamp, Second Wind

Solar

- 30-fold increase in solar PV – from 3.5 MW to more than 90 MW installed or in pipeline by end of 2011;
- 4-fold increase in number of firms involved in solar energy installation (50 >> 200);
- Doubling of employment in solar manufacturing and installation between 2007 and 2009.

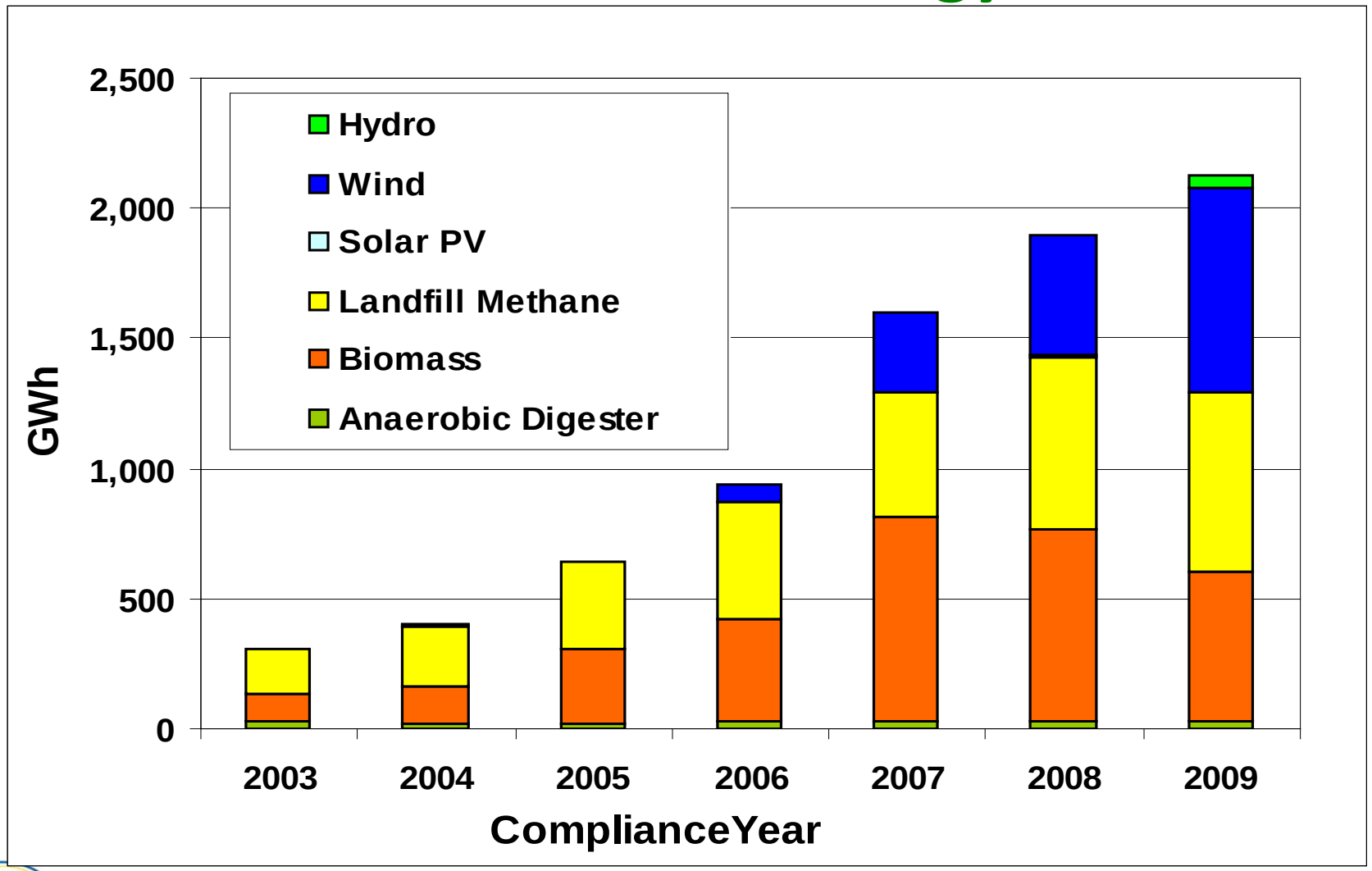
Wind

- 30-fold increase in wind – from 3.1 MW to more than 90 MW installed or in pipeline by end of 2011;
- Wind Blade Test Facility
- Cape Wind
- *Turbine pilings to be made in Mass: plant planned for Cape Wind work*
- Wind siting bill
- New Bedford Port

NEWIS

- ISO New England completed their 'New England Wind Integration Study' (NEWIS) in 2010
- Primary conclusions:
  - NE could meet up to 24% of energy needs from wind by 2020 (10-12 GW)
  - Increasing amounts of wind energy will require investments in operational capacity (e.g. wind forecasting) and transmission from high wind areas to areas of high load
  - Wind could reduce fossil fueled generation in NE
  - Wind in NE has very healthy capacity factors & values
  - 200 GW of wind energy potential in NE

MA RPS Class I Technology Trend



Commonwealth Wind Goals

- 2,000 MW by 2020
- Enough electricity to power 800,000 homes
- Meet 10% of electricity load with clean, emission free, renewable energy
- Reduce greenhouse gas emissions by 3.1 million tons, or roughly 12% of emissions from power plants today
- 1,000 MW of onshore wind creates $1.4 billion dollars of economic benefit
  - $2.7 million dollars a year in payments to landowners
  - 3,251 jobs created during construction and 462 new local long term jobs

Conclusion: A Win-Win Plan for 2020

- Transmission critical to success of large scale renewables in Massachusetts and New England
- Cut energy costs for households and businesses
- Reduce vulnerability to volatile fossil fuel prices
- Improve energy independence
- Create jobs
- Greatest mandatory GHG reduction for 2020 of any state
- Puts us well on the way to 80% mandated reduction in 2050