



# RENEWABLE ENERGY BENEFITS AND COSTS

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David Littell

Commissioner, Maine Public Utilities Commission



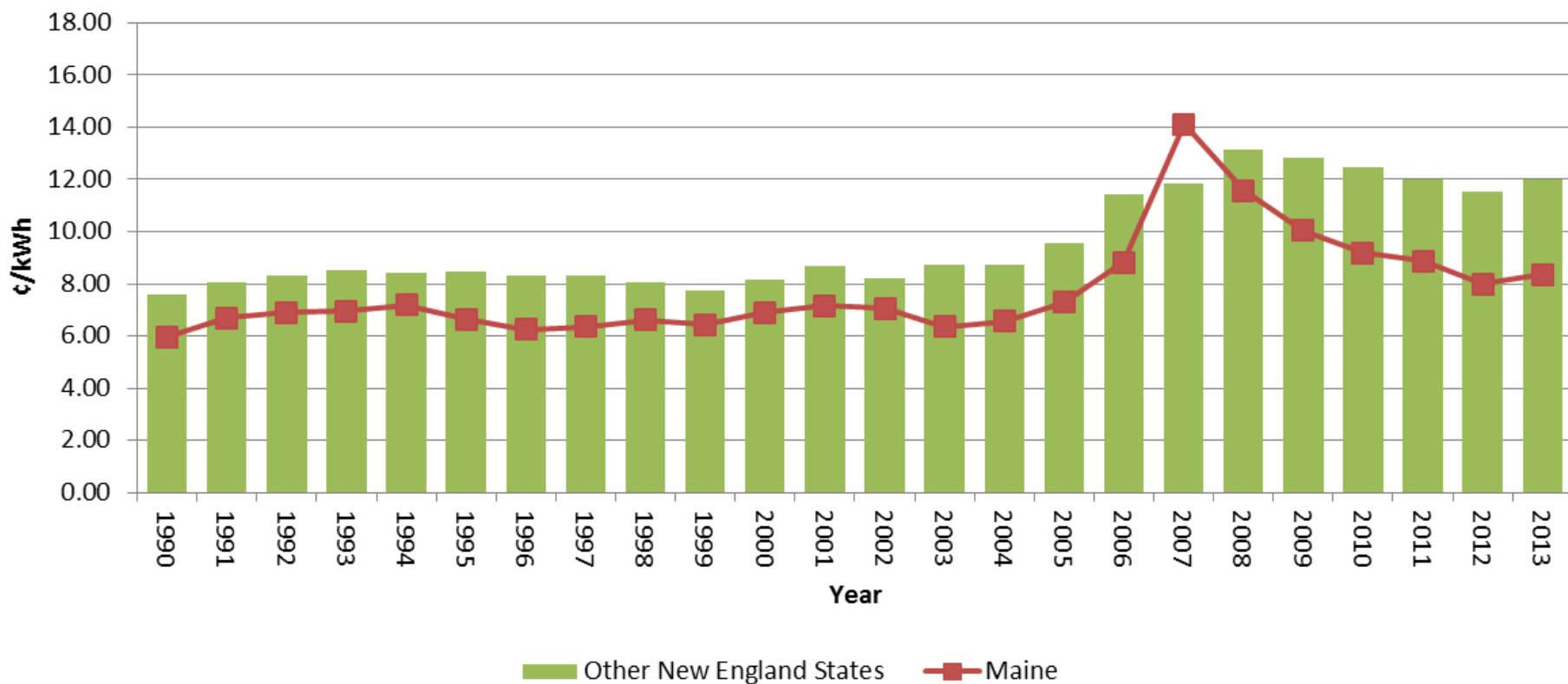
# Renewables

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- Economic benefits for ratepayers & state
- Higher upfront (capital) costs
- Environmental benefits & impacts
- Reliability, diversity, hedge benefits

# Industrial Electricity Rates

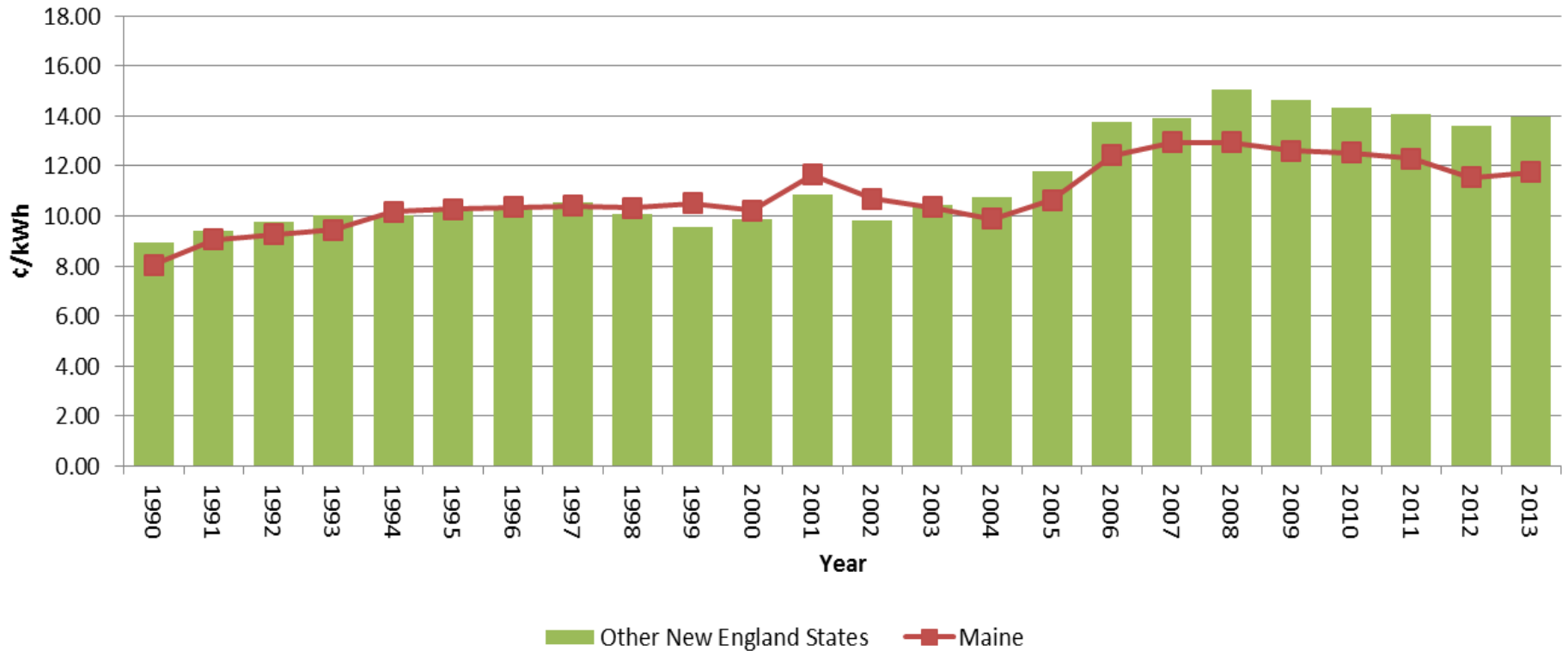
## Maine's Electricity Rates vs. Other New England States



Data Source: US Energy Information Agency (EIA), Average Price by State by Provider (EIA-861), [http://www.eia.gov/electricity/data/state/avgprice\\_annual.xls](http://www.eia.gov/electricity/data/state/avgprice_annual.xls)

# Commercial Electricity Rates

## Maine's Electricity Rates vs. Other New England States



Data Source: US Energy Information Agency (EIA), Average Price by State by Provider (EIA-861), [http://www.eia.gov/electricity/data/state/avgprice\\_annual.xls](http://www.eia.gov/electricity/data/state/avgprice_annual.xls)

# Maine Retail Electricity Prices Are the Lowest in New England

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<b>State</b>	<b>Commercial /kWh*</b>	<b>Industrial /kWh*</b>	<b>All Sectors /kWh*</b>
<b>ME</b>	12.70 ¢	8.14 ¢	12.49 ¢
<b>NH</b>	14.37 ¢	11.63 ¢	14.70 ¢
<b>VT</b>	14.74 ¢	9.95 ¢	14.42 ¢
<b>MA</b>	13.70 ¢	11.63 ¢	14.70 ¢
<b>CT</b>	15.18 ¢	12.45 ¢	16.79 ¢
<b>RI</b>	13.26 ¢	11.96 ¢	14.36 ¢
<b>NY</b>	15.28 ¢	6.21 ¢	15.36 ¢
<b>NJ</b>	12.20 ¢	10.24 ¢	13.25 ¢
<b>PA</b>	9.53 ¢	6.97 ¢	9.93 ¢

\* Data Source: EIA, "Electric Power Monthly with data for November 2014" (Release Date: January 2015), Table 5.6.A. Average Retail Price of Electricity to Ultimate Customers by End-Use Sector, by State. <http://www.eia.gov/electricity/monthly/>

# Maine Standard Offer Retail Electricity Prices

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Maine Standard Offer (Default Service) Retail Supply Rates Are Also Competitive

<b>Utility</b>	<b>Small</b>	<b>Medium</b>	<b>Large</b>
<b>CMP</b>	6.544 ¢/kWh	7.640 ¢/kWh	8.401 ¢/kWh
<b>EM-BHD</b>	6.504 ¢/kWh	7.723 ¢/kWh	8.137 ¢/kWh
<b>EM-MPD</b>	8.493 ¢/kWh	8.493 ¢/kWh	11.120 ¢/kWh

Data Source: Maine Public Utilities Commission, Standard Offer Rates. March 2015.  
[http://www.maine.gov/mpuc/electricity/standard\\_offer\\_rates/index.html](http://www.maine.gov/mpuc/electricity/standard_offer_rates/index.html)

# Small Class Standard Offer Prices Flat to Declining

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¢/kWh	2008	2009	2010	2011	2012	2013	2014	2015
<b>CMP</b>	9.974	8.924	9.029	8.491	7.438	6.826	7.560	6.544
<b>EM-BHD</b>	10.05	8.996	8.782	8.252	7.139	6.695	7.576	6.504
<b>EM-MPD</b>	8.539	8.333	8.625	7.300	7.300	7.300	8.493	8.493

Note: Price reported for the Year is for the majority of months of that Year

Data Source: Maine Public Utilities Commission, Standard Offer Rates.

[http://www.maine.gov/mpuc/electricity/standard\\_offer\\_rates/index.html](http://www.maine.gov/mpuc/electricity/standard_offer_rates/index.html)

# Renewable Development = Economic Benefits

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## ○ Direct

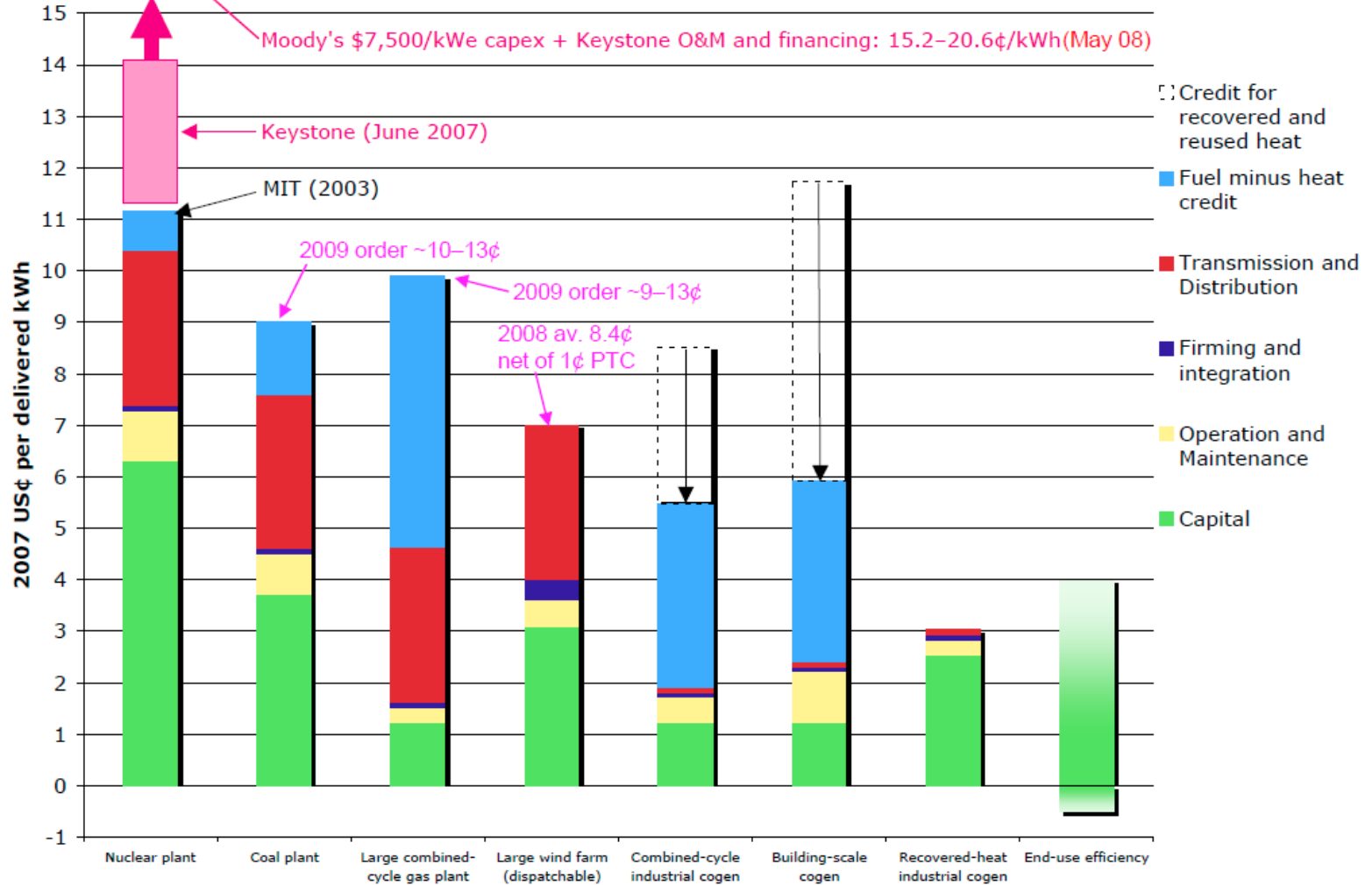
- Marginal energy prices
- New capacity
- Price suppression

## ○ Indirect

- Economic Development
- Moderation of Fuel Supply Risk
  - Longer term price stability
  - Hedging benefit



## Cost of new delivered electricity



# Renewables Direct Economic Impact

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- Renewables like wind, hydro, solar and tidal need to run when the resource is present
  - These are “price taking” resources in electricity market
  - Price takers displace more expensive generators in each hour available.
  - This often lowers prices in hours renewables are available
- An example of this appears in the recent summary of the GE NEWIS study performed for ISO-NE
  - GE estimates that at 20% wind generation in ISO-NE market there’s an average \$5-11/MWh annual price decrease
    - **\$650 million to \$1.4 billion** average annual energy price decrease in New England region\*

\*Based on \$5-11/MWh for 130,370 GWh, see ISO-NE, Net Energy & Peak Load Report (Nov 2010) (Sep '09- Oct '10 NEL); see also GE New England Wind Integration Study Summary (Nov. 16, 2010).

# Subsidy Imbalance Masks Portion of Economic Benefit of Renewables

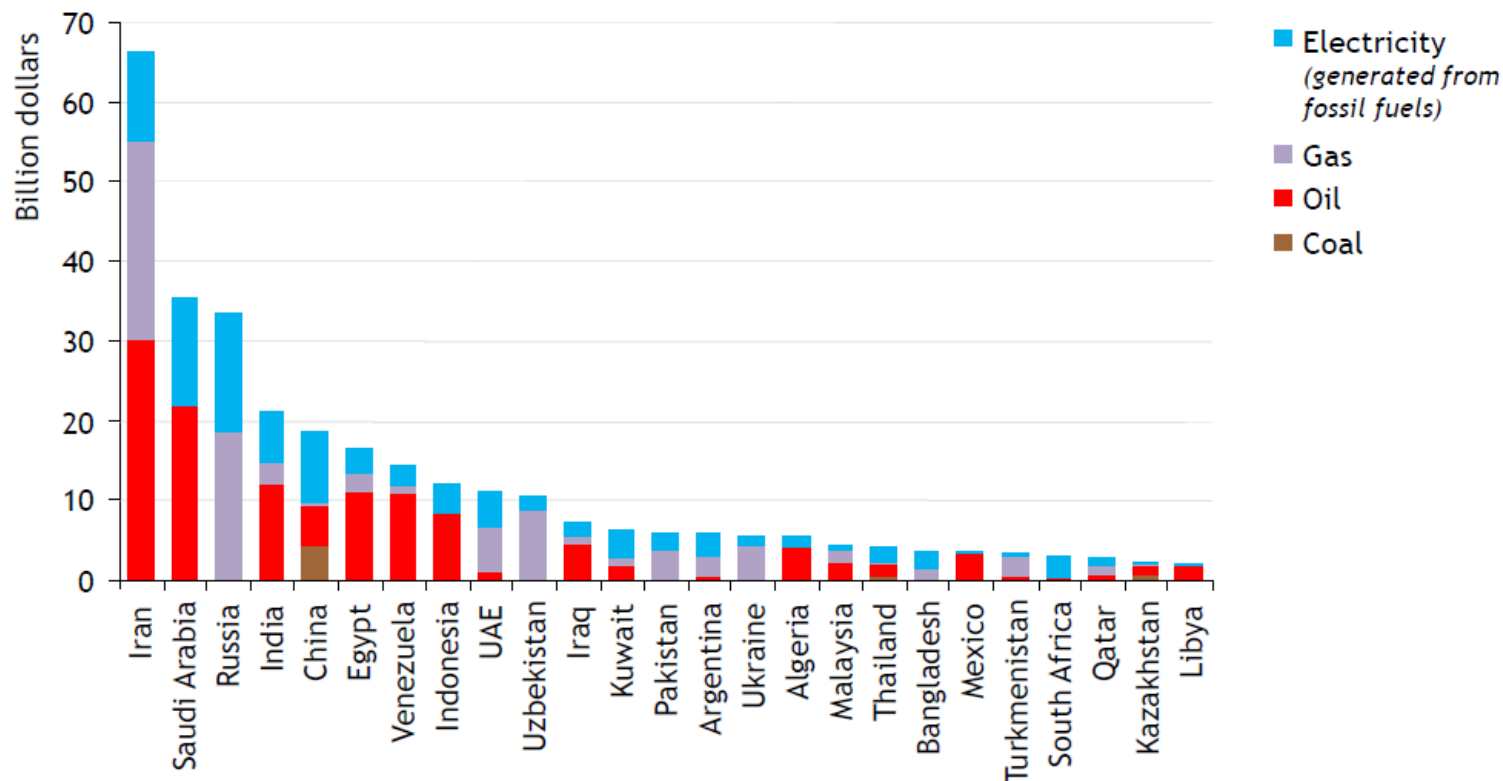
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- EIA Study\* Indicates Fossil Fuels received 48% of 2007 subsidies per unit of electricity production
- Nuclear Received 19%
- Renewables Only Received 15%
  - At comparable levels of subsidy the hourly price impact of resources like wind would be even greater than the estimated \$650-\$1,400 million decrease.

\*Energy Information Administration Office of Coal, Nuclear, Electric, and Alternate Fuels "Federal Financial Interventions and Subsidies in Energy Markets 2007," Table 34 Pg. 105 (April 2008)

# Globally, Government Subsidies Distort Price Signals

Economic value of fossil-fuel consumption subsidies by country, 2009



*Fossil-fuel consumption subsidies amounted to \$312 billion in 2009, down from \$558 billion in 2008, with the bulk of the fall due to lower international prices*

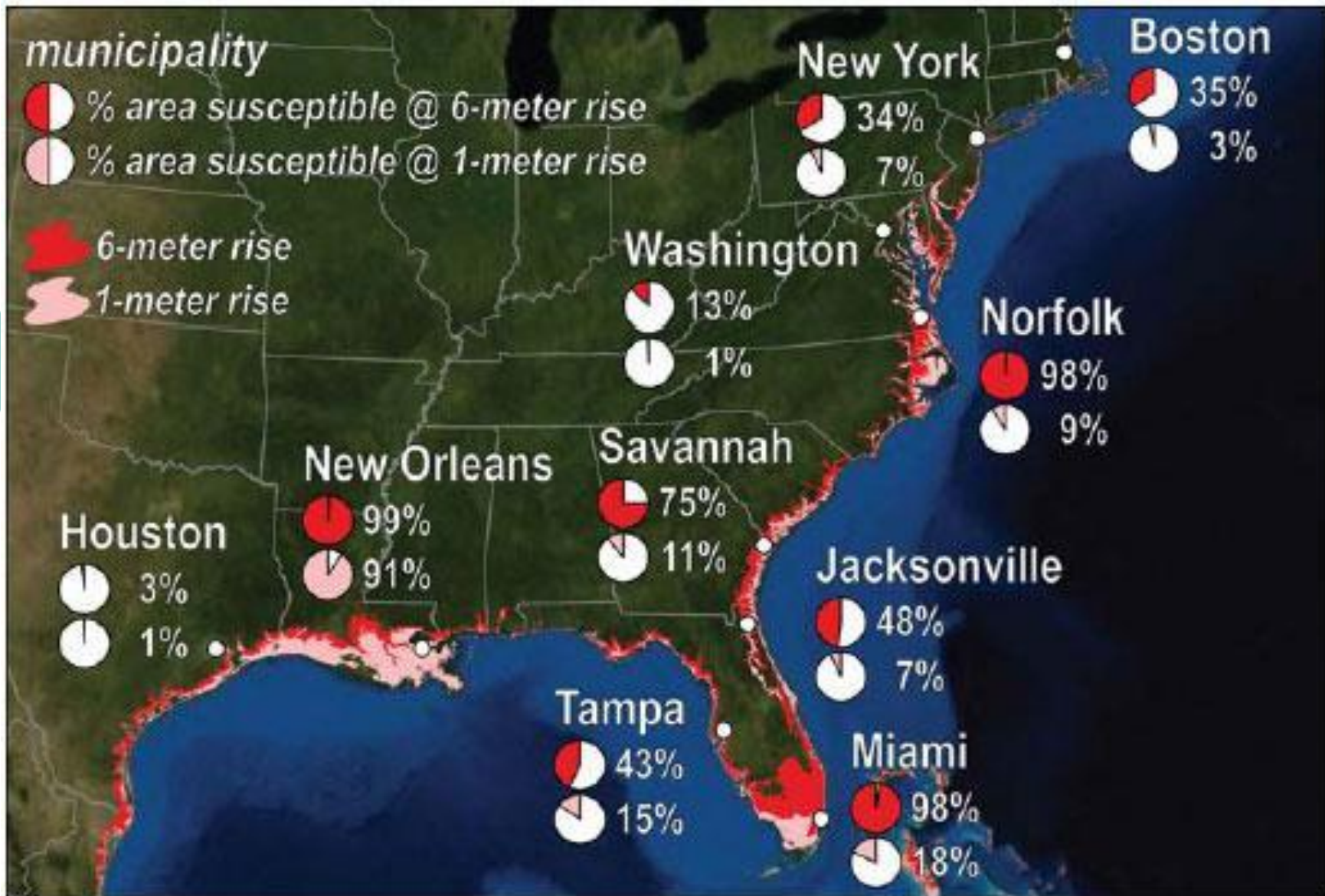
\*Source: IEA, World Energy Outlook 2010



# Indirect Economic Impacts

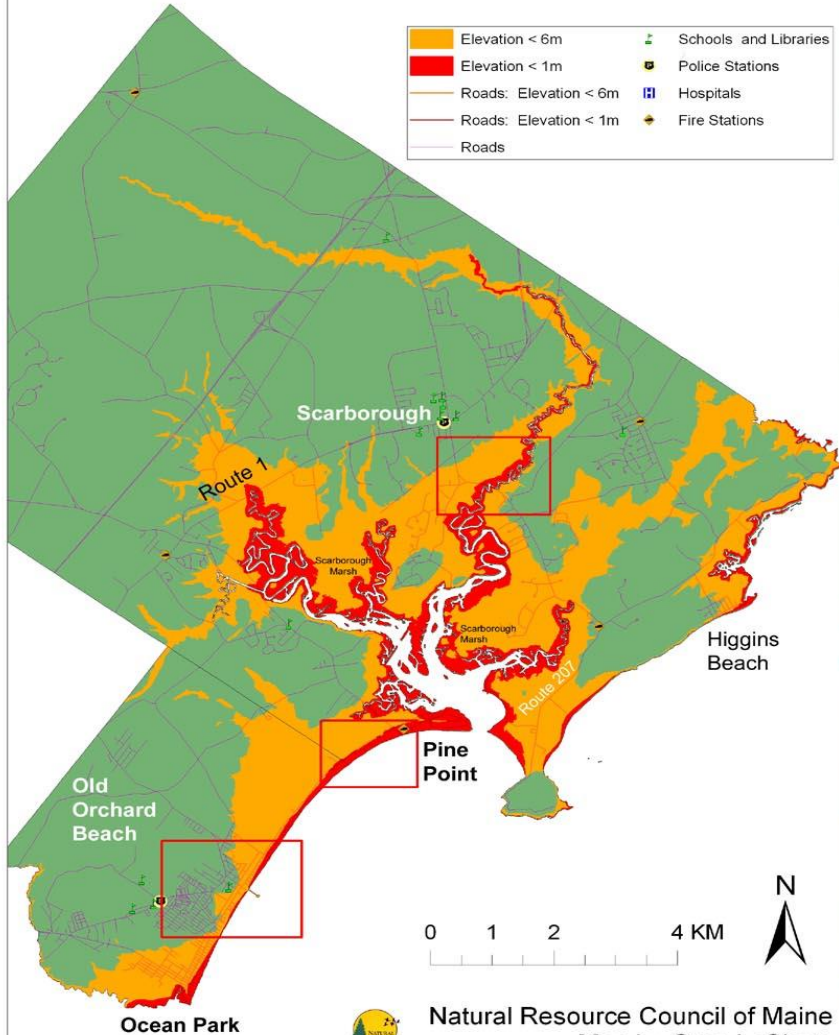
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- Local employment in construction and maintenance
- Potential manufacturing, research,
- For small-scale systems more sellers, installers, and servicers
- Lease revenues to landowners
- Increased Local Property Tax Revenues



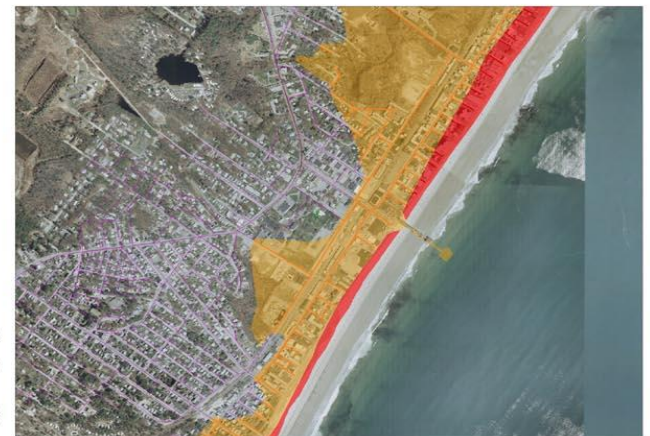
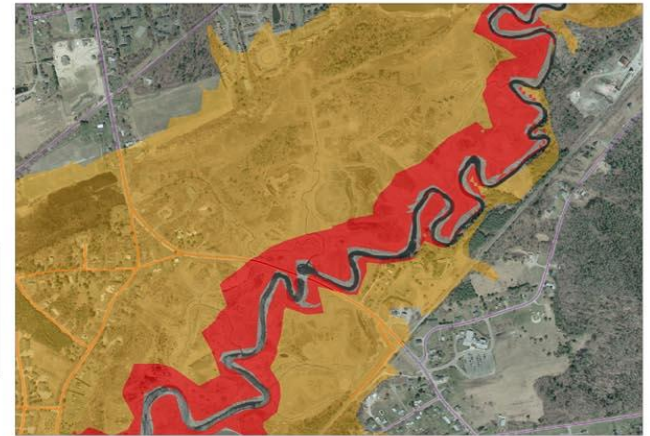
**East Coast Sea Level Rise**

# Impact of Sea Level Rise on Scarborough and Old Orchard Beach, Maine



Natural Resource Council of Maine  
Map by Greg LaShoto

2006



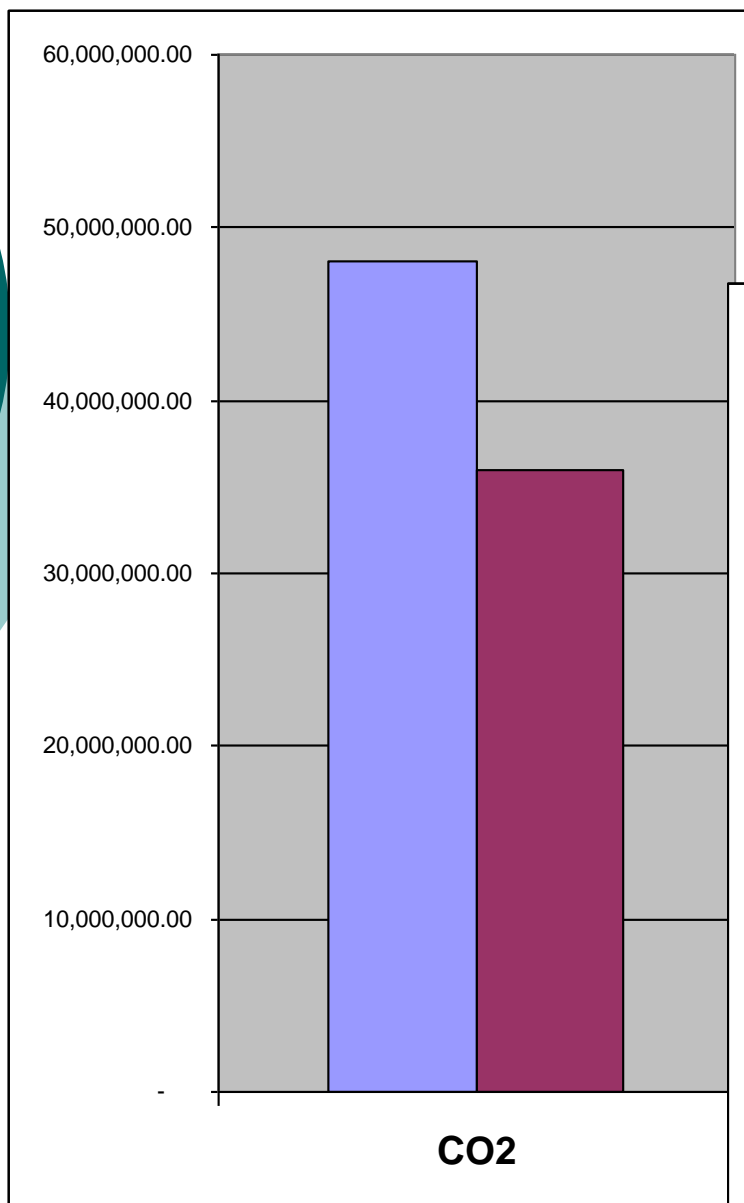
# Carbon Pollution Reduction

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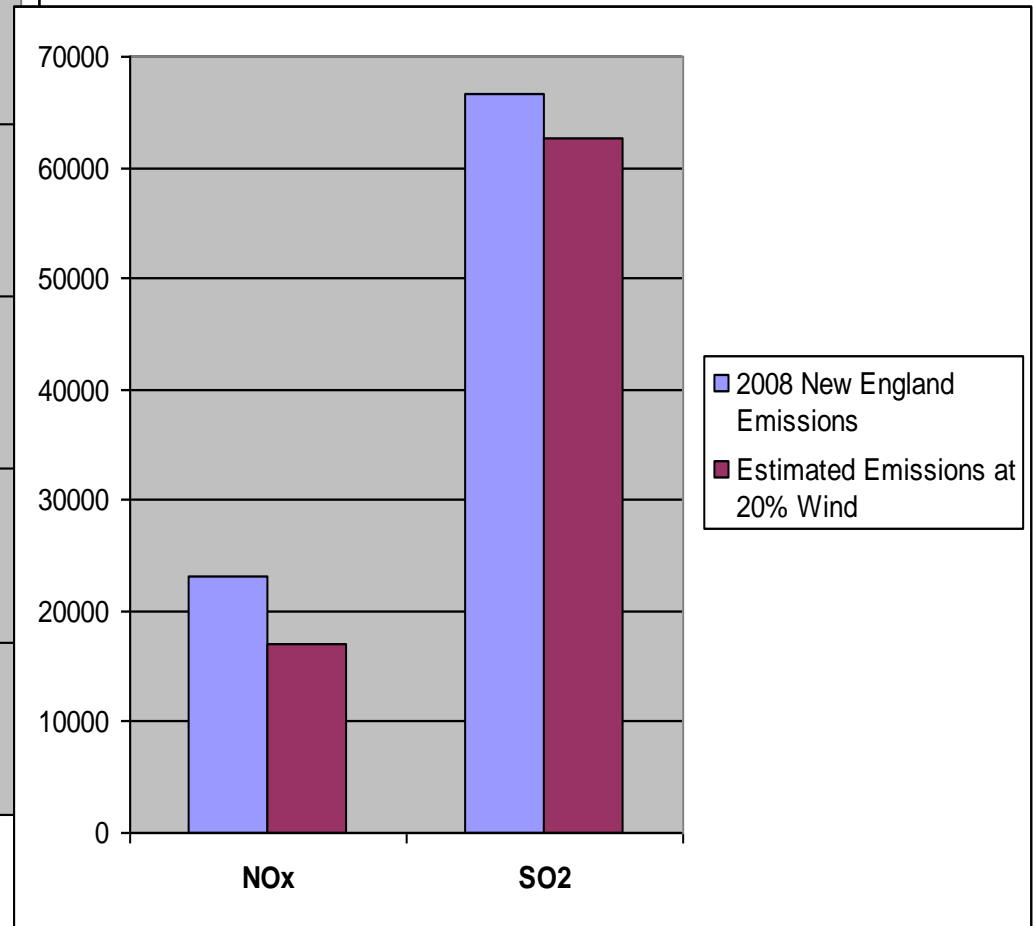
- Risk to the world from global warming is well known, and potentially catastrophic.
  - Sea levels “began to rise in the 19th century, around the same time that advanced countries began to burn large amounts of coal and oil”
  - “The sea has risen about eight inches since then, on average”
  - Scientists project a rise of 3 feet in the US with “...an estimated 5,000 square miles of dry land and 15,000 square miles of wetlands...at risk of permanent inundation” \*
- Renewable energy helps push trends like ocean acidification, sea level rise, and climate change resulting from CO2 intensive energy production in the opposite direction.

\* “As Glaciers Melt, Science Seeks Data on Rising Seas,” Justin Gillis, New York Times (Nov. 13, 2010).





NOx emissions fall 26% (6,000 tons)  
 SOx emissions fall 6% (4,000 tons)  
 CO2 emissions fall 25% (12 million tons)



Wind resource growth to 20% of generation yields a better than 20% decrease in CO2 and NOx, and a sizable decrease in SOx. \*

\* See GE NEWIS study summary for ISO-NE

# ○ Coal Extraction

- Mountaintop Removal, Mine cave-ins, explosions, long burning mine fires (e.g. Centralia, PA), contaminated run-off

**WARNING - DANGER**

**UNDERGROUND MINE FIRE**

WALKING OR DRIVING IN THIS AREA COULD  
RESULT IN SERIOUS INJURY OR DEATH

DANGEROUS GASES ARE PRESENT

GROUND IS PRONE TO SUDDEN COLLAPSE

Commonwealth of Pennsylvania  
Department of Environmental Protection





## ○ **Oil and Natural Gas Extraction**

- Spills, Contaminated waste water, Sludge, extensive infrastructure: including roads, jet-landing strips and pipelines, Hydrofracking risk to ground water



- **Nuclear Extraction**

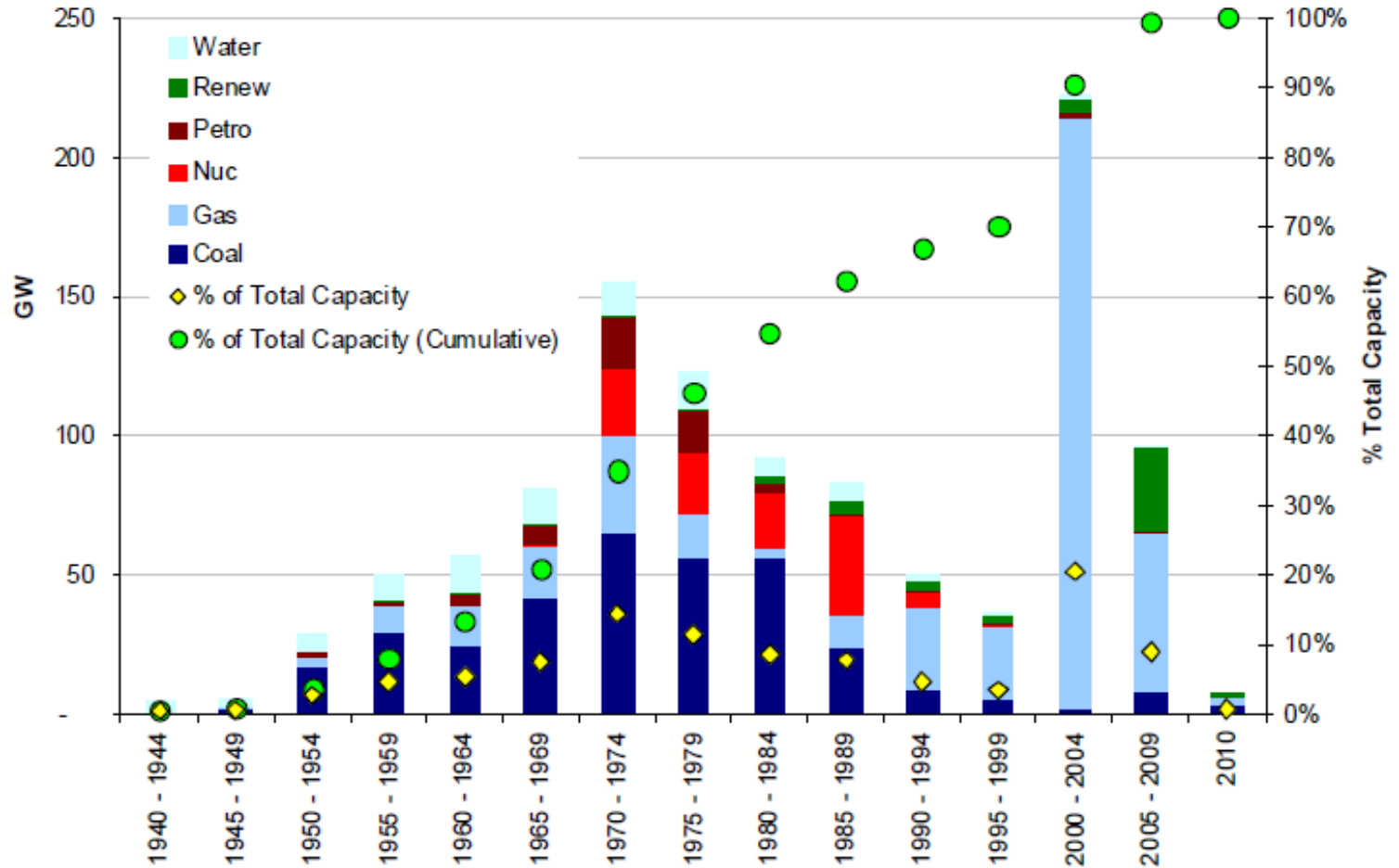
Destructive mining similar to coal, radioactive uranium tailings from mining, waste from fuel processing, and risk of nuclear weapons proliferation

# Renewables and Transmission Should Meet Strong Siting Standards



- **Consider impacts of transmission**
- **Permit carefully, limit environmental impacts**
  - **Visual, audio, bird/bat, habitat impact risks**
  - **Biomass can use waste and sustainable forest harvest**
  - **Consider multiple time and scale dimensions in analysis**

## Exhibit 25: US Power Plants by Vintage and Fuel Type



Source: Energy Velocity, Company data, Credit Suisse estimates