Synapse
Energy Economics, Inc.

Creating a Future

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15 May 2008

REV Distributed Energy Conference, Stratton, VT

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Topics for Today

- What we know today
- What we think we know about the future
- Uncertainties and unknowns
- A strategy for going forward

ISO Scenario Analysis Report

- Predominance of gas generation under all scenarios makes natural gas the marginal unit in most hours
  - Natural Gas generation sets hourly marginal price
  - Natural Gas market volatility will transfer to energy market
  - Global natural gas market limits ability to change energy price
- Carbon emissions have little variability under all scenarios
  - Modest RGGI targets are not achieved
  - More significant reductions appear unattainable
  - Nuclear scenario is an exception
- All new generation options show investment uncertainty
  - Energy and capacity revenues do not support most scenarios
  - Significant infrastructure costs for all

Natural Gas Sets the Energy Price

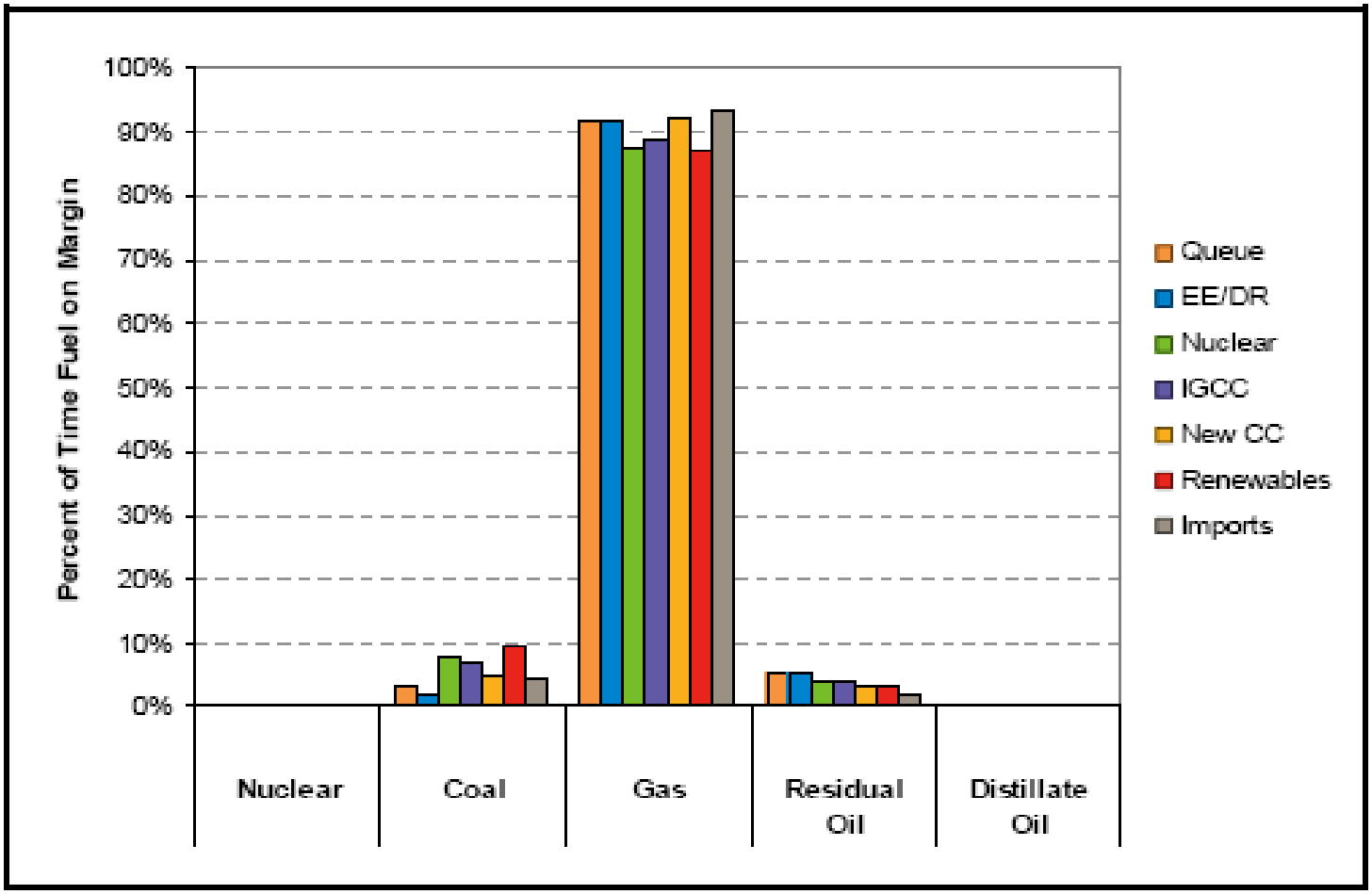


Figure 5-2: Percent of time fuel is on the margin.

Modest RGGI Goals Not Met

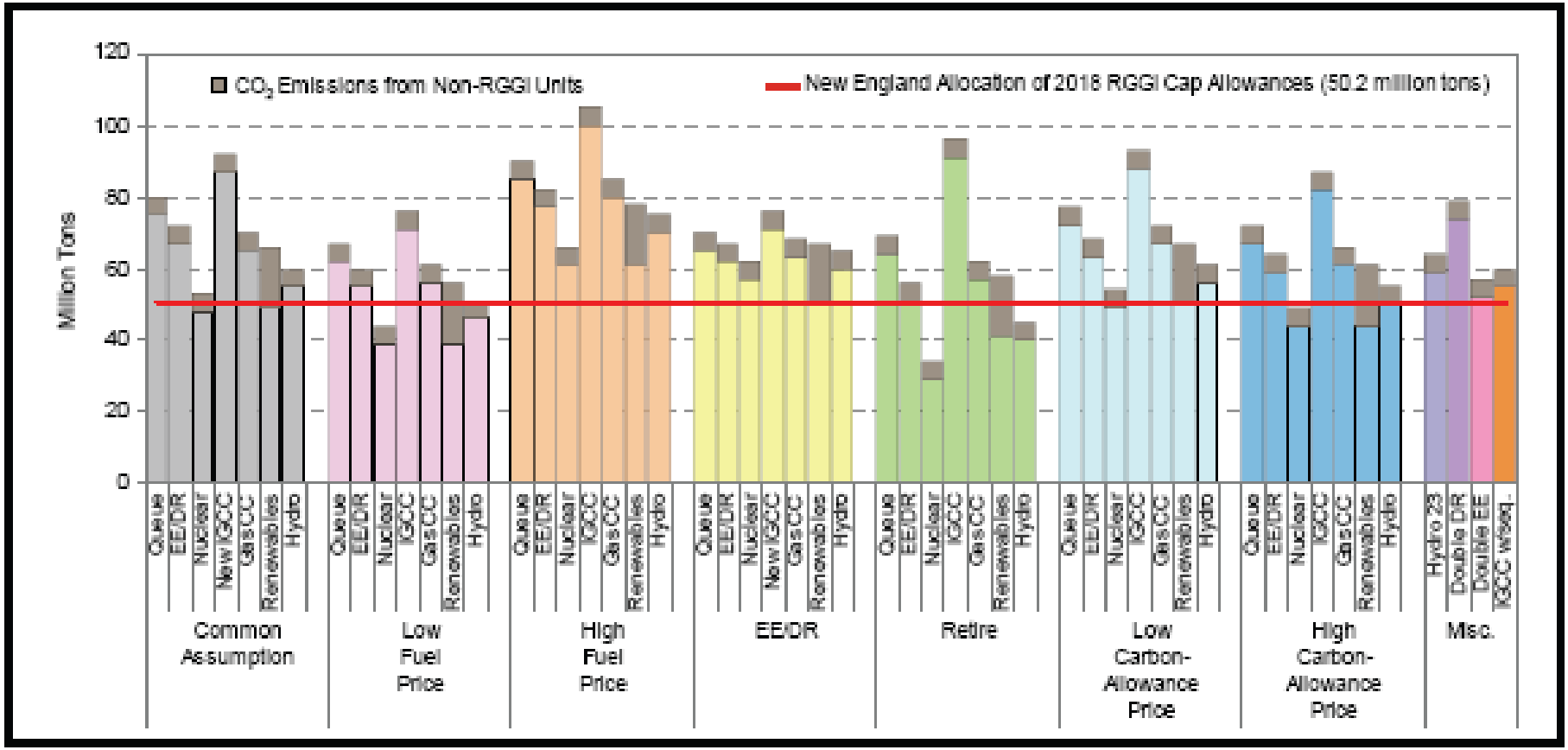


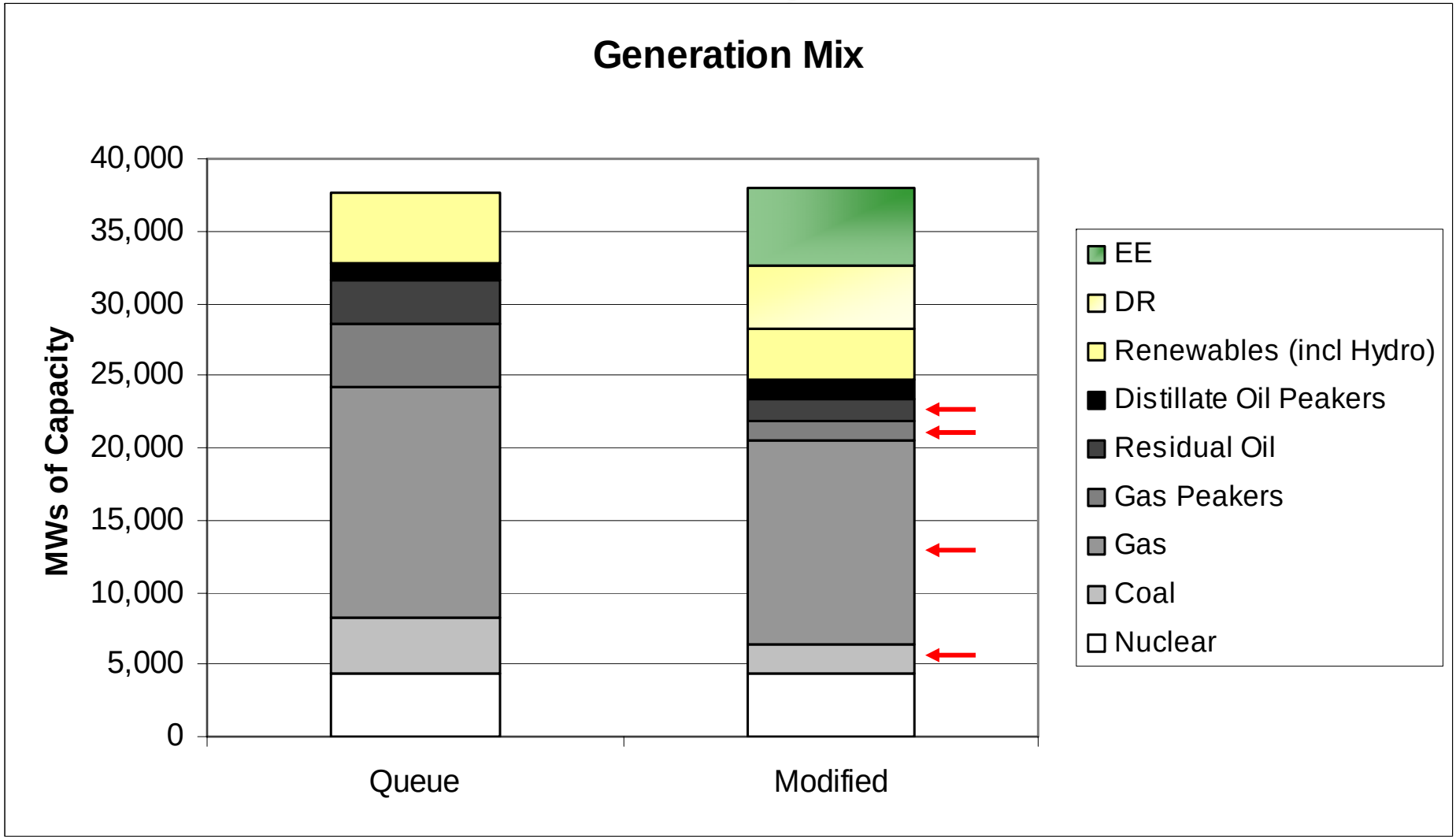
Figure 5-10: Total annual CO_2 emissions, grouped by sensitivity case and showing the New England allocation of the 2018 RGGI cap allowances.

Note: Table includes emissions for units that are not obligated to comply with RGGI requirements.

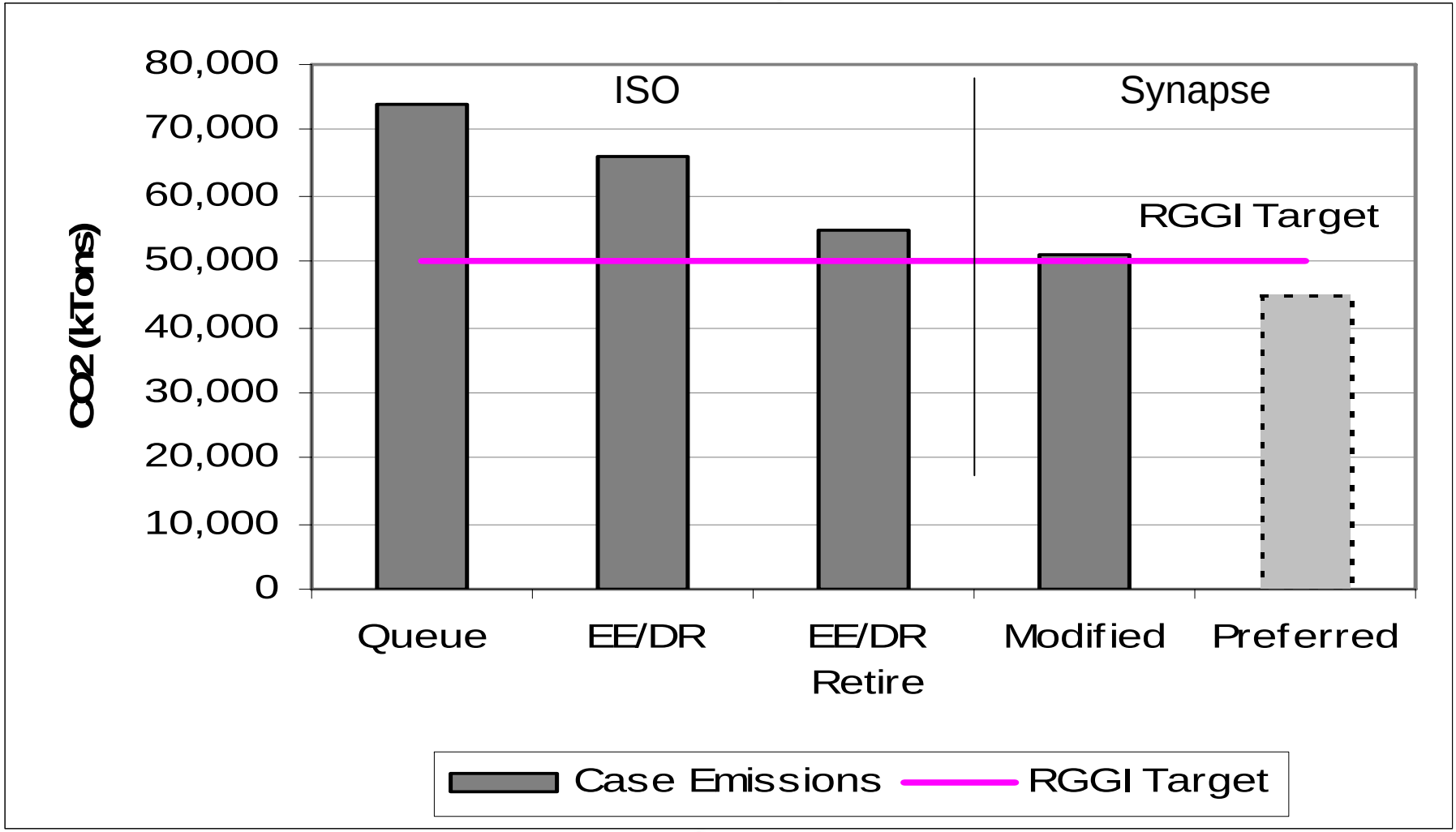
Synapse Companion Report

- The ISO is required to be resource neutral, but we are allowed to choose our future
- Increase efficiency resources to develop Modified scenario
  - Start with ISO's mix of energy efficiency and demand response
  - Blend with the ISO's Double EE scenario
  - Use results of Double EE scenario to estimate energy price
- Implications of Modified scenario
  - Significant reduction in purchased energy (quantity)
  - Small reduction in average annual energy price
  - Carbon emissions almost reach RGGI targets
  - Financial viability appears robust
  - No incremental infrastructure costs (possible savings)

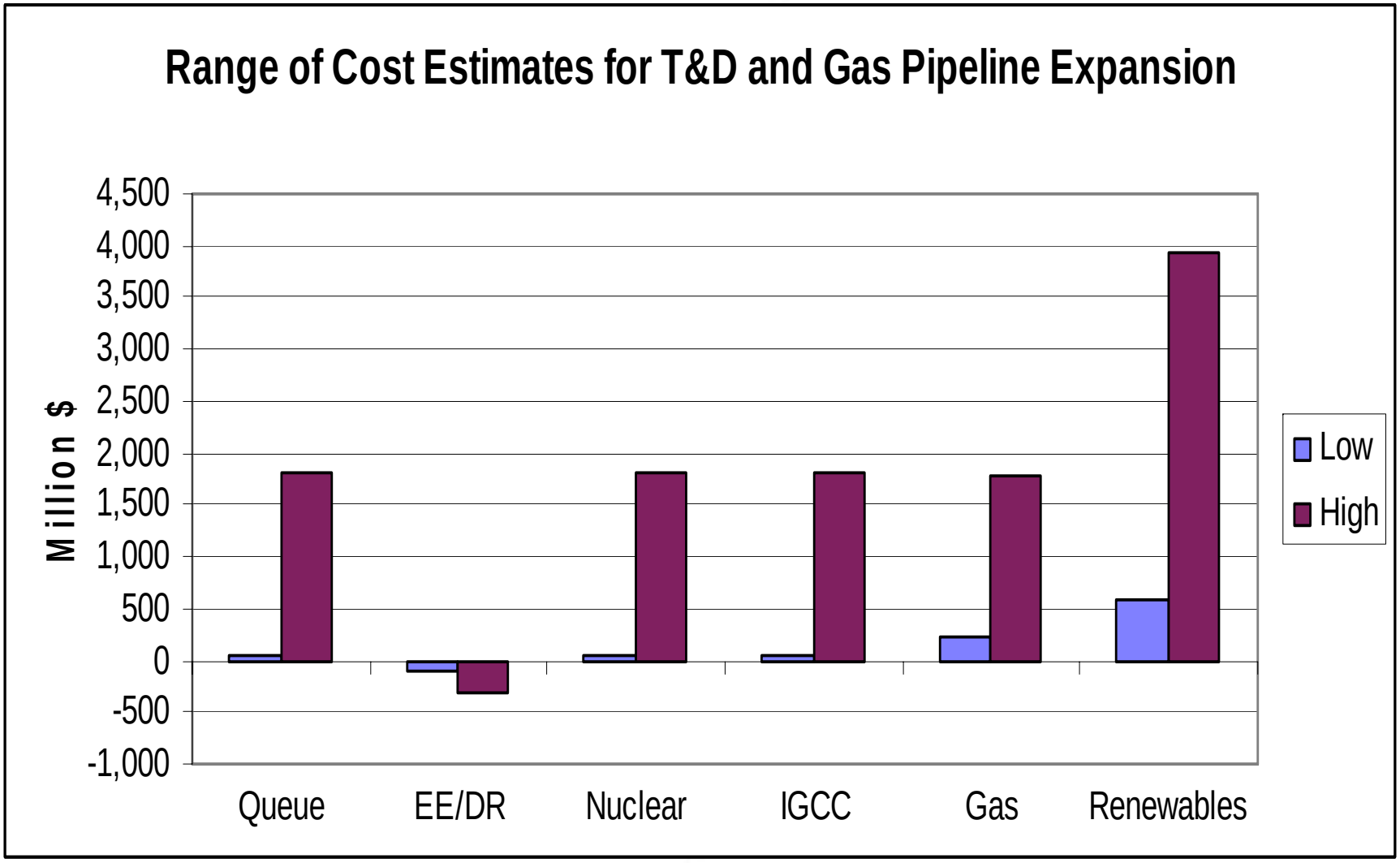
Companion Report to ISO-NE SA



Companion Report to ISO-NE SA



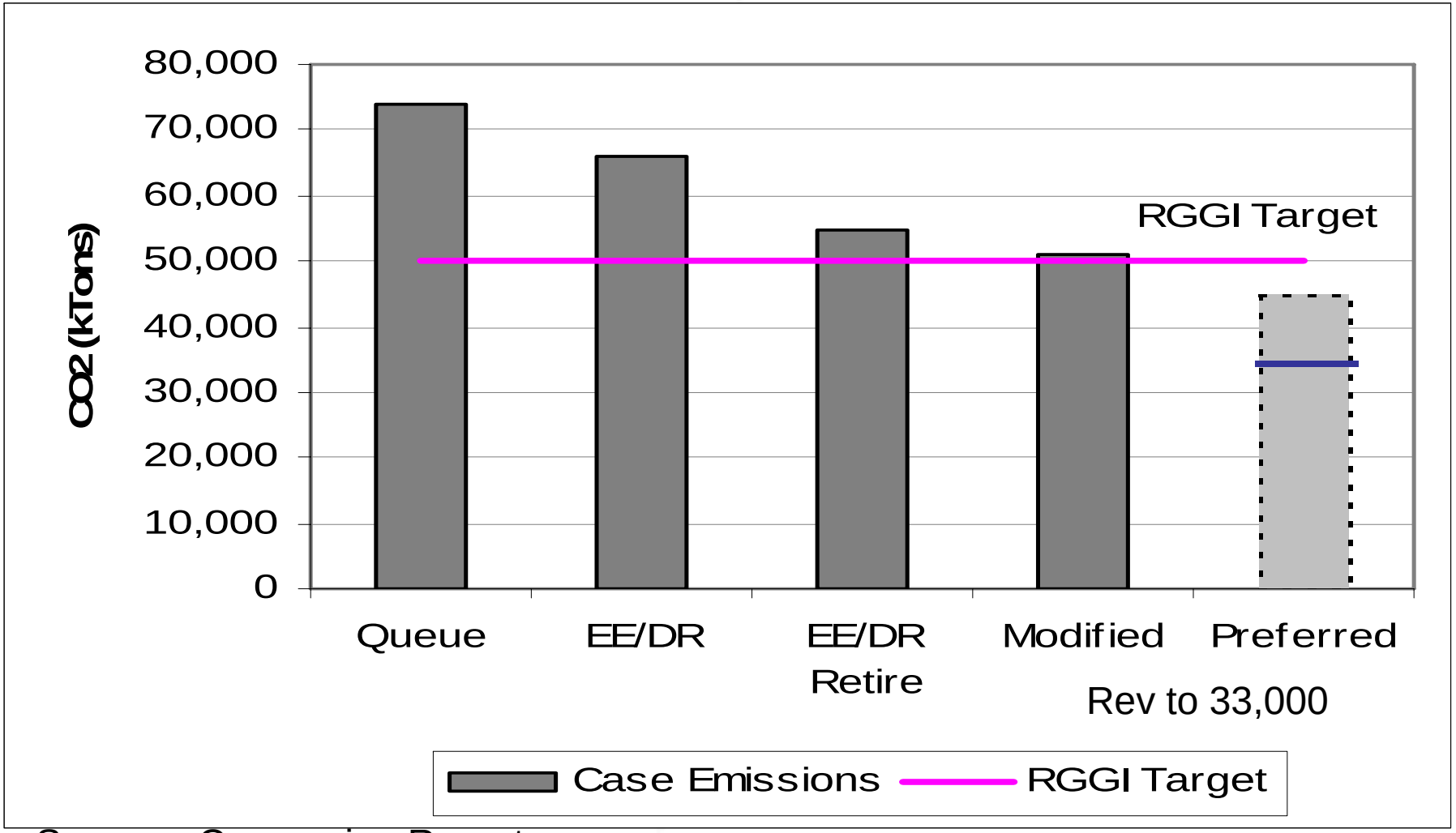
Companion Report to ISO-NE SA



Additional ISO Analysis

- Goals
  - Lower energy consumption
  - Level or reduced peak demand
  - Carbon reductions that exceed modest RGGI goals
  - Reduced need for T&D upgrades
- Modified Scenario results verified by ISO-NE
- Preferred Scenario results more dramatic than expected
  - Carbon reductions significantly **exceed** RGGI
  - Energy consumption and peak load greatly **reduced**
  - Energy clearing prices **decreased** significantly

ISO Scenario Analysis

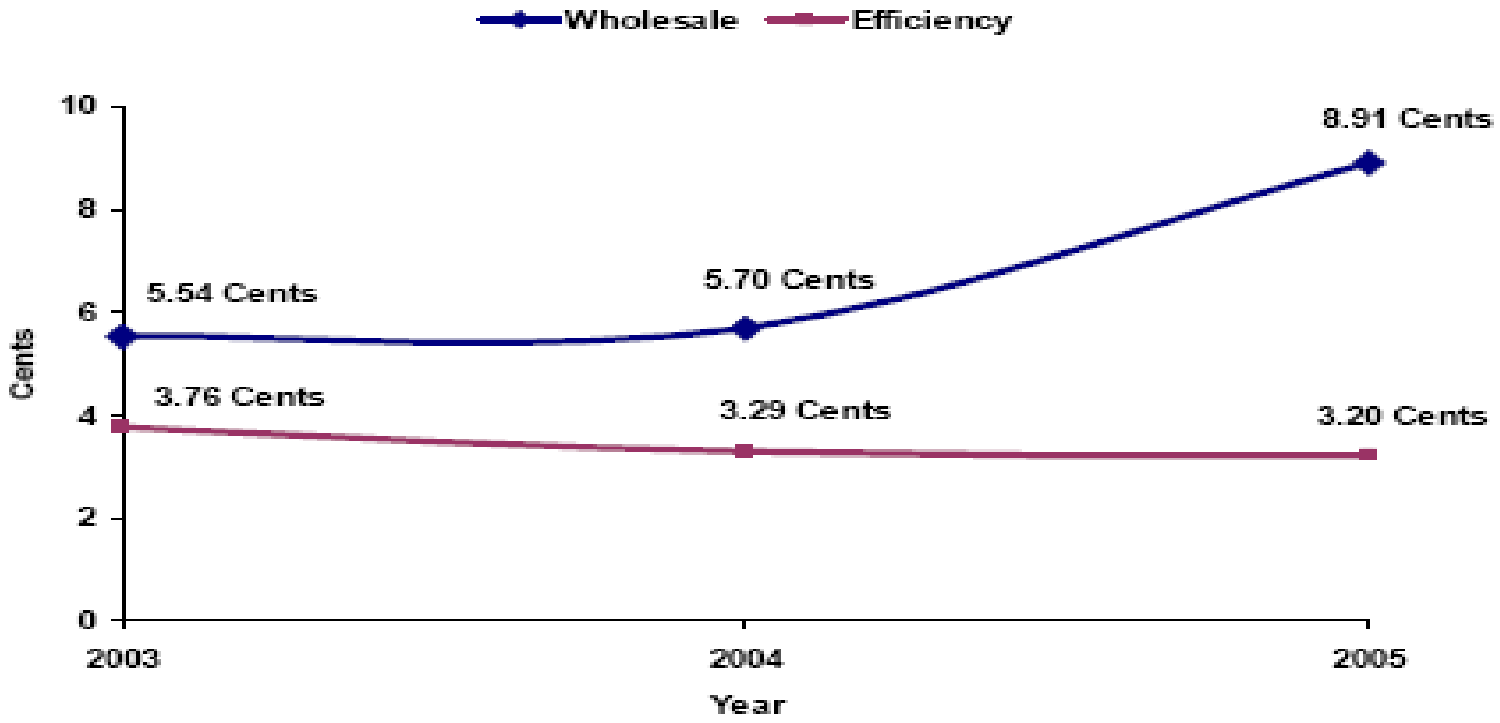


Synapse Companion Report

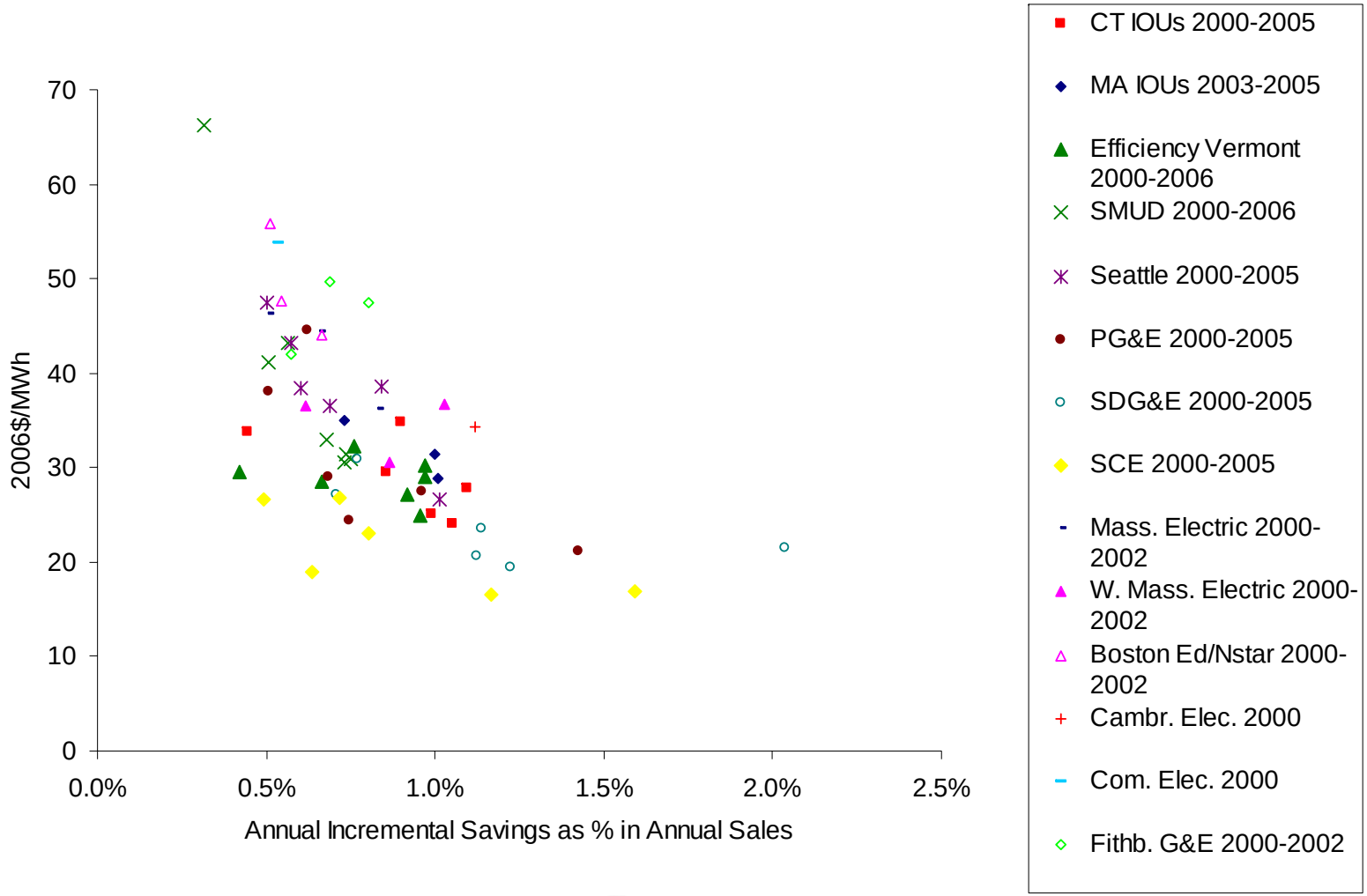
What we know today

MA DOER Report

Chart 1
Costs of Electricity Generation and Energy Efficiency
2003 - 2005



What we know today: Energy Efficiency Costs



State Polices on EE

- Some states have adopted specific targets
  - NY15% by 2015
  - NJ 20% by 2020
  - IL 2% annual savings by 2015 (includes EE)
  - MN 1% annual savings from EE
  - PA 18.5% RPS (includes EE) by 2020
  - NC 12.5% RPS (includes EE) by 2021
  - VA reduce electric consumption 10% by 2022
- Some states have adopted general targets
  - MA- all new load met with DR and EE
  - CT, RI, VT, CA and WA: all cost-effective EE

Possible future: TX

Texas to 2023

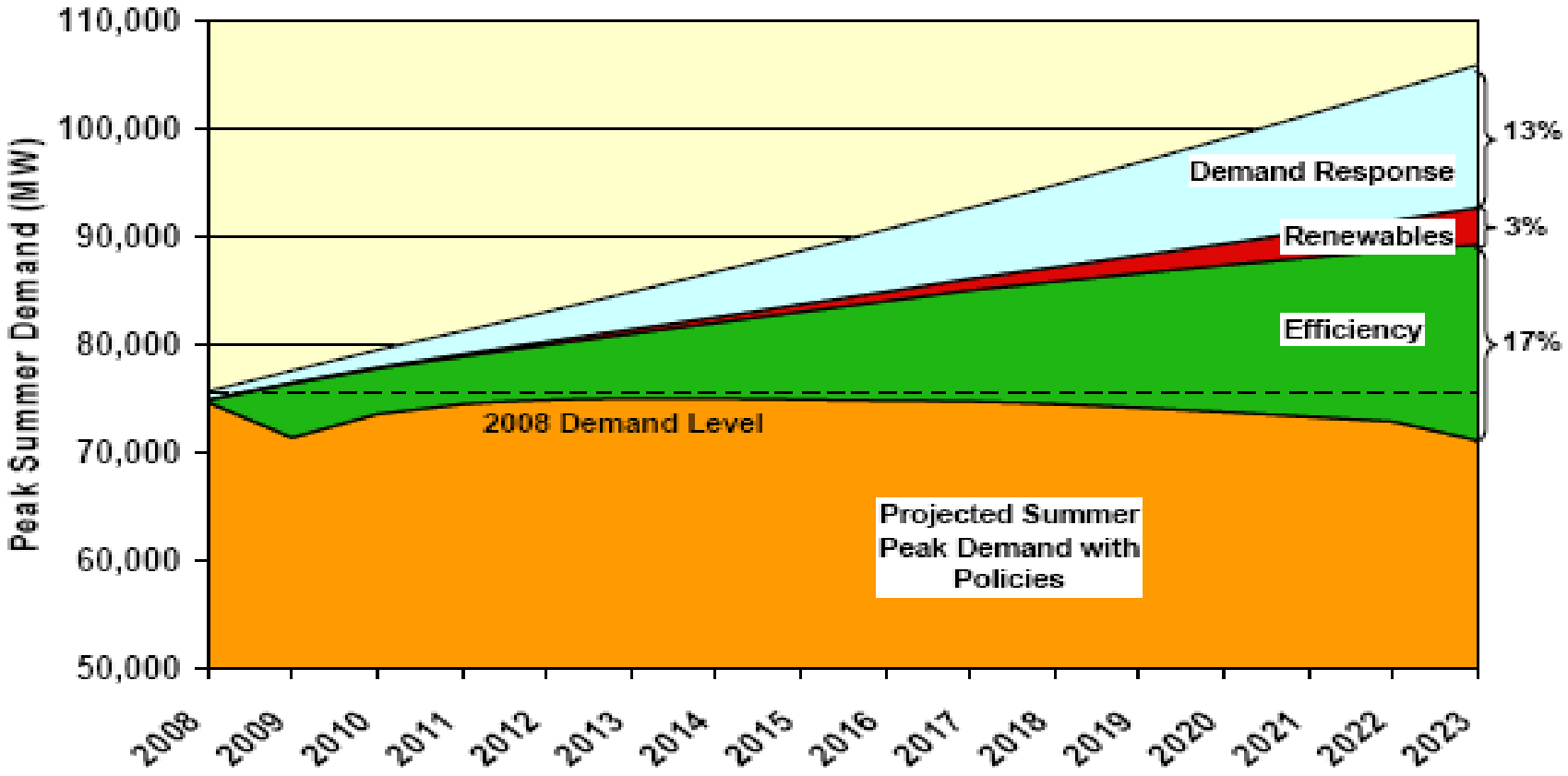


Figure 6: A particularly helpful example of how EE, DR and renewables can help to meet capacity needs is a recent analysis of Texas' growing demand.

Possible future: NY

NY to 2015

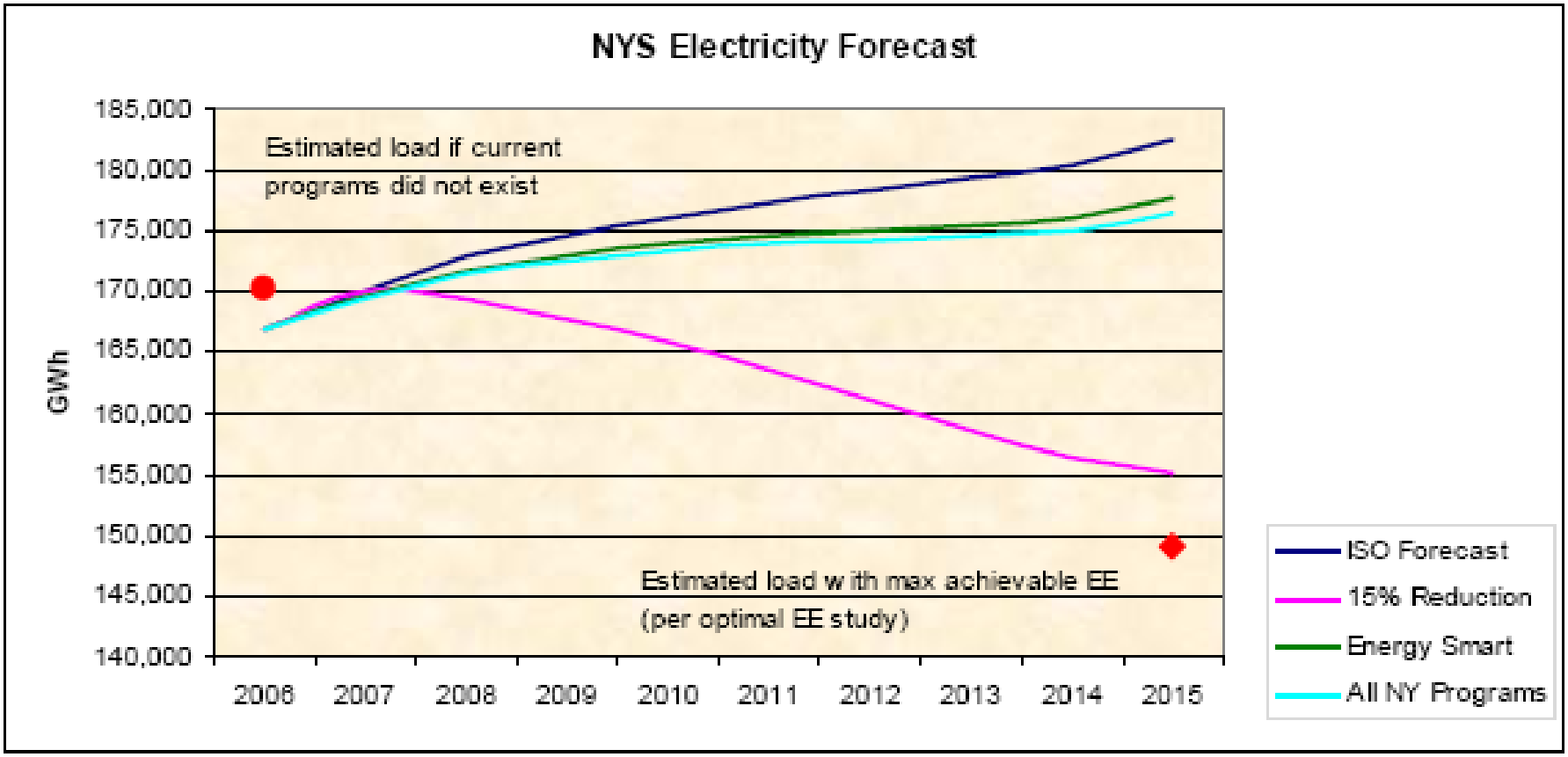


Figure 8: A graph showing the energy impacts of New York's "15 By 15" approach (15% energy reduction by 2015).

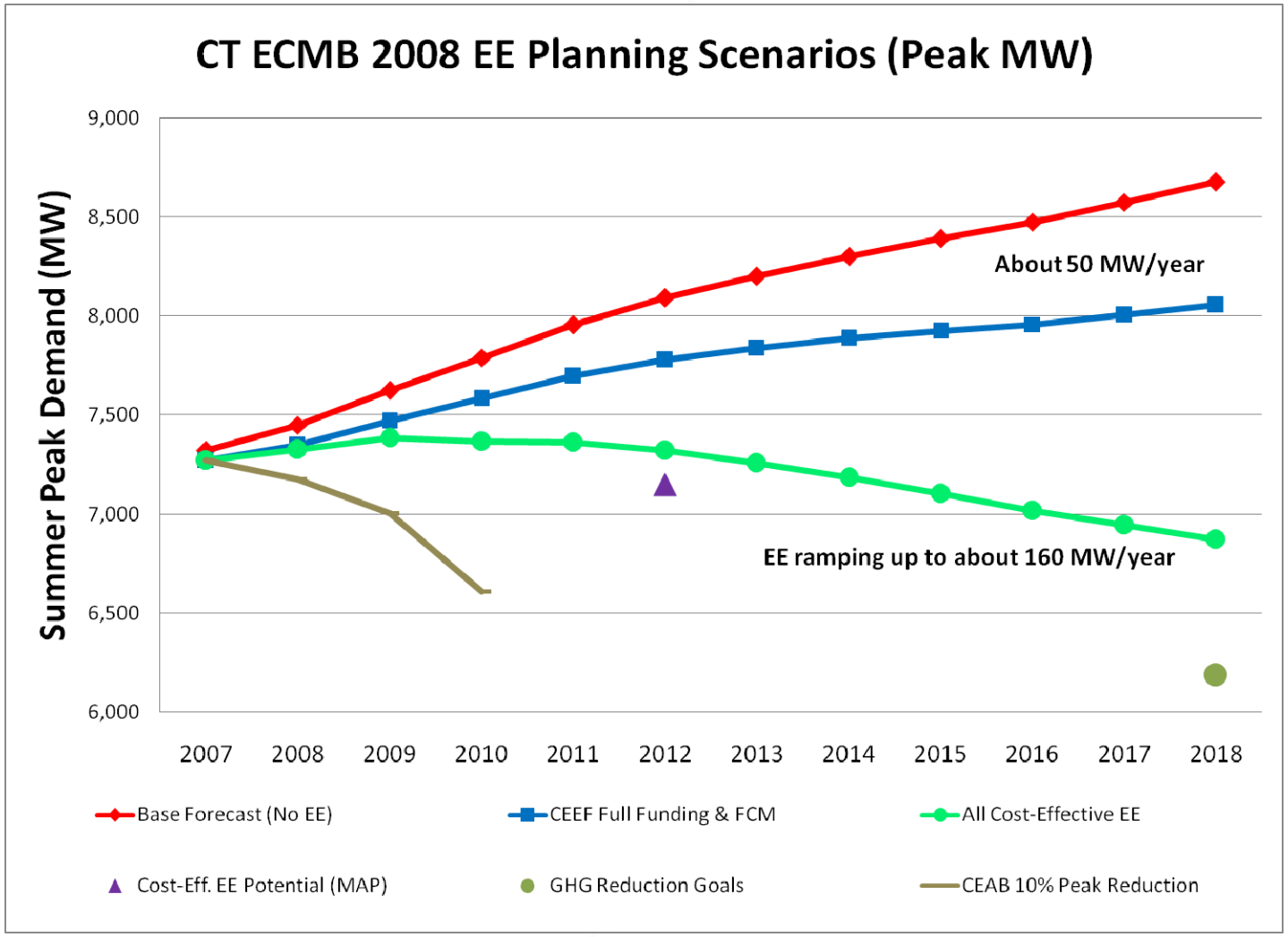
Summary

- Not possible to “build out” to solve problems
- DR and EE:
  - Lowest cost resources
  - Abundant resources
  - Lower carbon emissions
  - Avoid infrastructure costs

Policy issues

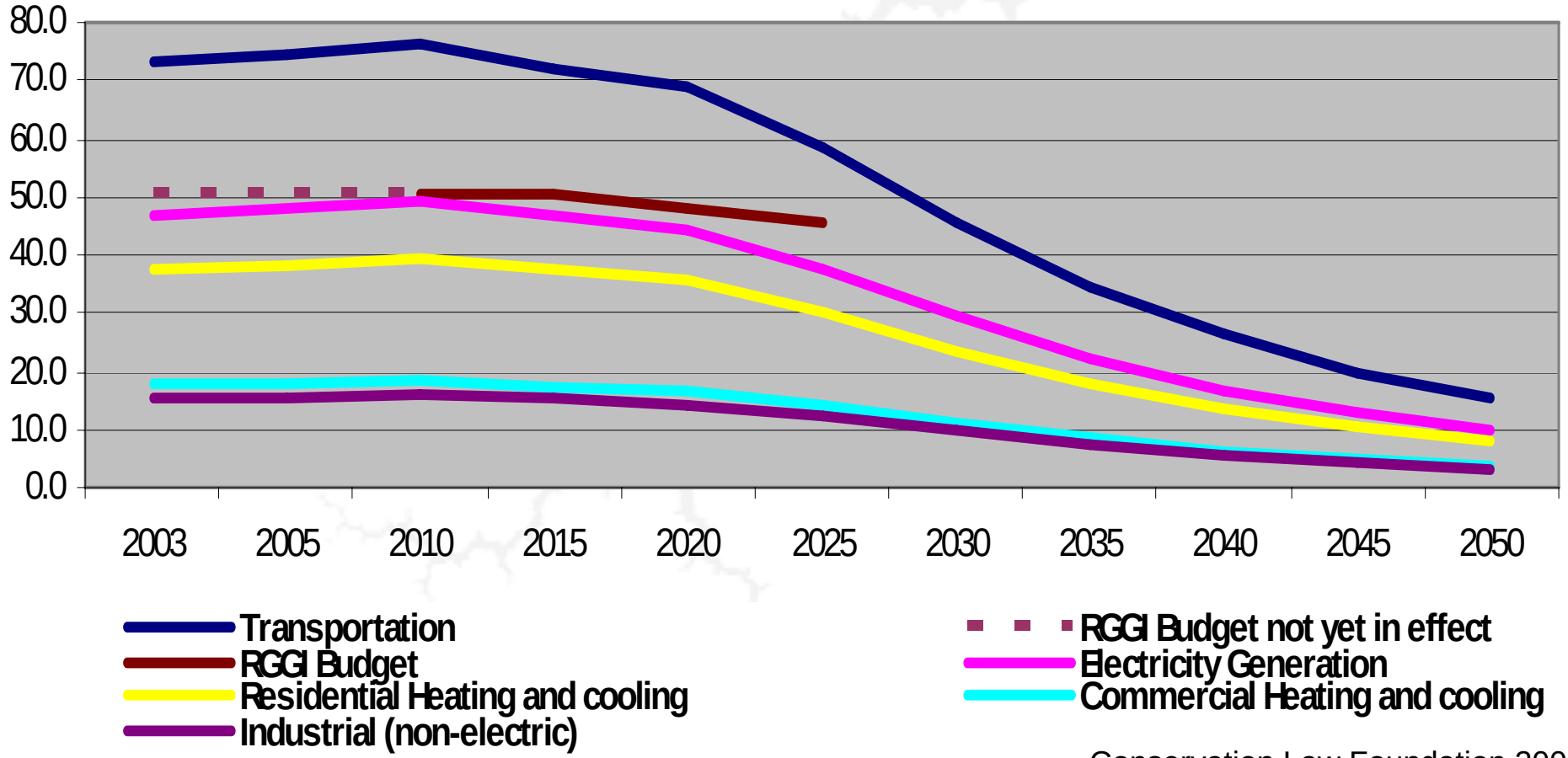
- Commitment to reduce carbon?
- Commitment to do cost effective EE and DR?
- State driven or federally driven?
- Carbon goals vastly exceed RGGI goals

Possible Future: CT



The Big Future Issue: Climate

New England Greenhouse Gas Emissions by Sector (Million Metric Tons CO2 eqv.) - EIA Inventory for 2003, CLF 2005 & 2010 projections based on "business as usual" and post 2010 decreases to reach 80% reductions by 2050



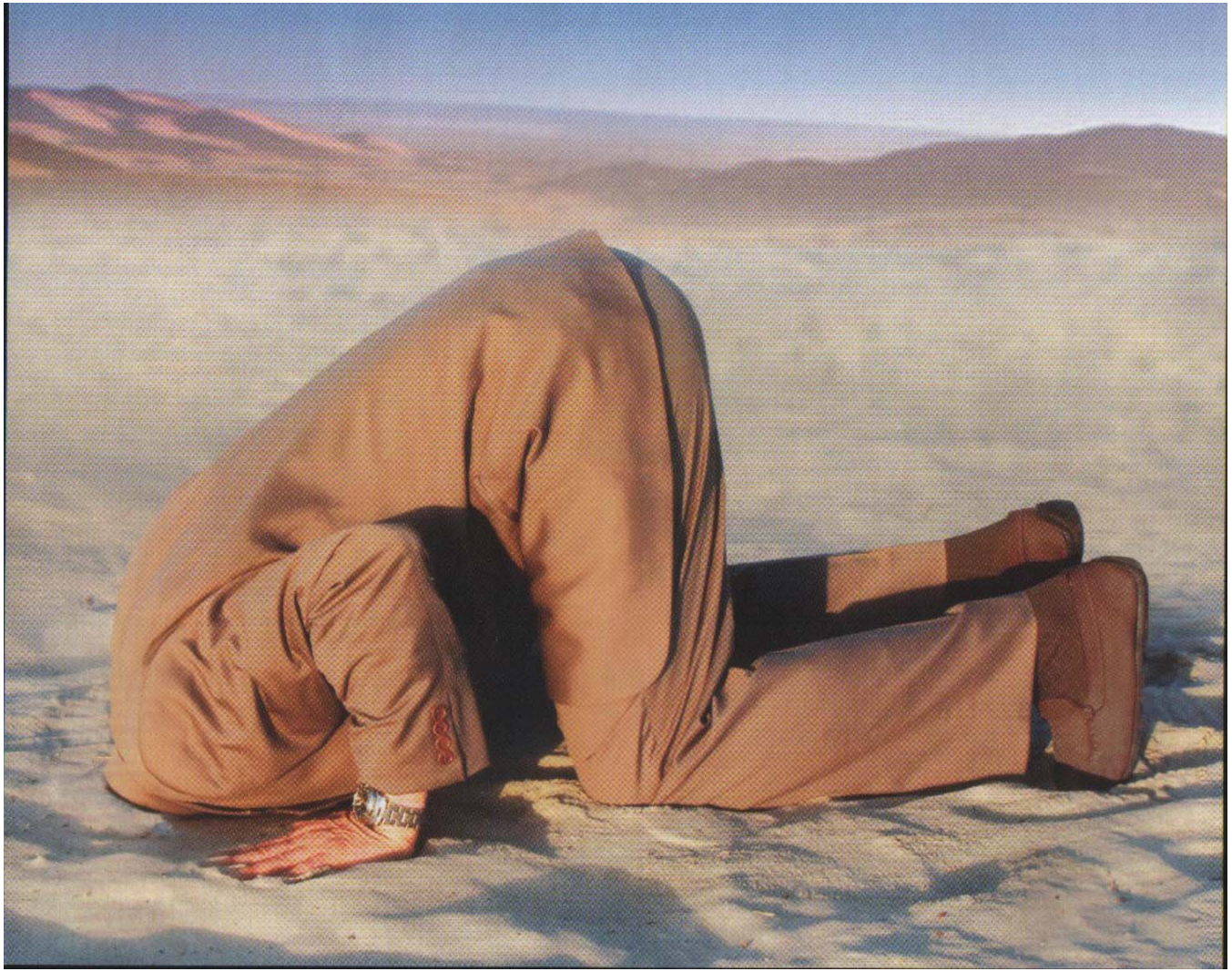
Technology transformation issues

- Smart appliances and smart grid
- Specific technologies
  - Residential photovoltaic applications
  - Residential wind applications
  - Residential combined heat and power (CHP)
- Legislation, codes, regulation, and market rules to support a distributed grid

It is okay to dream

- Envision a distributed grid and consider how actions can support it
- Envision small scale energy production from as many resources as possible
- Consider planning issues associated with zero load growth (or less) for 10-20 years
- Support changes to electric industry necessary to achieve transformation

Alternative Strategy (not recommended)



QUESTIONS?

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