Connecticut Energy Advisory Board

February 5, 2010

What we want to accomplish today

- Review of Discussion with E&T Subcommittee
- Briefing on Key Issues and Policy Issues for topic areas
- Status Update on the 2010 Plan Development
  - Comments on EDCs Filing
  - EDCs Compliance
  - Key Upcoming Dates

Review of Discussion with E&T Subcommittee

- Reviewed Procurement Planning Process including legislative actions to re-establish State planning and 2010 objectives
- Focused on key IRP Components ("needs," drivers and resource options)
- Key message of increasing costs, challenging environmental targets and tradeoffs required when determining a long-term Procurement Plan

2010 Integrated Resource Planning Components

Key Objectives ("Needs")

- Reliability
- Low Cost
- Environmental Requirements
- Secure Supplies

Key Drivers

- Natural Gas Supply
- Renewable Policy
- Carbon Policy
- NOx Emissions
- Resource Finance
- Load & Demographics

Resource Options

- DSM
- Renewables
- CHP
- Repowering
- Transmission
- Imports
- Evolving Technologies
- Nuclear

Key Policy Observations: Resource Adequacy
(Cassella)

Key Observations

- State and Region surplus capacity likely to 2020
- None of the EDCs' cases looked at outlook without NEEWS
- Significant exposure to retirements of aging fleet, over the next 5-20 years
- ISO Planning is driving transmission additions for grid reliability
- Absence of immediate resource adequacy need affords CT the opportunity to consider a thoughtful, balanced approach to retirement and repowering

Policy Issues

- Should CT be proactive in repowering existing sites (versus defer to ISO markets)?
- How can CT avoid paying old and higher emitting generation that continue to operate for reliability purposes?
- Can Connecticut derive greater benefits from market solutions, bilateral contracting or cost of service?

Key Policy Observations: DSM (Healey)

Key Observations

- CT continues to have significant cost effective DSM opportunities
- Statute directs resource needs to be first met by DSM
- DSM offers quantifiable environmental and RPS compliance benefits

Policy Issues

- Who should pay for DSM and how should it be funded?
- What is the right timing for ramping up programs?
- What are the true costs and economic benefits of DSM?
- Are there creative ways to finance DSM so non-participants are not unduly burdened?

Key Policy Observations: Renewables (Ozols)

Key Observations

- CT RPS requirements increase significantly over the decade (20% of CT MWh)
- Limited in-state potential requires CT to seek supplies outside CT (NE/NY) to most cost effectively meet RPS
- Renewables may require substantial transmission investments
- Aggregate Regional RPS requirements will lead to need for more costly renewable projects

Policy Issues

- CT strategies versus regional strategies for to meet RPS
- Market solutions versus proactive procurement
- What is the real cost implication of the CT RPS?

Key Policy Observations: Transmission (Gaudiosi)

Key Observations

- Process: Alternatives assessment needs to be more cost effective and better integrated with ISO process
- Near-Term: 2nd & 3rd components of NEEWS are pending ISO-NE reassessment
- Long-Term: Potential for significant regional transmission upgrades to access renewable (ISO-NE 2030 study)

Policy Issues

- What are the proper roles for CEAB/DPUC/CSC in the assessment of alternatives to transmission projects?
- How does CT engage more effectively in the ISO-NE regional planning process?

Key Policy Observations: Environmental (Babbidge)

Key Observations

- NOx emissions reductions is a key near-term challenge
- CO2 emissions reductions is a key long-term challenge economy-wide and to the electric sector
- Existing generation faces significant costs to comply with NOx emissions and water cooling issues

Policy Issues

- Key tradeoff decisions to add environmental controls, retire, or repower Connecticut's fossil steam generation
- Potential use of DSM or renewables to mitigate emissions
- Opportunities may exist to address how dispatch rules impact meeting environmental standards

Key Policy Observations: Generation and Repowering (Hoffman)

Key Observations

- CT has over 2,000 MW of aging fossil fired generation capacity nearing retirement
- Challenges for continued operation include age, NOx and water regulations, and poor market economics
- Generation sites exist with key locations in CT power system

Policy Issues

- Should these units/sites be retired, repowered, or retrofitted?
- What procurement process should be used to facilitate repowering?
- Timing – should these be proactively done?

Key Policy Observations: Resource Finance
(Hennessy)

Key Observations

- Primary supply options are capital intensive (renewables, repowering); especially true for offshore wind and nuclear power
- Supply options are difficult to back with debt finance without contracts
- Projects and contract structures that are very large or retain too much risk may still be difficult to finance

Policy Issues

- Are market structures adequate to implement the Plan?
- Should DPUC Procurement authority be used to secure preferred resources?
- Are public guarantees, borrowing or third party borrowing (e.g. by an EDC) necessary and/or cost effective means of securing desired resources?

Key Policy Observations: Nuclear (Sheridan)

Key Observations

- Nationally, nuclear is re-emerging as a long-term supply consideration to meet growing GHG targets
- Significant improvements in technology design and standardization, but costs and waste issue still present challenges
- Long lead time for nuclear (10 to 15 years)
- New purely merchant nuclear capacity unlikely in New England
- Smaller commercial reactors that may reduce financing risk are under development, but are unlikely to be available before 2020-2030

Policy Issues

- Is there a potential role for new nuclear in CT's long term supply mix?
- Will someone else build nuclear CT can 'import'?

Key Policy Observations: CHP (Cole)

Key Observations

- Retrofit potential for small scale is limited, much has already been done
- Large scale retrofit faces challenges related to proximate steam uses
- CHP has its most technical potential in new development over a long term horizon

Policy Issues

- Harvesting CHP and District Heating/Cooling potential requires integration of issues beyond power procurement such as economic development policy etc.
- How do we establish a Development Policy aimed at long-term change?

Key Policy Observations: Energy Security (Gordes)

Key Observations

- Desire for greater security of the power system and need to understand how resource choice can impact energy security
  - Renewable supply and amount of intermittent generation
  - Increased transmission interconnections
  - More natural gas usage for generation and DSM
  - Distributed generation
  - Nuclear power
- Increasingly important as CT develops increasing reliance on LNG facilities and gas pipeline supply as well as large transmission projects

Policy Issues

- Can energy security issues be integrated into the ISO-NE capacity market?
- Challenge of developing State supported dispersed resources is very different from large capacity contracting

Key Policy Observations: Emerging Technologies
(Marie/Simes)

Key Observations

- PEVs/PHEVs
  - emerging as long-term strategy to reduce transport sector carbon emissions and oil consumption
  - limited fleet penetration likely by 2030
  - Significant cost and charging barriers
- Smart Grid/AMI
  - Significant activity due to Federal investment
  - Real potential to reduce peak loads

Policy Issues

- PEVs - Regional Electric Vehicle Initiative (REVI) and Connecticut Electric Vehicle Coordinating Council (CEVC) to provide long-term planning support
- Will require TOU rates to encourage off-peak charging?
- AMI – need for full cost benefit analysis, timing and scope of deployment and consideration of interface options

Key Policy Observations: Natural Gas (Mengacci)

Key Observations

- Potential for natural gas to serve as a "bridge" fuel
- New-found domestic shale supplies significantly improve gas supply and price outlook in near-term and potentially longer-term
- New LNG sources, pipeline compression enhancements/development with access to New England create additional gas flexibility

Policy Issues

- Degree of near-term and long-term reliance on natural gas in Connecticut/New England power supply
- How to best secure pipeline systems for reliability and security of power supply?
- Is further integration necessary in terms of gas system and electric system planning?

Key Policy Observations: Load & Demographics
(Cole)

Key Observations

- CT load expected to recover slowly leading to limited required investment in electric resources for reliability needs.

Policy Issues

- To significantly alter our energy consumption, CT citizens would have to change the way we live and work. Bringing about such change would require extreme policy changes.

Key Policy Observations: Integration (Cassella)

Key Observations

- Analysis of Key Resource Decisions (Renewables, DSM, Repowering, role of nuclear, CHP)
- Evaluate portfolio options for impacts on key metrics
  - Cost of electricity versus impact on State economy
  - Energy Security
  - Emissions Impact versus targets
- Key determination is the optimal portfolio

Policy Issues

- What trade-offs are necessary to make in choosing a Plan?
- Can the market provide what Connecticut wants in its Plan?
- What does CT need to do now to enable the recommended Plan?

Key Policy Observations: State Support for Integrated Resource Planning (Buckley)

Key Observations

- Longer term resource procurement may require creative thinking, policy changes and legislative solutions

Policy Issues

- Improve Transmission Planning Process through better needs assessment, including State specific interests, harmonization of timelines and additional state involvement in ISO processes
- Degree of Reliance on Contracting/State actions vs. Market Solutions
- How can we maximize the effectiveness of current structure and policies to implement the plan?
- State organizational and operational structures and tools may be revisited through lens of Resource Planning and implementation

Status Update

- Reviewed written public comments on EDCs' Filing in preparation for Public Hearing on 2/11
- Reviewing EDCs' plan for Compliance
- Preparing for upcoming workshops on Transmission and CHP
- Finalizing analytical cases and metrics
- Drafting of several "Issues Papers" is underway

Written Public Comments

Request for written comments EDCs IRP

- Issued on January 6, 2010; comments were due January 25th
- 26 sets received - 5 from individuals; 21 from entities

Overview of Summary of Comments

Comments were respectful and positive; expressed appreciation for the improvements in this year's plan.

- Twelve called for All Cost-Effective DSM, rather than the Targeted DSM Plan proposed in IRP.
- Ten supported the regional approach to meeting CT's RPS but wanted the state to maximize in-state cost effective renewable resources.
- Four objected to any time being spent studying or considering nuclear power.
- Several calls for CEAB and/or DPUC to issue a proactive RFP.
- Three suggested CEAB's energy plan should include natural gas and unregulated fuels.

A detailed summary of the written public comments is available.

2010 IRP Scorecard Overview

- 2010 EDCs Plan demonstrates continued progress towards compliance under Section 51 of PA 07-242
- EDCs state they can meet projected demand, assuming New England states are successful in building enough new renewable generation and associated transmission to meet RPS requirement
- A number of areas EDCs have not complied with what some would argue is the strict interpretation of the Statute, largely because they do not recommend procurement
- Key areas EDCs have not evaluated in depth are optimization of existing generation sites, appropriate reliance on import limitations, and energy security risks for potential energy resources

Analytical Framework

Connecticut Resource Strategies

Developed under the following major themes to see what attributes can be improved and what is needed to meet the targets

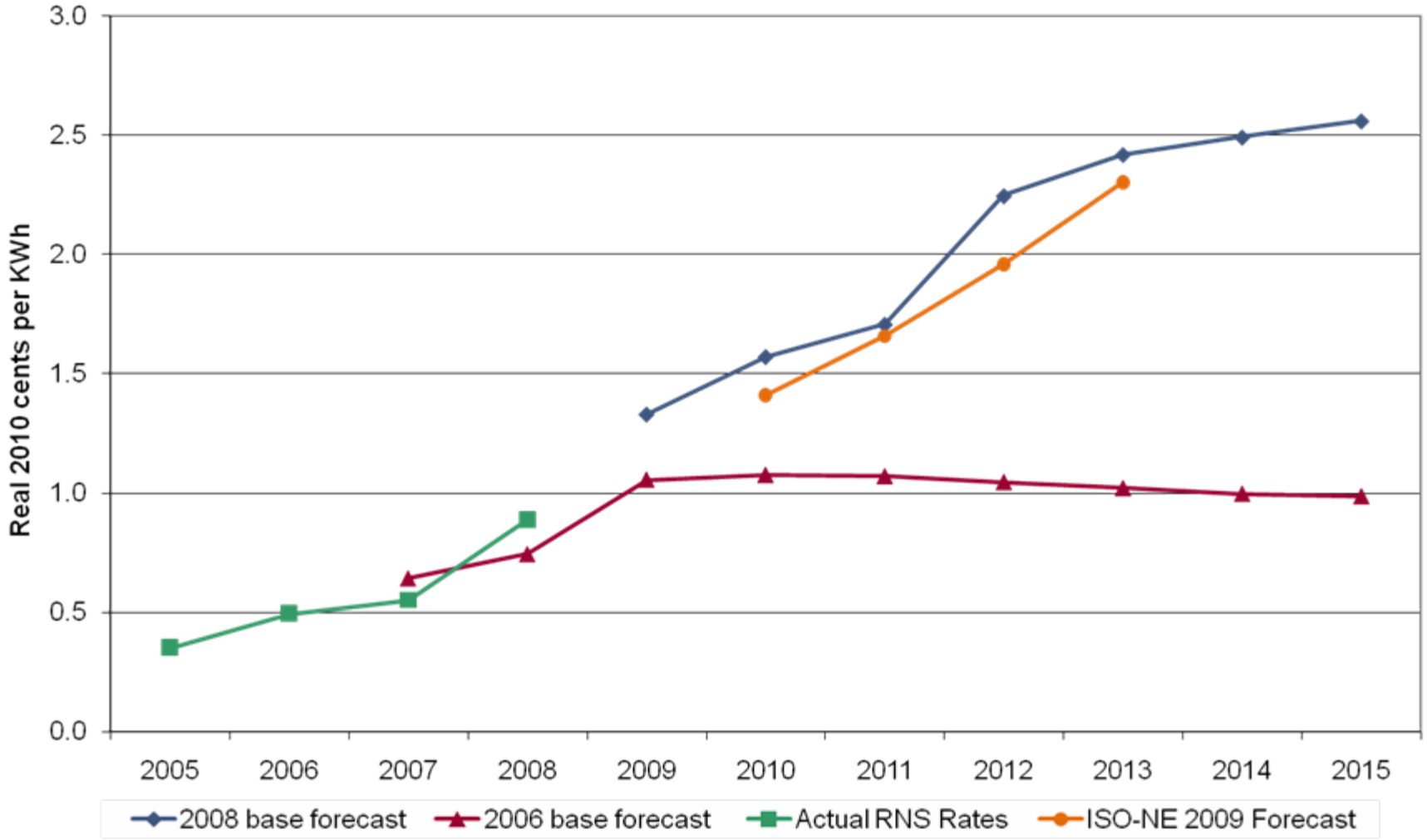
1. Conventional Resources, Connecticut Financial Support
   a. Resource Adequacy Focused
   b. Energy Security Focused
2. Renewable Portfolio Trade-offs
   a. In-State vs. Regional vs. Import strategies
   b. Post-2020 RPS Requirement Target Options
3. Energy Efficiency Program Strategy Optimization
   a. Program Target Levels, up to Max
   b. Timing of additional ramp-up
   c. Potential funding/program design impacts
4. Nuclear Build
   a. In-State vs. Regional vs. Import strategies for Nuclear 's no-carbon energy
5. Energy Independent Connecticut Strategy
   a. A hypothetical 2030 look if all energy consumption/production levers are pulled
   b. Highly Efficient End-use equipment, Efficient Demographic Shift, CHP Maximized
   c. Maximum in state 'fuel' usage (air, water, sun, waste)
   d. Maximize High Energy Security resource options

2010 Planning Process: Key Dates

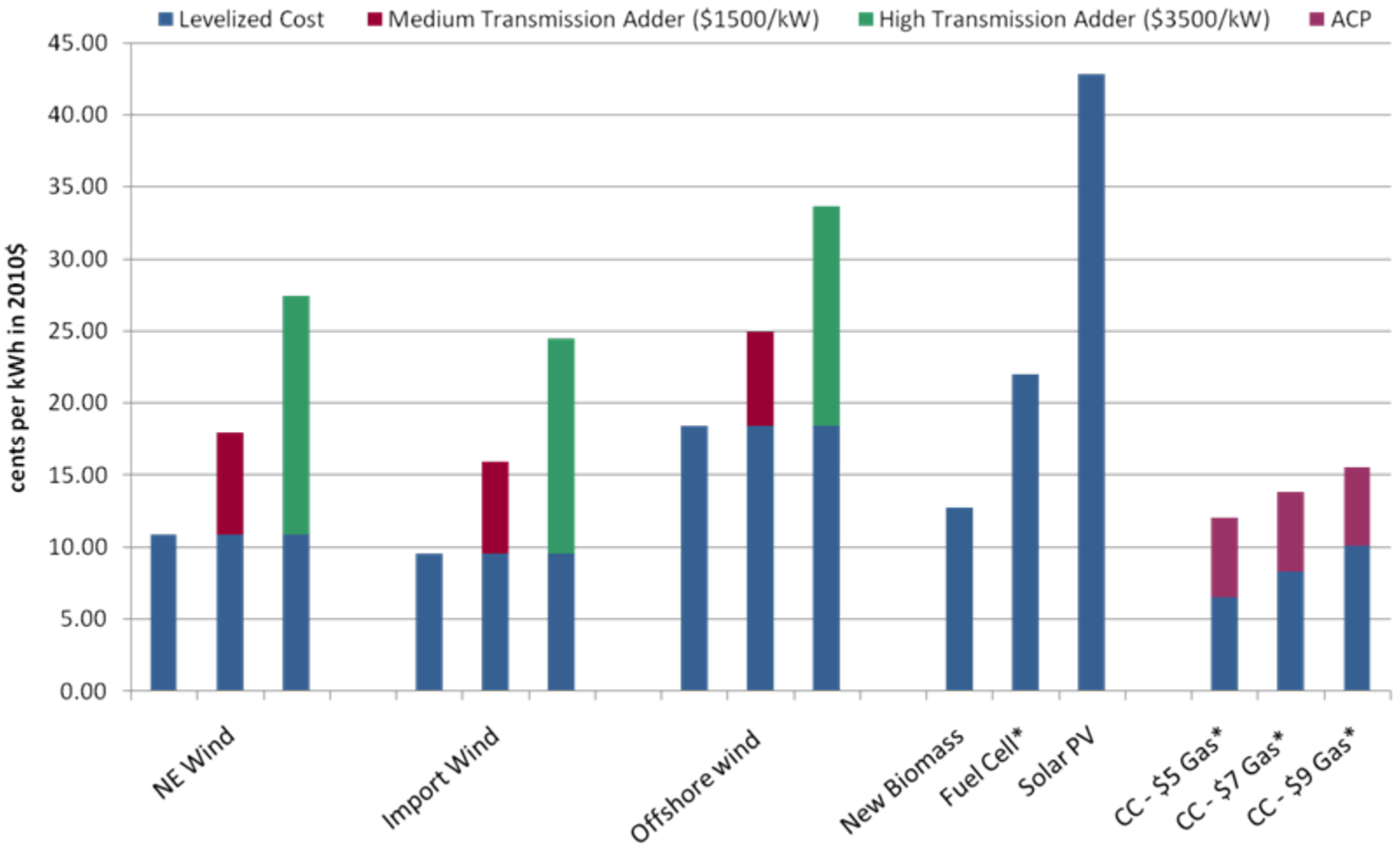
To Date	November 2009		CEAB led Stakeholder Workshops
	January 1, 2010		EDCs Plan filed
	January 25, 2010		Written Public Comments Due
Next	February 5, 2010		CEAB Board Meeting *(comments, summaries, preliminary findings)*
	February 11, 2010	1:00pm	CEAB Public Hearing on EDCs IRP Goodyear Room at Central Connecticut State University's Institute of Technology and Business Development Conference Center
	February 19, 2010	9:00am	Transmission Workshop CERC, 805 Brook St., Bldg. 4, Rocky Hill, CT
	February 23, 2010	11:30am	CHP Workshop DOT Research Offices, 280 West Street, Rocky Hill, CT
	March 5, 2010		CEAB Board Meeting *(Hearing comments, preliminary recommendations)*
	April 9, 2010		CEAB Procurement Report Filed with DPUC *(Final Vote)*
	TBD		DPUC Uncontested Proceeding to Review 2010 Plan

APPENDIX

Transmission: ISO – NE RNS Rates



RENEWABLES: 20-year levelized cost of renewable technologies - 2010 with PTC



**Fuel Cell and Combined Cycle costs do not include carbon tax*

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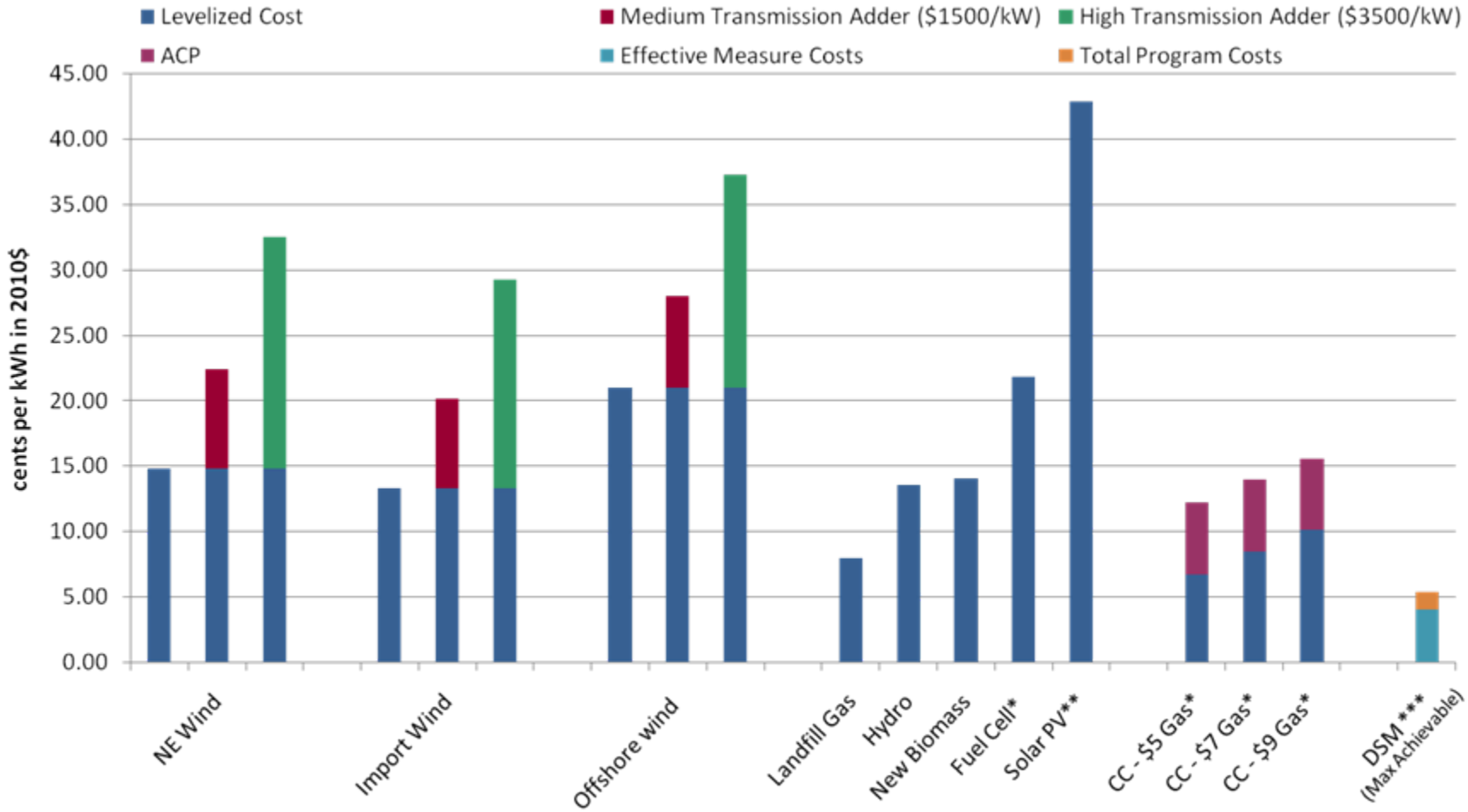
RENEWABLES: 20-year levelized cost of renewable technologies - 2020 without PTC



** Fuel Cell and Combined Cycle costs do not include carbon tax*

*** Solar PV costs need to be adjusted to incorporate technology improvements between 2010 and 2020*

*** Costs are based on KEMA savings and cost estimates

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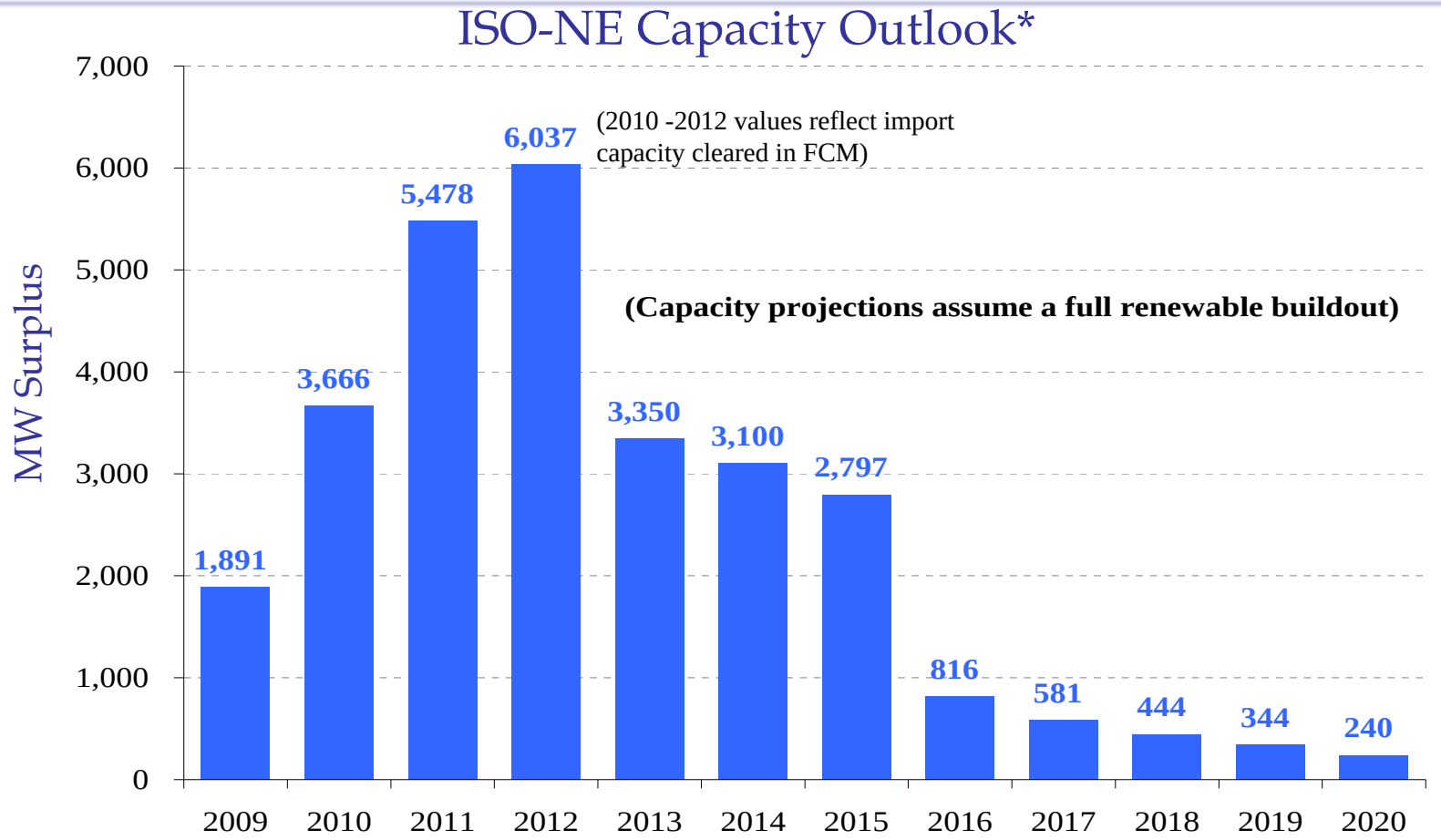
Key Objectives - Reliability

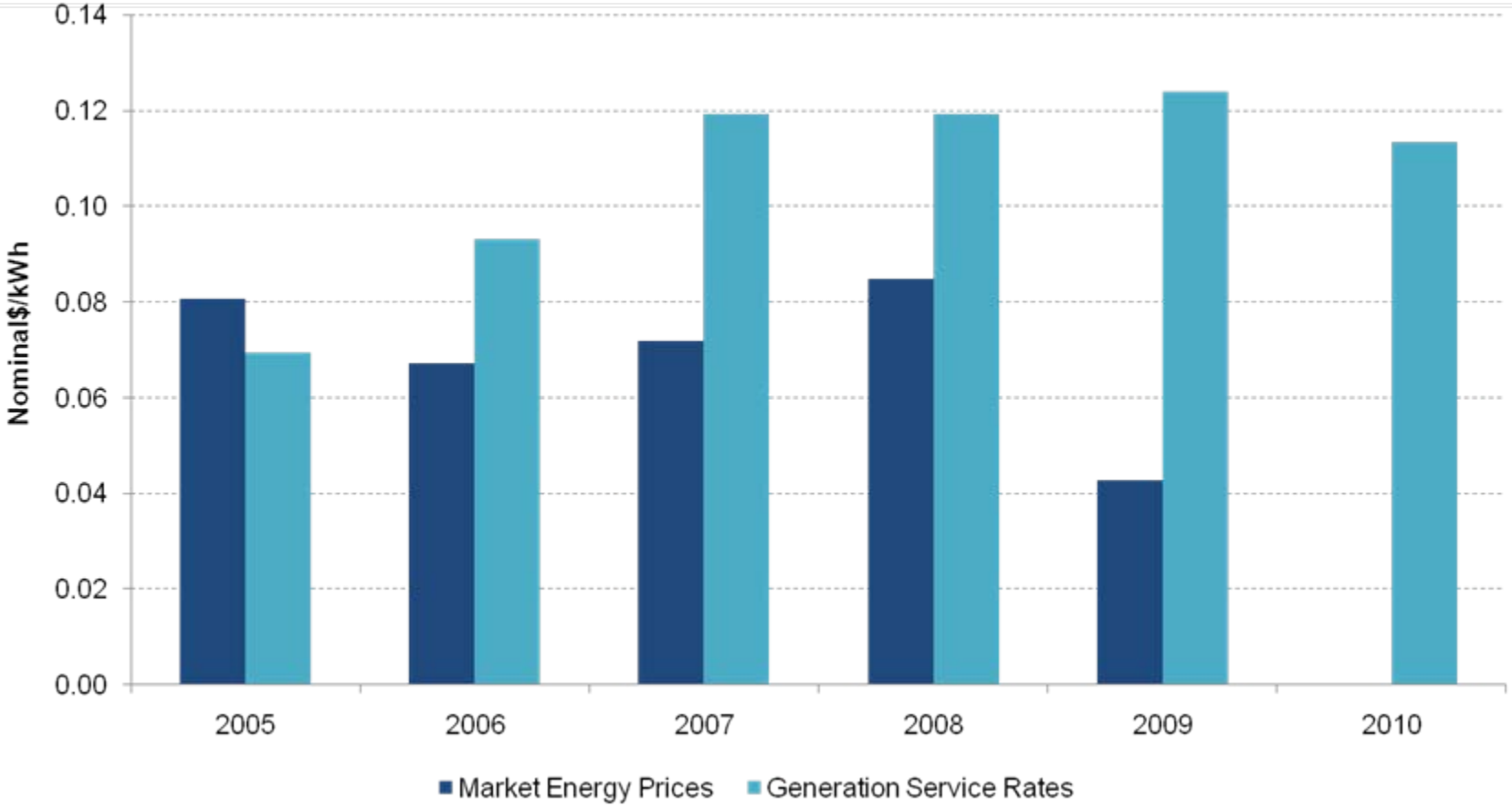
Near-term Surplus Capacity - CT & NE



* Total generation in Connecticut increased from 2009, largely due to 2012 addition of Kleen, (620 MW), the addition of cost of service peaking units (716 MW), and some renewables, including Project 150 contracts.
* Retirements are estimated at 2,446 MW in New England (1,504 MW in Connecticut) with 826 MW in 2013 and 1,620 MW in 2016.
* Assumes New England needs to add about 4,000 MW of new wind supply and 800 MW of other new renewable generation to meet RPS.

Key Objectives - Low Cost

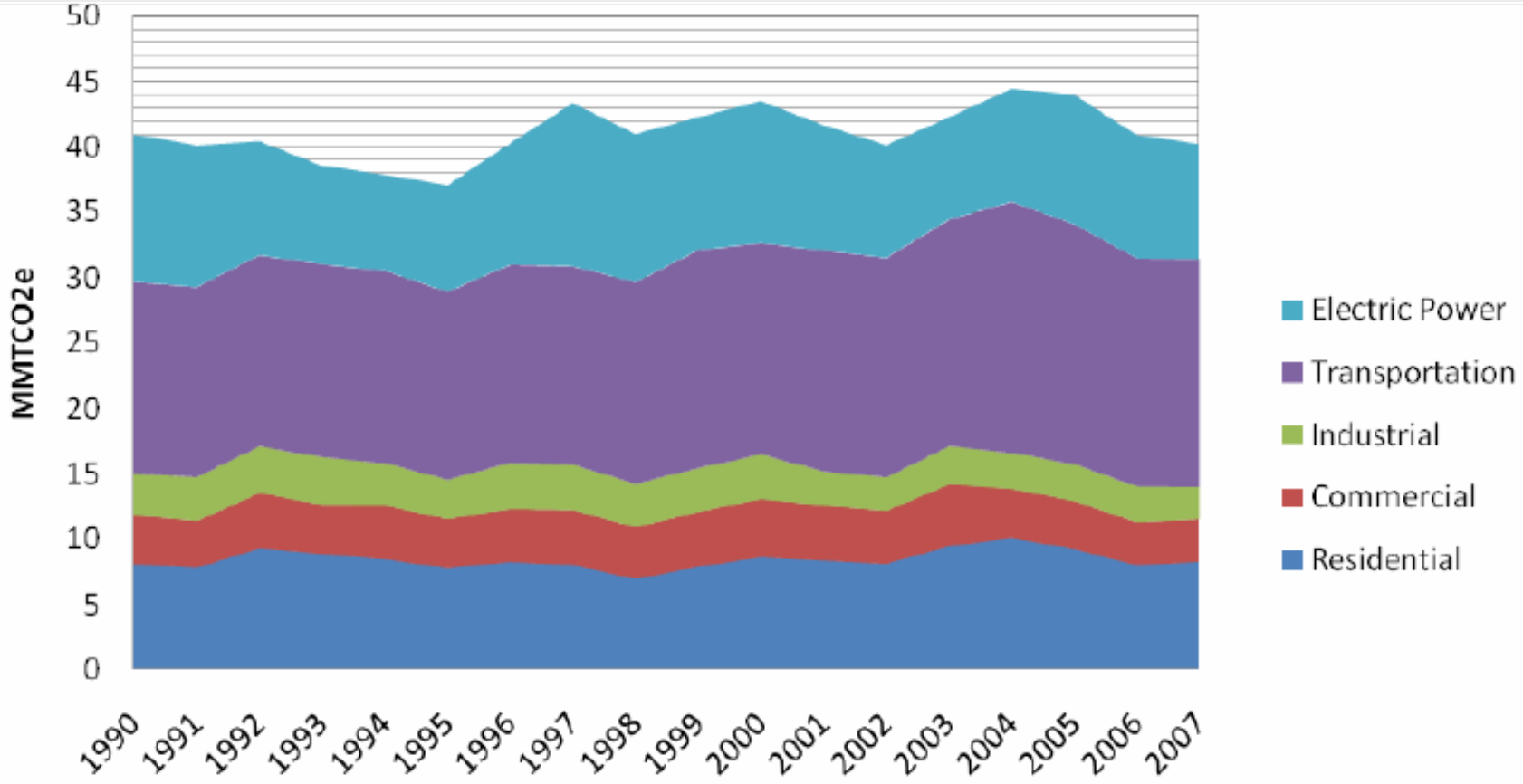
Connecticut Annual Market Energy Prices and Generation Service Rates



Key Objectives – Environmental Requirements

Historical CT CO_2 Emissions

Connecticut Fossil fuel Combustion CO2 by Sector
1990 - 2007



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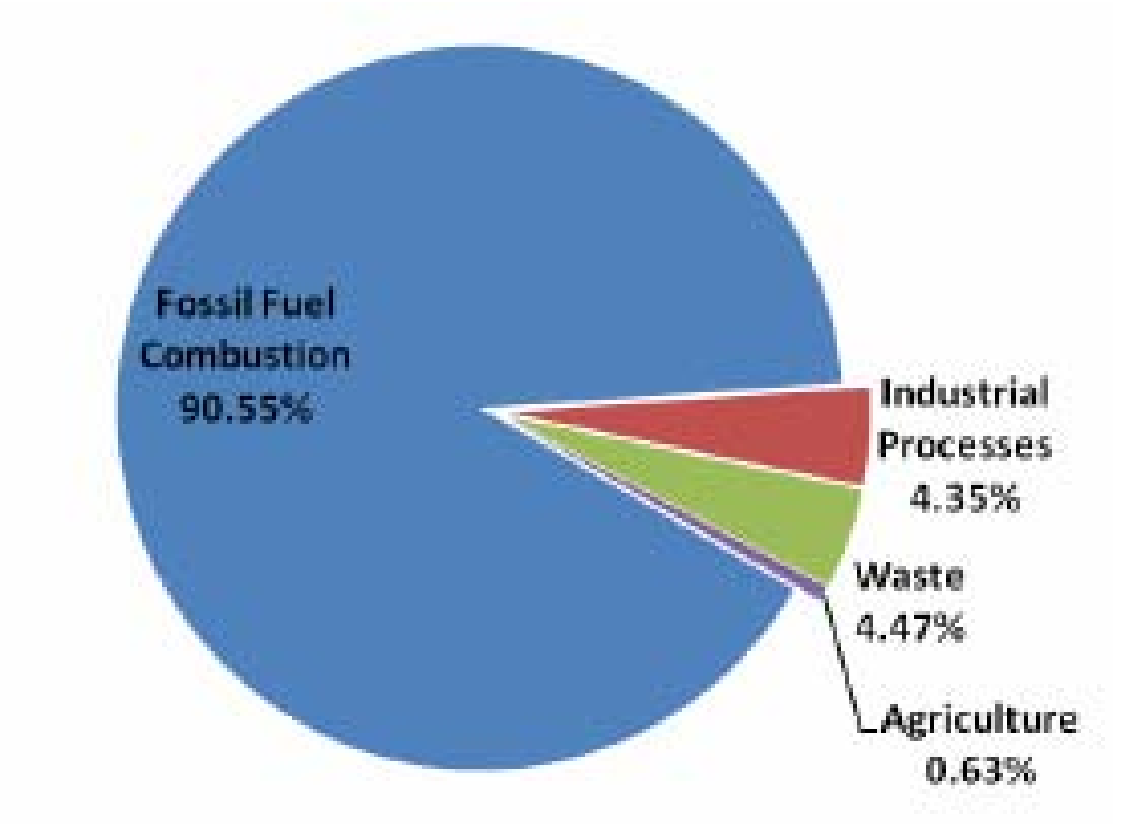
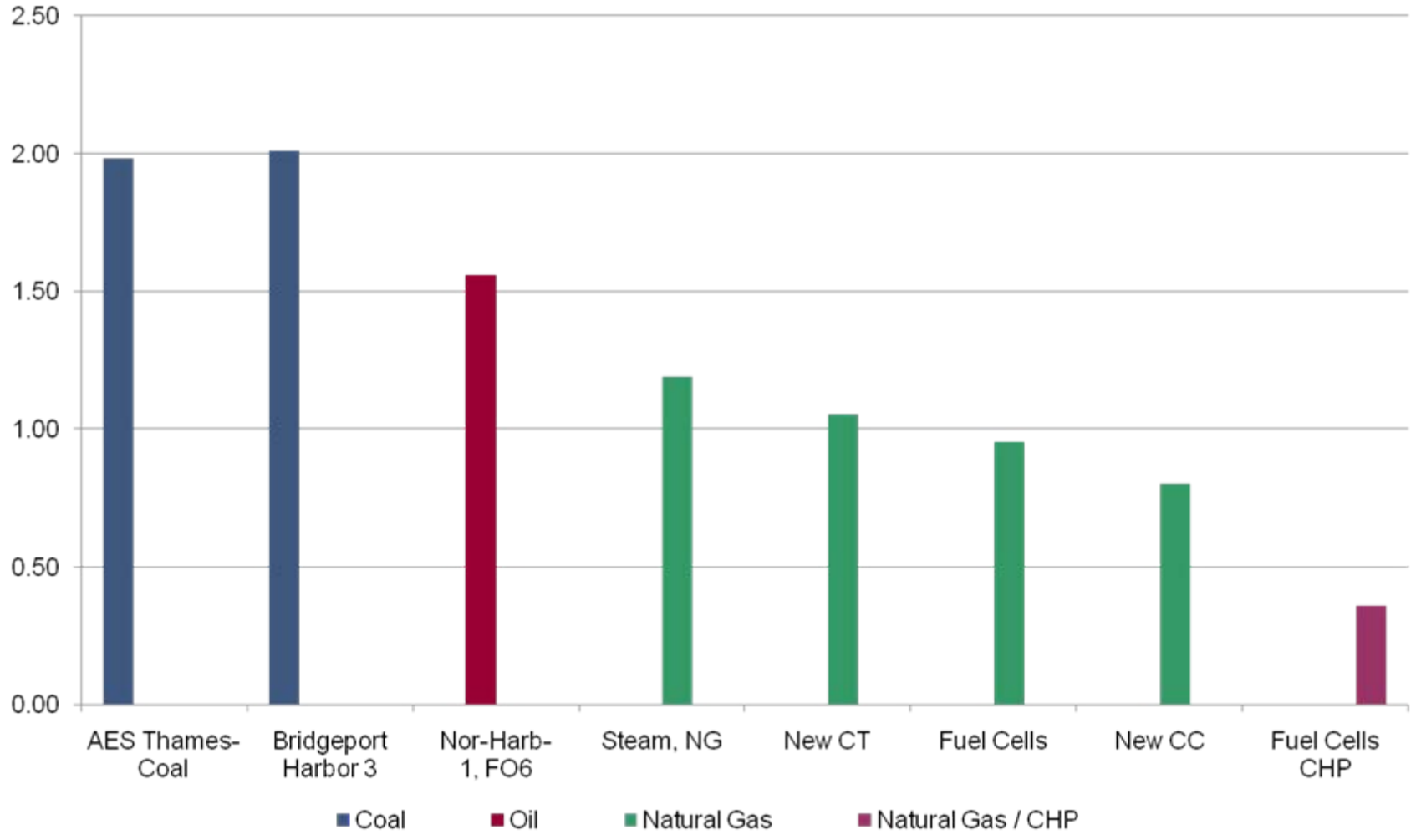
Key Objectives – Environmental Requirements

CT CO_2 Emissions by Source

- Connecticut GHG Emissions by Source
- 2006



CO2 Emissions for Generating Technologies – lbs/kWh



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Key Objectives – Environmental Requirements

NOx Reduction Targets

Key Issues:

- Connecticut is in non-attainment of federal ozone standards
- Emissions on High Electric Demand Days (HEDD) continue to exceed limits
- Clean Air Interstate Rule is likely to require reduced NOx and SOx emissions
- Significant capital investments to achieve NOx, Sox particulate and Mercury reductions

Limits*:

Current limit - .15 lbs/MMBtu *(with trading)*

2013 - .125 lbs/MMBtu *(expected limits)*

2017 - .07 lbs/MMBtu *(expected limits)*

Connecticut High Energy Degree Day (HEDD) Target - 42.7 tons/day

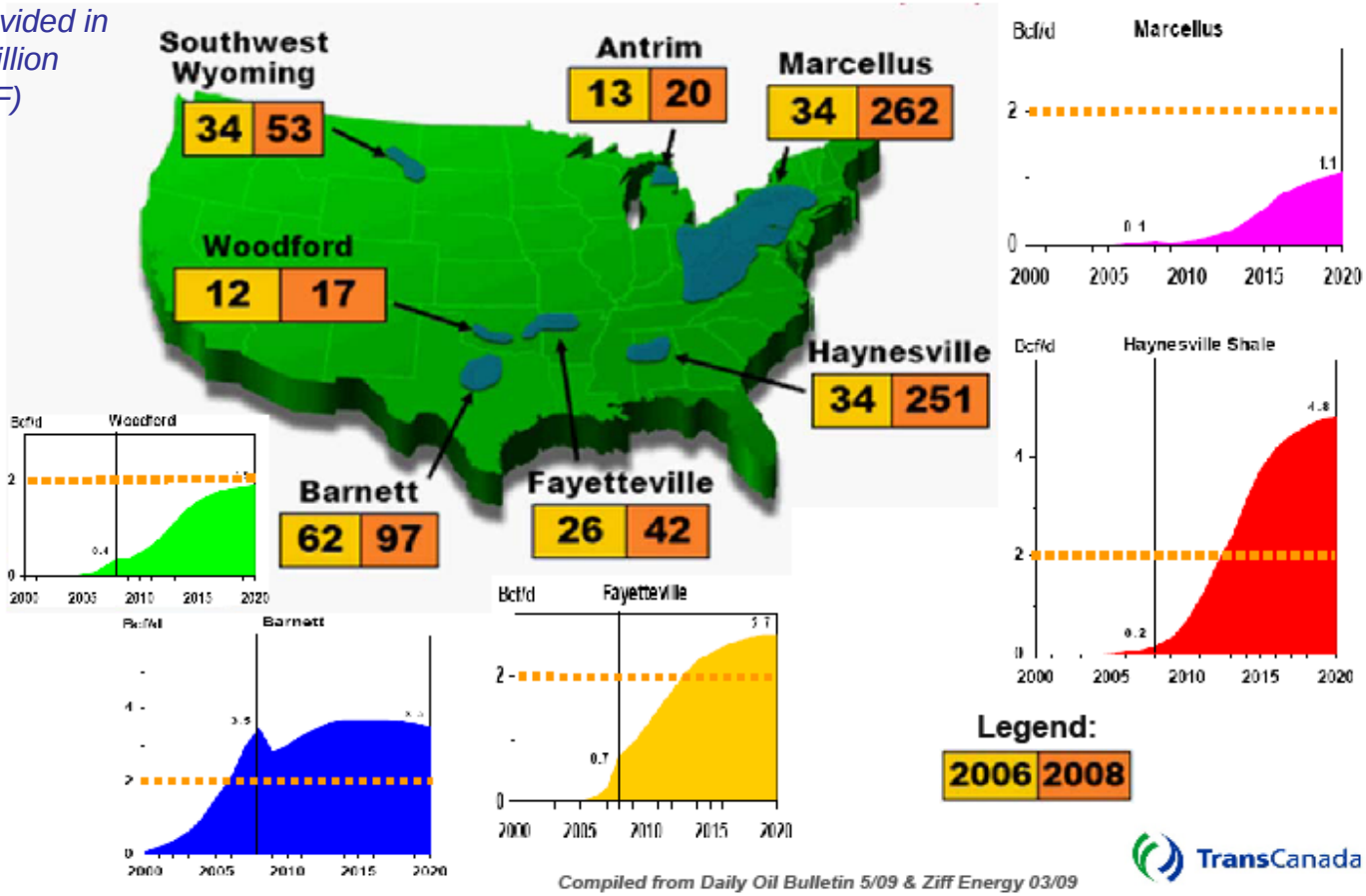
*contains limits on emission rates at individual generation units.

Key Drivers - Natural Gas Supply

Profound Changes – Shale Revolution

Shale Gas Resource Estimates

** Note: data provided in the map is in Trillion Cubic Feet (TCF)*

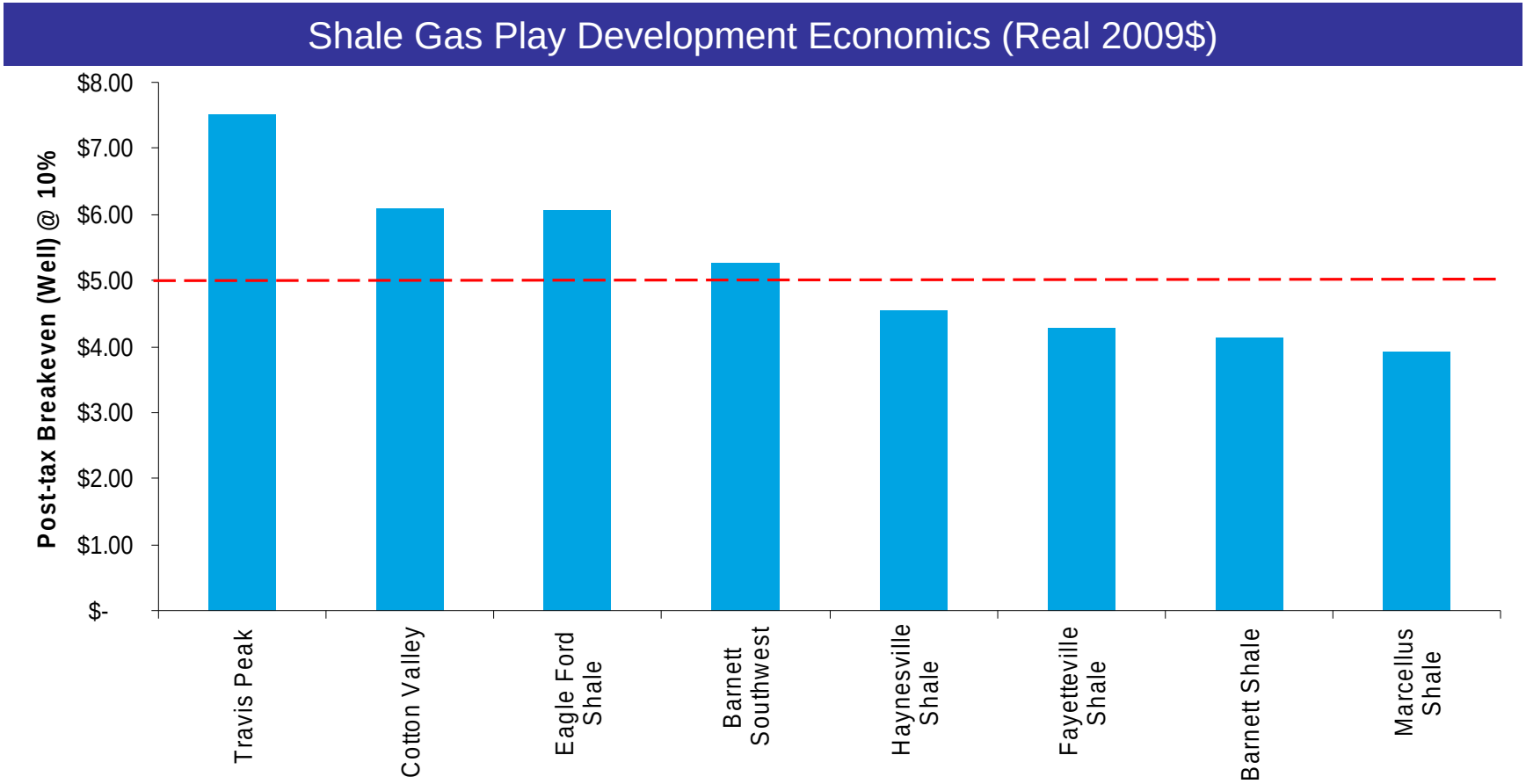


Compiled from Daily Oil Bulletin 5/09 & Ziff Energy 03/09

Key Drivers - Natural Gas Supply

Profound Changes – Shale Revolution

Estimate for Development Wells in Four L48 Shale Plays Break Even at Prices Below $5.00/MMBtu, With Some at $4 (Or Even Below)

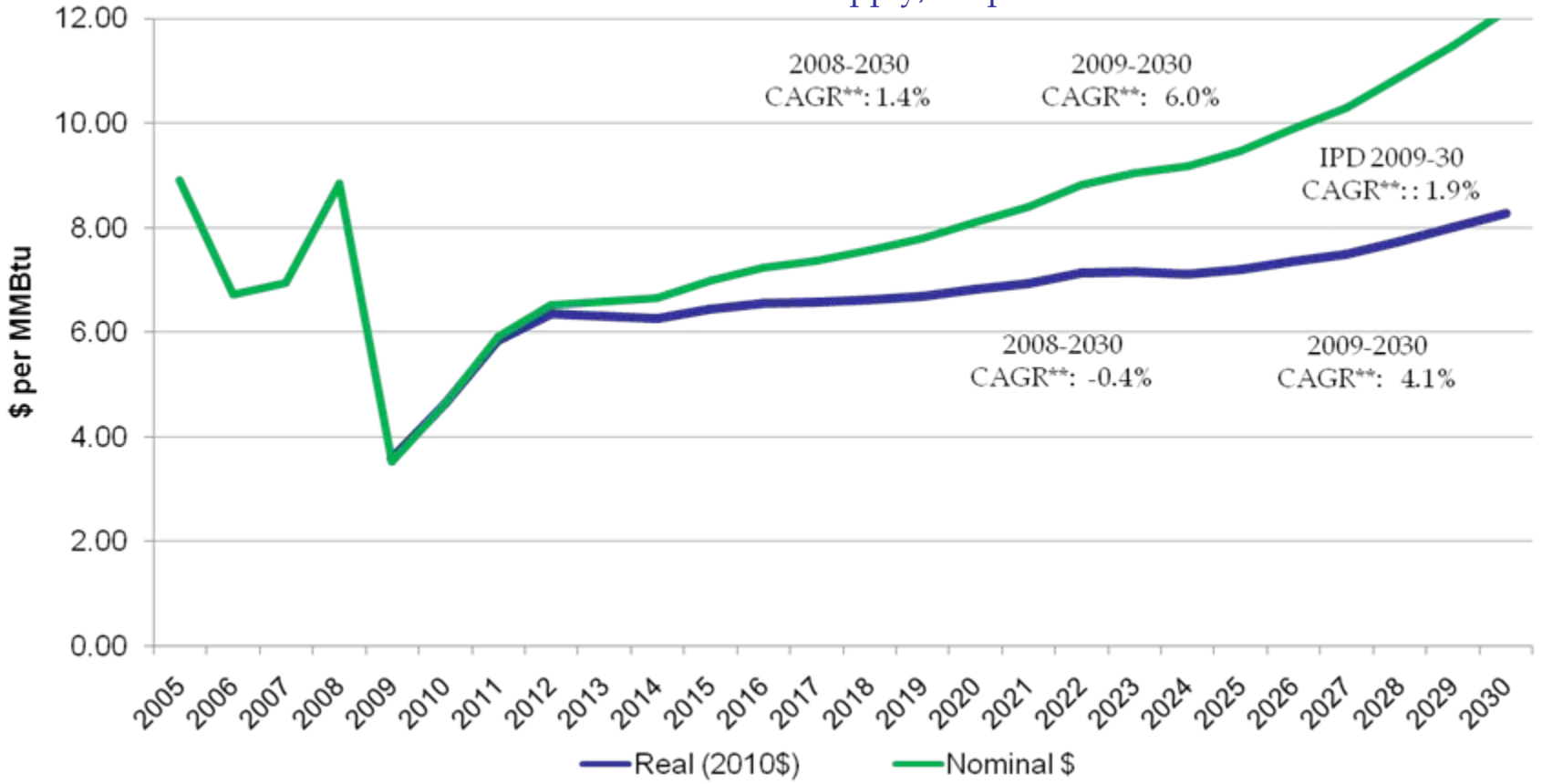


Key Drivers - Natural Gas Supply

Moderating Natural Gas Prices

Henry Hub Spot Price $/MMBtu

EIA AEO 2010* Table 13. Natural Gas Supply, Disposition and Process



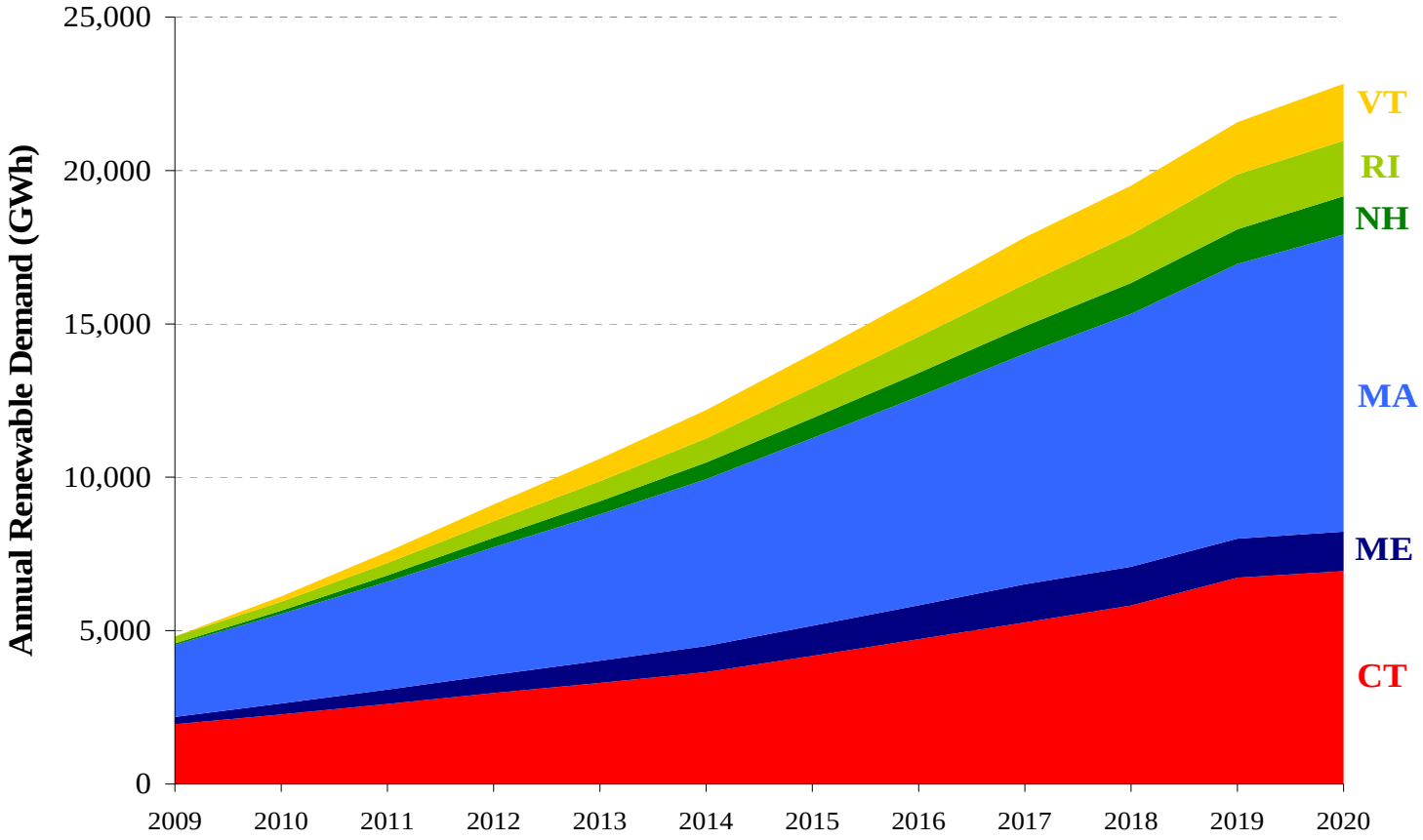
** Data is from November 18, 2009*

*** Compound Annual Growth Rate (CAGR)*

Key Drivers – Renewable Policy

Increasing Renewable Energy Requirements

Renewable Policy: New England Class I Renewable Demand to 2020*

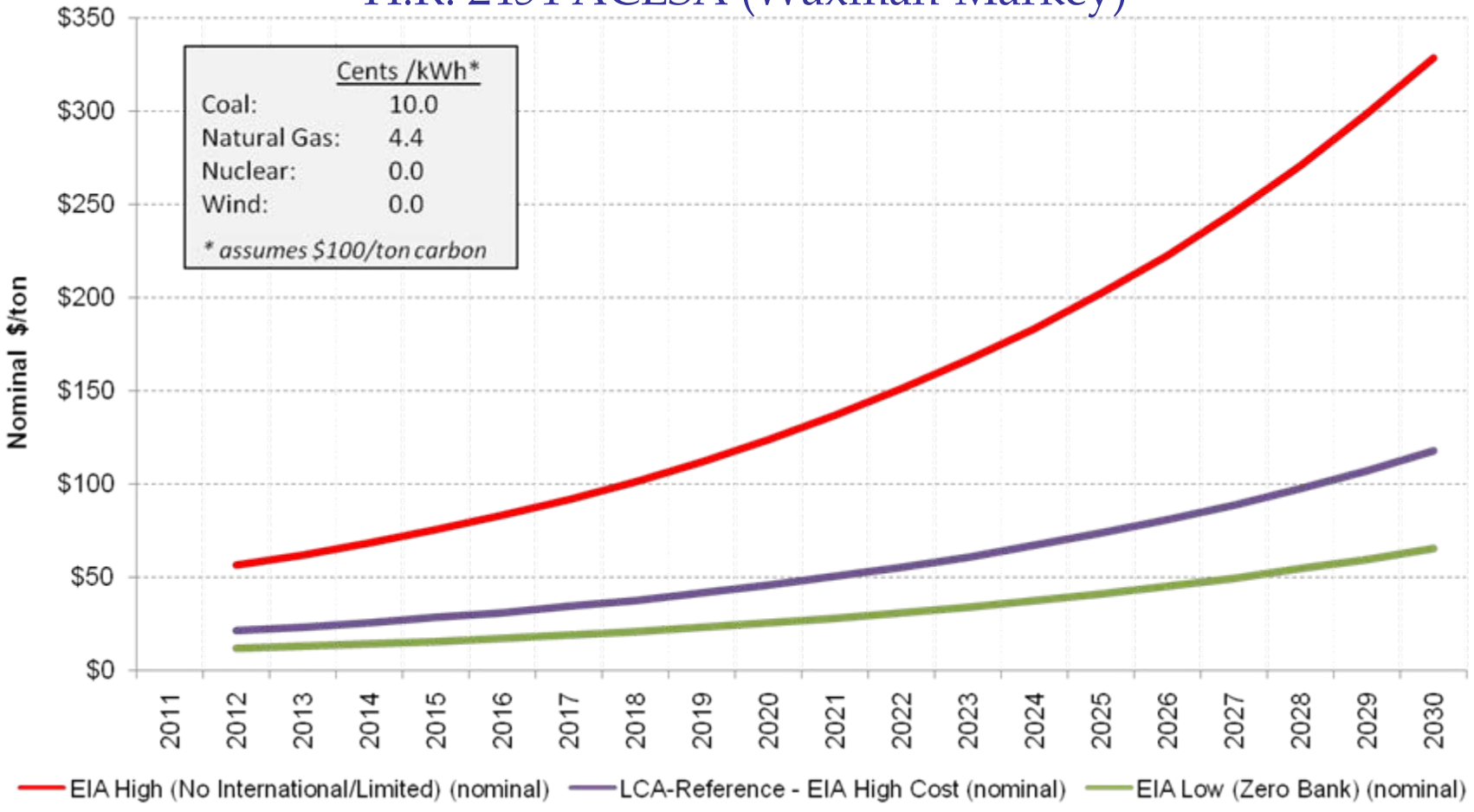


* EDC Renewable buildout to 2020 is assumed to be 4,774 MW (2,066 Off-shore wind, 1,939 MW on-shore wind, 382MW biomass, 247MW Solar PV, 66MW fuel cells, 43 MW landfill gas and 31 MW small hydro)

Key Drivers – Carbon Policy

Potential Costs for CO_2 Allowances

GHG Allowance Price Forecasts (Nominal)
H.R. 2454 ACESA (Waxman-Markey)



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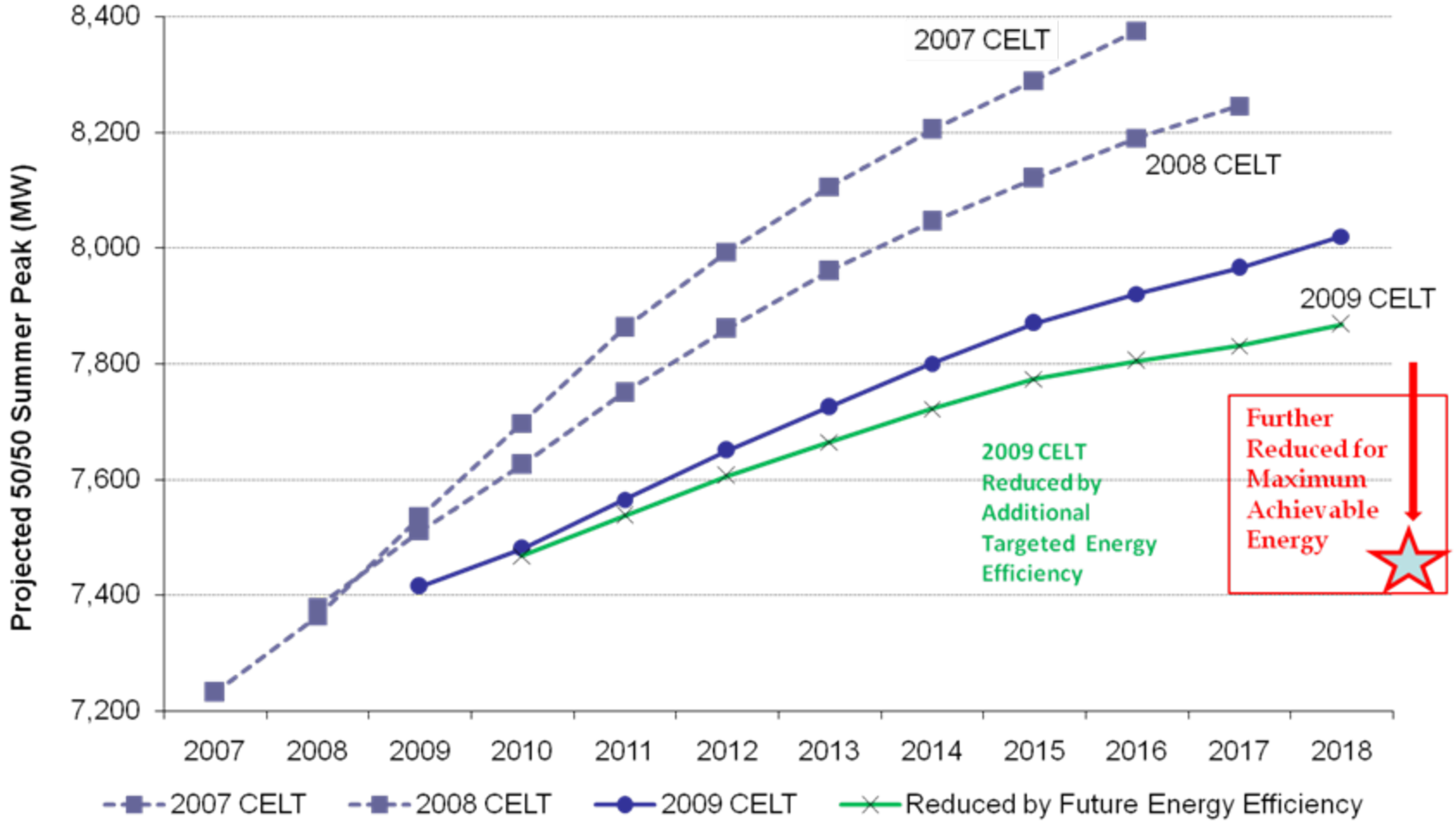
Resource Options – DSM

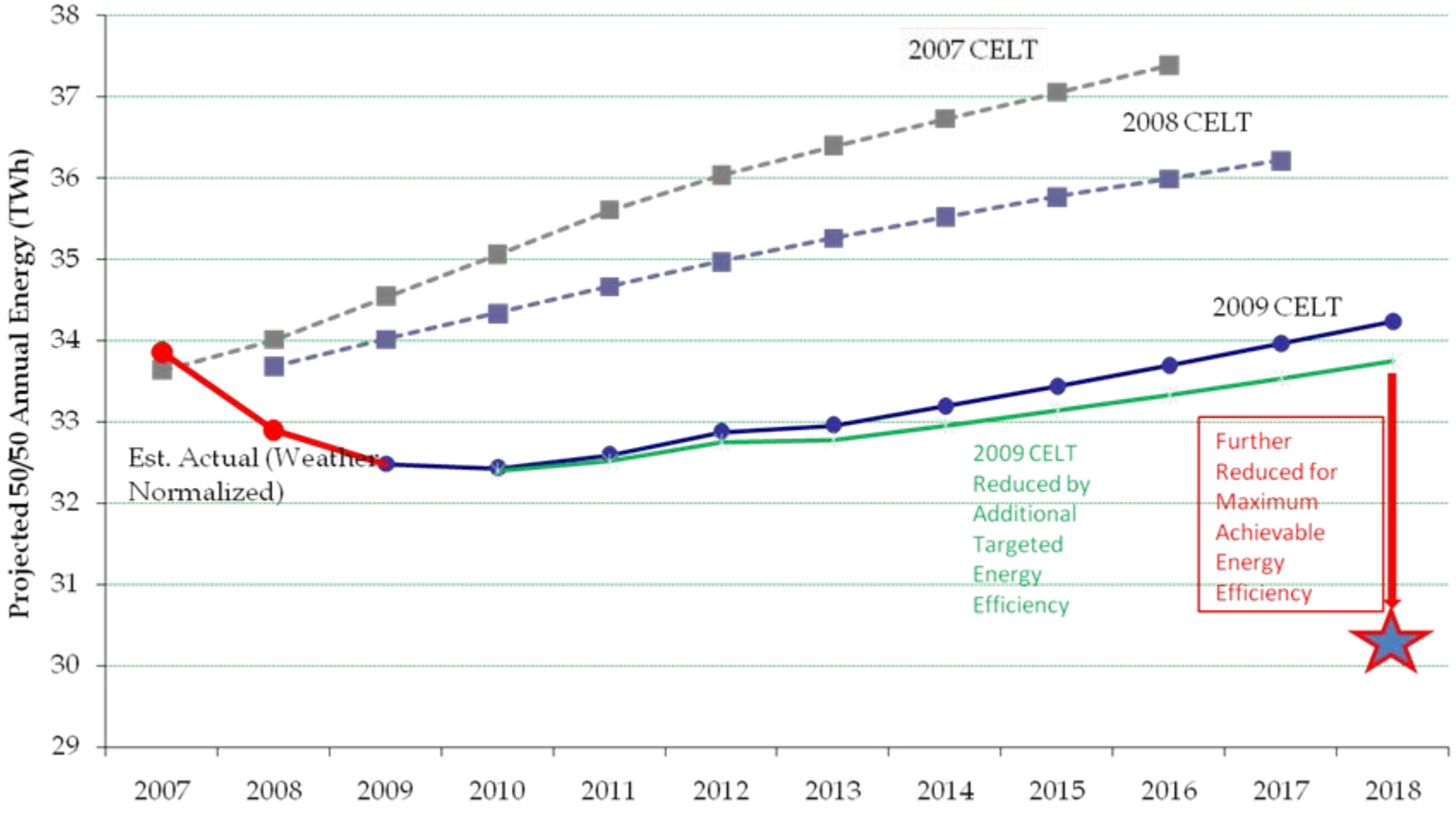
*Connecticut Peak Demand – The Potential to be Flat**



* These numbers do not include Demand Response (DR)

Resource Options - DSM

*Connecticut Energy Requirements – The Potential to be Substantially Lower **



* These numbers do not include Demand Response (DR)

Resource Options – Renewables

Wind Resource Potential in New England

Legend

Class 7: >8.8 (m/s)

Class 6: 8-8.8 (m/s)

Class 5: 7.5-8 (m/s)

Class 4: 7-7.5 (m/s)

Class 3: 6.4-7 (m/s)

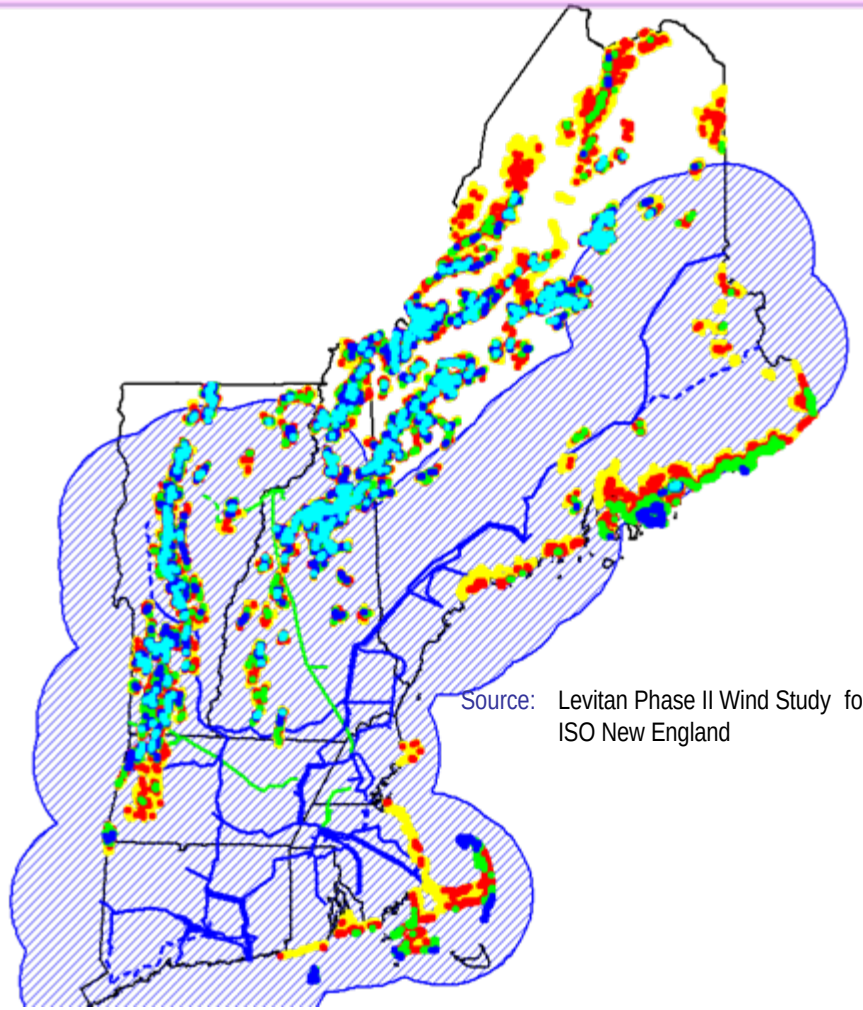
40 Miles

230 kV

345 kV

NE Total Wind Resource Potential:
9,433 MW

1 meter per second roughly 2.2 mph



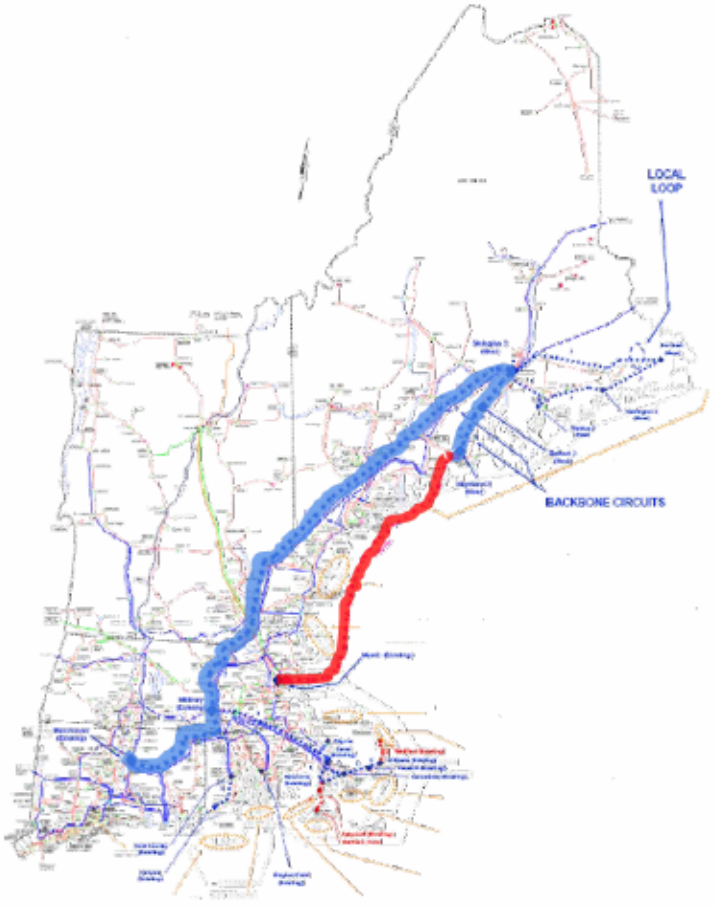
Source: Levitan Phase II Wind Study for ISO New England

Resource Options – Renewables

ISO-NE Estimates for Added Transmission for Wind

Transmission for 5,500 MW of Wind

- Potential transmission to connect 4,000 MW of offshore and 1,500 MW of near-shore onshore wind
- New transmission paths
  - New 345 kV line from Maine to Connecticut
  - New HVDC underwater cable from Maine to Boston
- Local loops to collect wind in Maine
- Preliminary cost estimate: $6 billion



Resource Options – Repowering

Retirement of Aging Fossil Generation

Repowering: Aging Steam Oil / Gas and Coal Units In CT

Unit Name	Fuel	Capacity (MW)
Montville 5	Oil/Gas	81
Middletown 3	Oil/Gas	236
Middletown 2	Oil/Gas	117
Norwalk Harbor 1	Oil	168
Norwalk Harbor 2	Oil	162
Montville 6	Oil	407
Middletown 4	Oil	400
Bridgeport Harbor 2	Oil	130
New Haven Harbor	Oil/Potential Gas	461
Bridgeport Harbor 3	Coal	372
AES Thames	Coal	181
Total		**2,715**