



# Arkansas Governor's Commission on Global Warming

Meeting #9, September 9, 2008

Arkansas Governor's Office  
The Center for Climate Strategies

# Welcome and Introductions

- Arkansas Governor's Office
- Governor's Commission on Global Warming Members
- Advisory Group Members
- Members of the Public
- Center for Climate Strategies

# Agenda

1. Welcome and Introductions
2. Review of Day's Agenda
3. Approval of Draft Summary of GCGW Meeting #8
4. Dates for Final GCGW Meeting and Final Report
5. Causes and Risks of Global Warming, and Federal Climate Change Issues
6. Review of GCGW Process Status and Draft Results
7. Review and Consideration of Draft Pending Priority Policy Options
8. Update on Status of Arkansas' Draft GHG Inventory and Forecast
9. Next Steps for Commission and Technical Work Groups
10. Agenda for GCGW Meeting #10
11. Public Input and Announcements
12. Adjourn

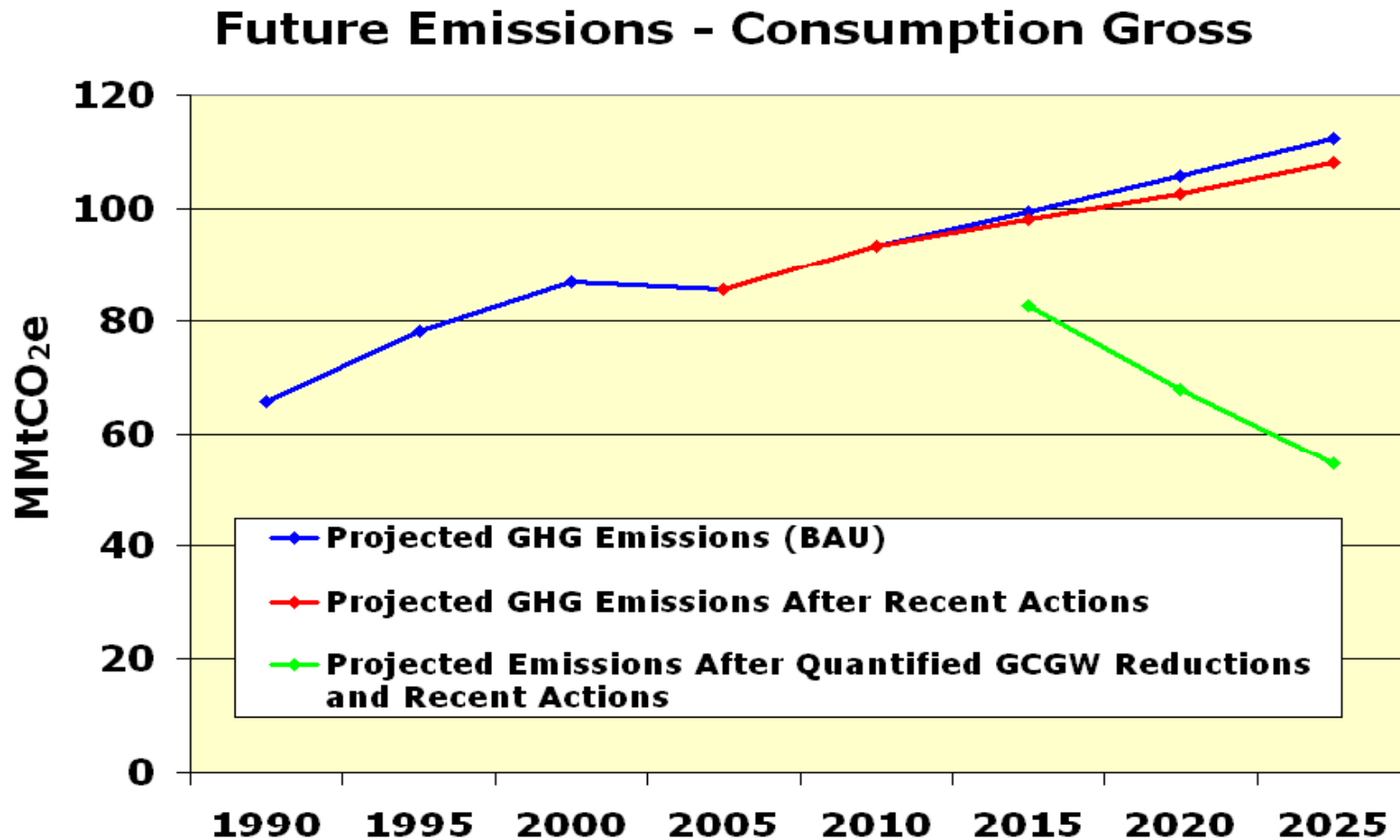
# Dates for Final GCGW Meeting and Final Report

- Meeting #9
  - Sept. 9 (Tuesday); 9:00 am – 4:30 pm
- Meeting #10 (Final Meeting)
  - September 25 (Thursday); 9:30 am – 4:30 pm
- Final Report and Recommendations to Governor
  - Friday, October 31

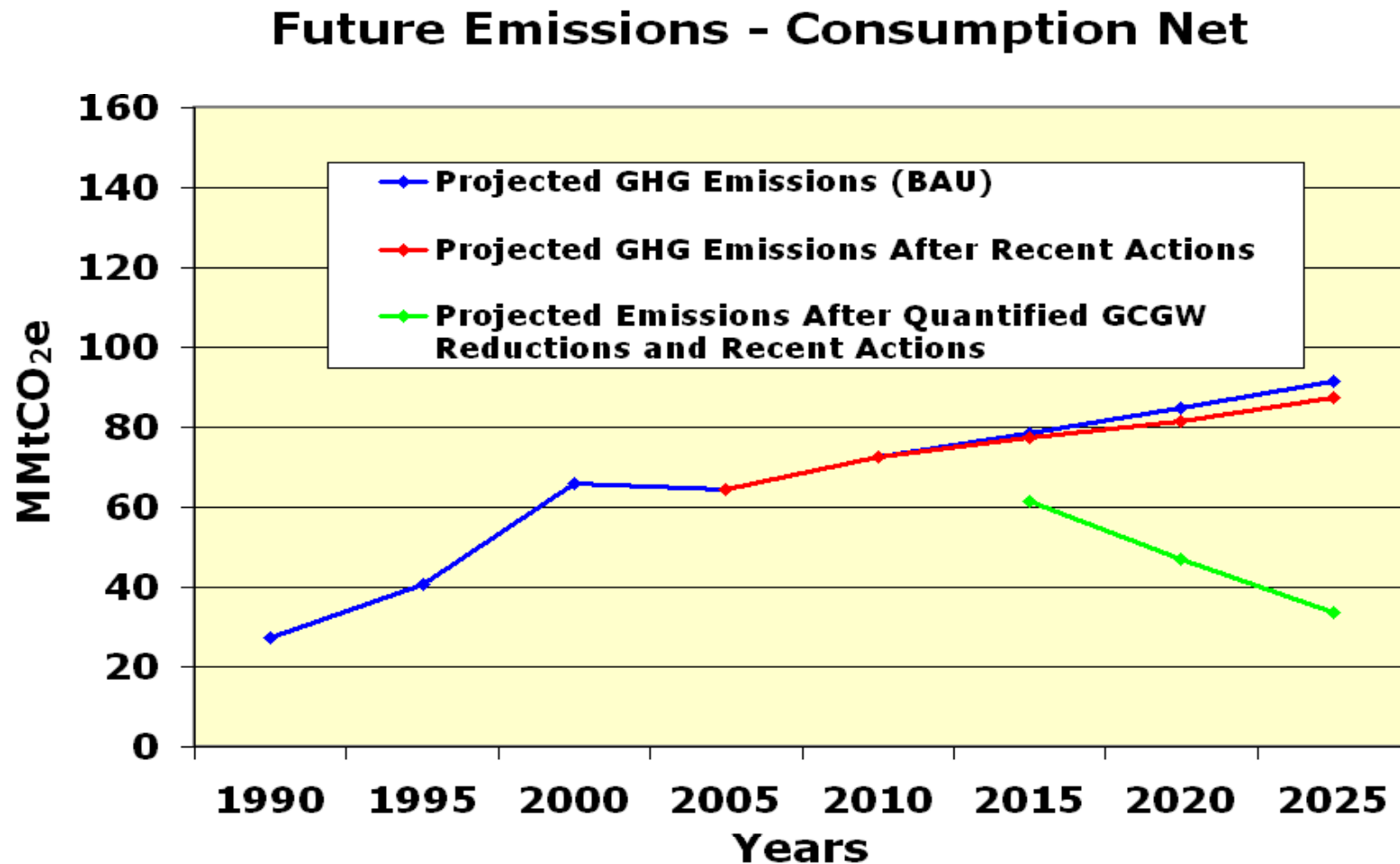
# Stepwise Planning Process

1. Develop inventory and forecast of emissions
2. Identify a full range of possible actions
3. Identify initial draft priorities for analysis
4. Develop straw proposals for draft priorities for analysis
5. Quantify GHG reductions and costs/savings
6. Evaluate externalities, feasibility issues as needed
7. Develop alternatives to address barriers as needed and iterate to final agreements on policy recommendations
8. Finalize the statewide inventory and forecast of emissions
9. Aggregate results
10. Finalize and report recommendations

# GCGW Actions – Draft Results



# GCGW Actions – Draft Results



# GCGW Actions

## Draft Results – Gross Emissions

Consumption Basis - Gross Emissions							
	1990	2000	2005	2010	2015	2020	2025
Projected GHG Emissions (BAU)	65.8	86.8	85.4	93.5	99.6	105.6	112.4
Reductions from Recent Actions			0.0	0.1	1.4	3.1	4.1
Projected GHG Emissions After Recent Actions			85.4	93.4	98.2	102.5	108.2
Total GHG Reductions from GCGW Policies					15.7	34.7	53.7
Projected Emissions After Quantified GCGW Reductions and Recent Actions					82.5	67.8	54.5
Production Basis - Gross Emissions							
	1990	2000	2005	2010	2015	2020	2025
Projected GHG Emissions (BAU)	70.8	86.2	85.4	93.5	99.6	105.6	112.4
Reductions from Recent Actions			0.0	0.1	1.4	3.1	4.1
Projected GHG Emissions After Recent Actions			85.4	93.4	98.2	102.5	108.2
Total GHG Reductions from GCGW Policies					15.7	34.7	53.7
Projected Emissions After Quantified GCGW Reductions and Recent Actions					82.5	67.8	54.5

# GCGW Actions

## Draft Results – Net Emissions

<b>Consumption Basis - Net Emissions</b>							
	1990	2000	2005	2010	2015	2020	2025
Projected GHG Emissions (BAU)	27.3	66.0	64.6	72.6	78.7	84.8	91.5
Reductions from Recent Actions			0.0	0.1	1.4	3.1	4.1
Projected GHG Emissions After Recent Actions			64.6	72.5	77.3	81.7	87.4
Total GHG Reductions from GCGW Policies					15.7	34.7	53.7
Projected Emissions After Quantified GCGW Reductions and Recent Actions					61.6	46.9	33.6
<b>Production Basis - Net Emissions</b>							
	1990	2000	2005	2010	2015	2020	2025
Projected GHG Emissions (BAU)	32.3	65.4	64.6	72.6	78.7	84.8	91.5
Reductions from Recent Actions			0.0	0.1	1.4	3.1	4.1
Projected GHG Emissions After Recent Actions			64.6	72.5	77.3	81.7	87.4
Total GHG Reductions from GCGW Policies					15.7	34.7	53.7
Projected Emissions After Quantified GCGW Reductions and Recent Actions					61.6	46.9	33.6

# GCGW Actions

## Draft Cumulative Results

Sector	2015 MMtCO <sub>2</sub> e (Annual)	2025 MMtCO <sub>2</sub> e (Annual)	2009-2025 MMtCO <sub>2</sub> e (Cumulative)	Million\$ NPV 2009-2025 (Cumulative)	\$/tCO <sub>2</sub> e (Weighted Average)
RCI	3.1	11.3	85.8	-\$1,510	-\$18
ES	3.2	21.5	149.7	\$4,966	\$33
TLU	2.4	2.6	38.8	TBD	TBD
AFW	7.0	18.3	157.7	\$1,024	\$6.5
CC	----	----	----	----	----
<b>Total</b>	<b>15.7</b>	<b>53.7</b>	<b>432.0</b>	<b>\$4,480</b>	<b>\$10.4</b>

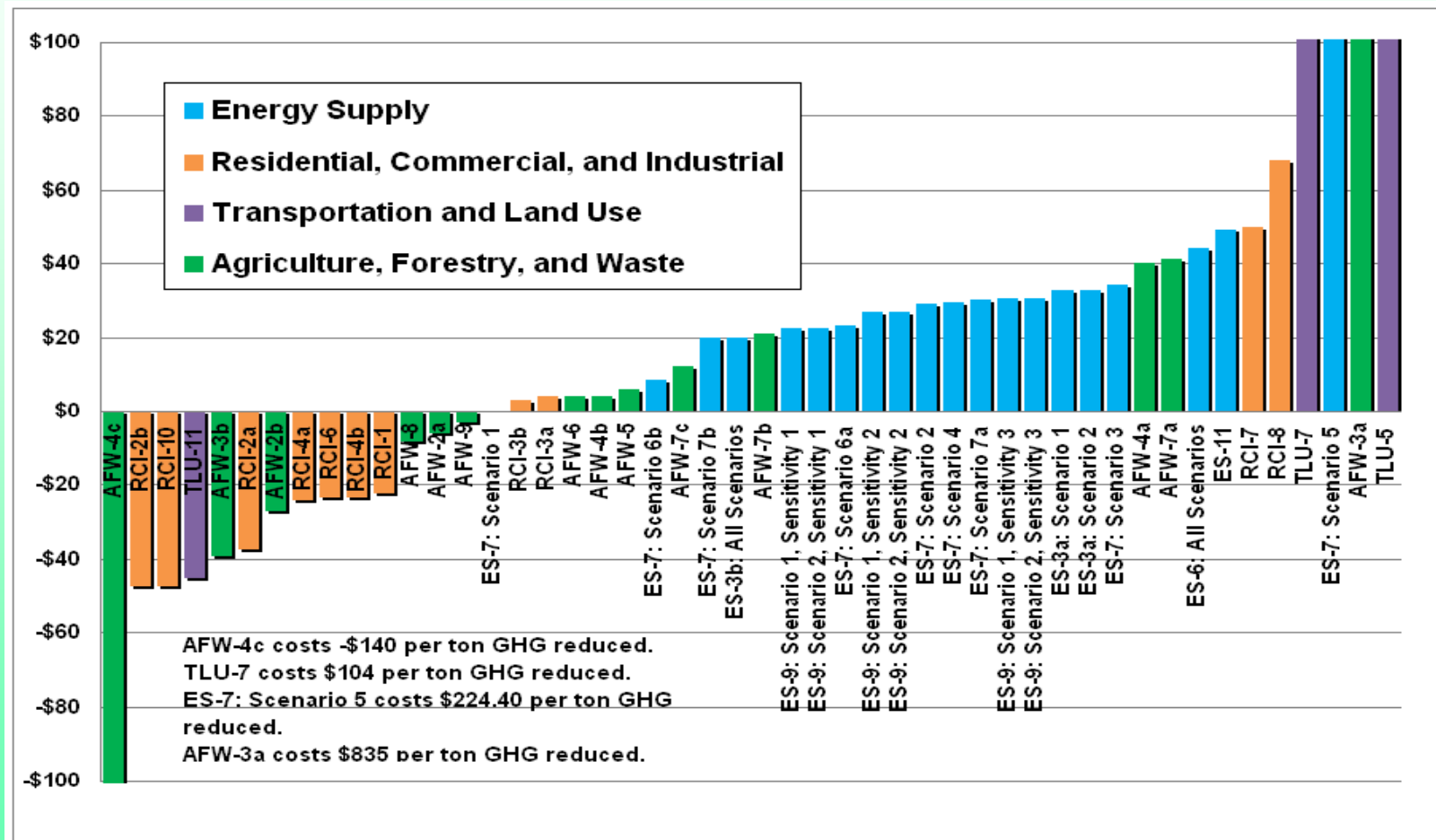
# Overlaps Between Options

Policy Option	Policy Option	Overlap Adjustment To:	Notes
AFW-4 (Expanded Use of Agriculture and Forestry Biomass Feedstocks for Electricity, Heat, or Steam Production)	ES-3a (Renewable Portfolio Standard (RPS)) ES-6 (Combined Heat and Power)	AFW-4	Assumed total overlap between AFW-4 and ES-3; impacts for AFW-4 removed from AFW-4 cumulative results
AFW-4	RCI-7 (Green Power Purchasing for Consumers)	AFW-4	Assumed total overlap between AFW-4 and RCI-7; impacts for AFW-4 removed from AFW cumulative results
AFW-4	RCI-8 (Non Residential Energy Efficiency (Combined Heat and Power))	AFW-4	Assumed total overlap between AFW-4 and RCI-8; impacts for AFW-4 removed from AFW cumulative results
AFW-5 (Expanded Use of Liquid Biofuels)	TLU-2 (Research and Development of Renewable Transportation Fuels) TLU-3 (Advanced Biofuels Development and Expansion)	AFW-5	Assumed total overlap between AFW-5 and TLU-2 and TLU-3; impacts for AFW-5 removed from AFW cumulative results
AFW-7 (Forest Management and Establishment for Carbon Sequestration)	RCI-3a (Reduced Energy Use in New and Retrofitted State-Owned Buildings) RCI-3b (Reduced Energy Use in State-Owned Buildings) RCI-4a (Promotion and Incentives for Improved New Building Design and Construction) RCI-4b (Promotion and Incentives for Improved Existing Buildings) RCI-9 (Support for Energy-Efficient Communities, Including Smart Growth)	None	No overlap: quantification methods for RCI options exclude energy savings from tree shading

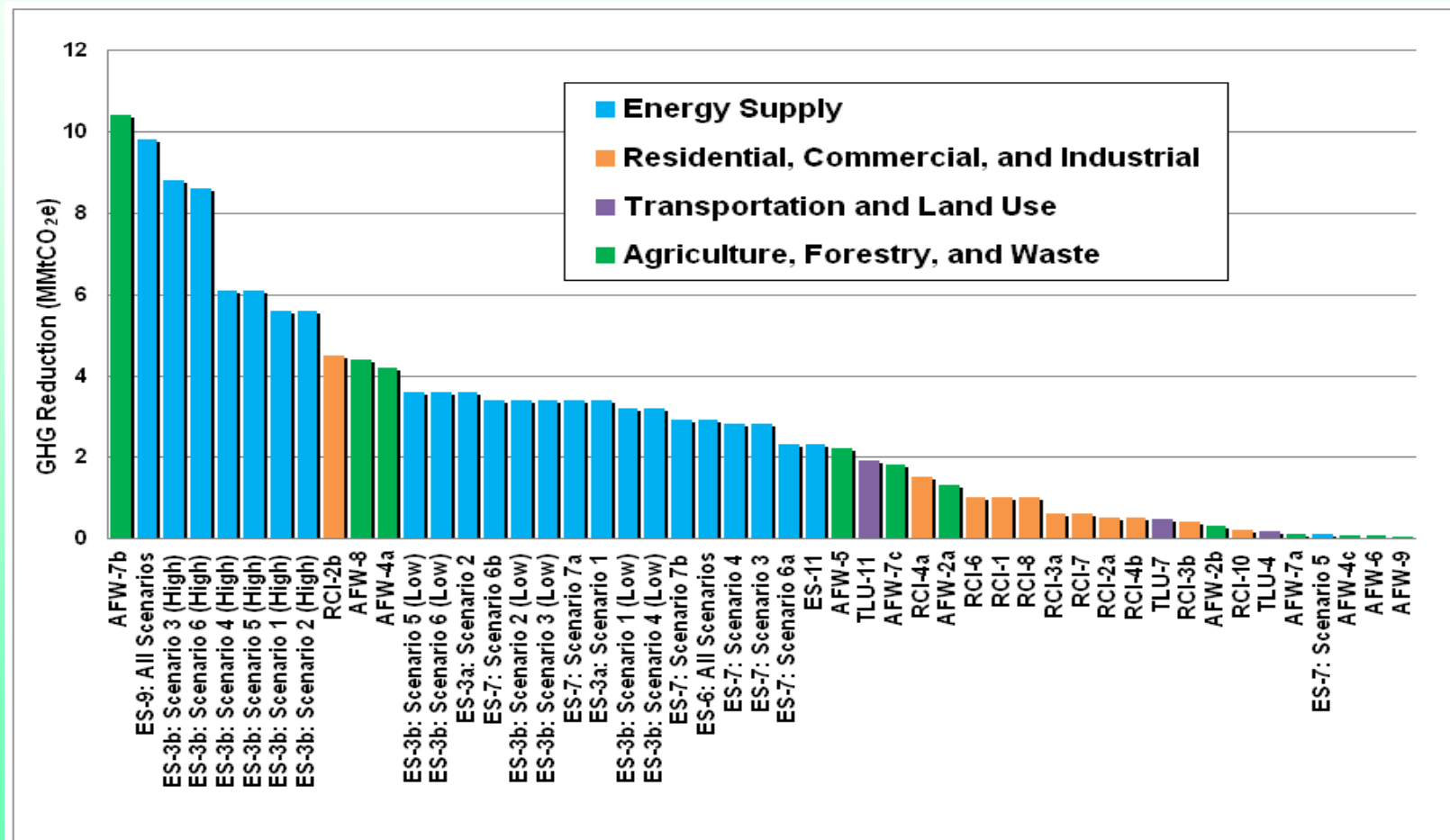
# Overlaps Between Options

Policy Option	Policy Option	Overlap Adjustment To:	Notes
TLU-4 (Smart Growth, Pedestrian and Bicycle Infrastructure)	TLU-5 (Improve and Expand Transit Service and Infrastructure) TLU-6 (School and University Transportation Bundle)	TLU-5 and TLU-6	TBD: Transit and land use interact closely; school siting overlaps with land use and school access overlaps with transit
TLU-7 (Promote and Facilitate Freight Efficiency)	TLU-11 (Lower Speed Limits and Enforcement)	TLU-7	TBD: Savings in long-haul truck emissions overlap with benefits from speed reduction
CC-11 (Regulatory Realignment in Government To Encourage Constructive Climate Action)	RCI-3a (Reduced Energy Use in New and Retrofitted State-Owned Buildings) and RCI-3b (Reduced Energy Use in State-Owned Buildings)	None	Keep Implementation Mechanisms language for energy audits of state facilities and activities in CC-11 and RCI-3

# Draft AR GHG Supply Curve (Completed & Pending Options)



# Draft AR GHG Reductions 2025 (Completed & Pending Options)



# Agriculture, Forestry & Waste Management (AFW)

2. Promotion of Farming Practices that Achieve GHG Benefits (Soil Carbon and Nutrient Efficiency)
3. Improved Water Management and Use (Increased Surface Water and Improved Purification)
4. Expanded Use of Agriculture and Forestry Biomass Feedstocks for Electricity, Heat, or Steam Production (Energy From Biomass, Energy From Livestock Manure and Poultry Litter, and Capture of Waste Heat)
5. Expanded Use of Advanced Biofuels
6. Expanded Use of Locally Produced Farm and Forest Products
7. Forest Management and Establishment for Carbon Sequestration (Urban Forestry, Sustainable Forest Management, and Afforestation)
8. Advanced Recovery and Recycling
9. End of Use Waste Management Practices

# Agriculture I&F Revisions

- Catfish Farms – TWG recommended inclusion in I&F
- Catfish sales in 2007 from National Ag. Statistics Service
- GHG emission factor from DOE publication

91,620,000	lb catfish sold (AR, 2007)
41,559	metric tons of catfish sold
2.0	kg CO <sub>2</sub> e/kg fish product
83,117	metric tons of CO <sub>2</sub> e
0.083	MMtCO <sub>2</sub> e in 2007

- Given the uncertainty of estimate, and the relatively low level emissions, suggest that the emissions be documented in the I&F report for the agriculture sector, but not include the emissions totals for the state

# Agriculture I&F Revisions

## Breakout of Manure Management Emissions

### CH<sub>4</sub> Emissions from Manure Management in Arkansas (MMtCO<sub>2</sub>e)

	1990	2005	2015	2025
All				
Poultry	0.526	0.113	0.125	0.136
All Cows	0.093	0.078	0.072	0.073
All Swine	0.255	0.115	0.115	0.115
Other	0.007	0.011	0.012	0.014

### N<sub>2</sub>O Emissions from Manure Management in Arkansas (MMtCO<sub>2</sub>e)

	1990	2005	2015	2025
All Poultry	0.779	0.980	1.098	1.200
All Cows	0.015	0.008	0.007	0.006
All Swine	0.005	0.002	0.002	0.002
Other	0.000	0.000	0.000	0.000

# Transportation & Land Use (TLU)

1. Study the Feasibility of Plug-In Vehicles
2. Research and Development for Renewable Transportation Fuels
- 3a. Advanced Biofuels Development and Expansion (10%)
- 3b. Advanced Biofuels Development and Expansion (12%)
4. Smart Growth, Pedestrian and Bicycle Infrastructure
5. Improve and Expand Transit Service and Infrastructure
6. School and University Transportation Bundle
7. Promote and Facilitate Freight Efficiency
8. Procurement of Efficient Fleet Vehicles (Passenger and Freight)
9. Fuel Efficiency: Clean Car Incentive
10. Public Education
11. Lower Speed Limits and Enforcement

# Break



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19

# Cross Cutting (CC) Issues

1. Greenhouse Gas Inventories and Forecasts
2. State Greenhouse Gas Reporting and Registry
3. Statewide Greenhouse Gas Reduction Goals or Targets
7. Optimizing Best-Scale of Reduction Policies
8. Creative Financial Mechanisms
10. Climate-Change Related Economic Development
11. Regulatory Realignment in Government to Encourage Constructive Climate Action

# Energy Supply (ES)

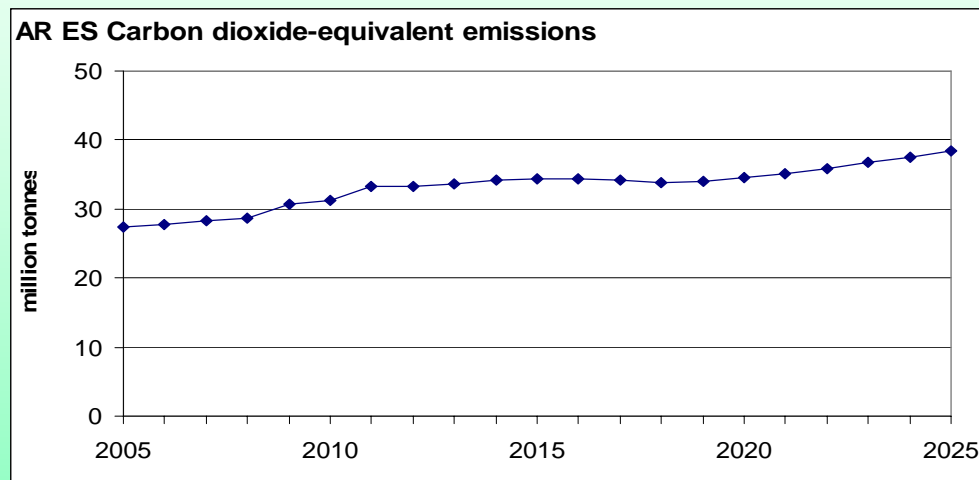
1. Green Power Purchases and Marketing (Transferred to RCI-7)
2. Technology Research & Development
- 3a. Renewable Portfolio Standard (RPS)
- 3b. Renewable Energy Feed-In Tariff (REFIT)
4. Grid-Based Renewable Energy Incentives and/or Barrier Removal
5. Approaches Benefiting from Regional Application
6. Combined Heat and Power
7. Geological Underground Sequestration for New Plants
8. Transmission System Upgrades
9. Nuclear Power
10. Carbon Tax
11. Efficiency Improvements and Repowering of Existing Plants

# ES I&F Revisions

- Comparison of draft ES GHG forecast to revised forecast per ES TWG's recommendations
- Outline
  - Sales
  - Electricity generation (including imports/exports)
  - Primary energy
  - Summary charts
  - Conclusions

# ES I&F Revisions

- Draft ES forecast (March 2008) is based on the following :
  - EIA data for the base year 2005;
  - EIA's Annual Energy Outlook data for the years 2006 through 2025 (based on outputs of AEO2007), including the Hempstead plant



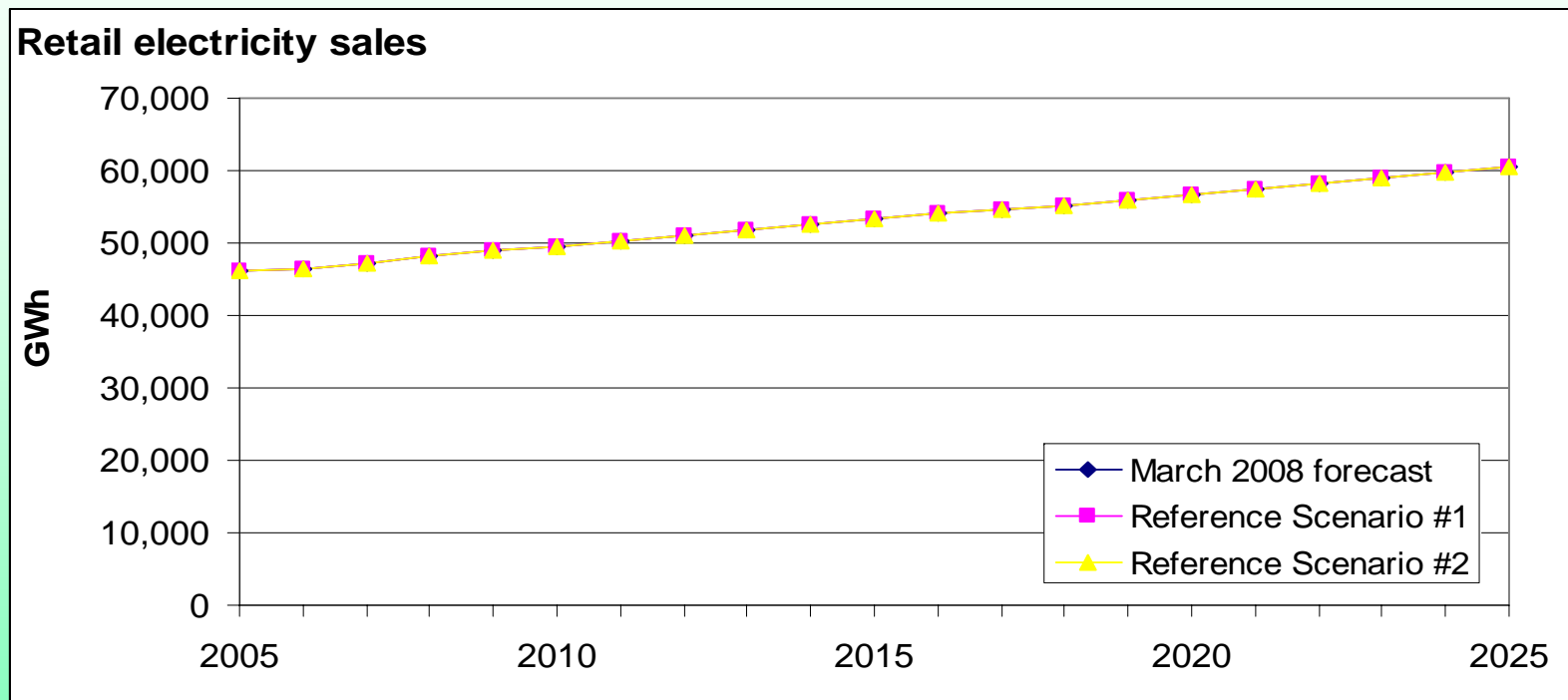
- Revised Forecast: At the 2 July 2008 meeting, the AR ES TWG requested that two reference scenarios be considered:
  - Reference Scenario #1 – NOT including the Hempstead plant
  - Reference Scenario #2 – including the Hempstead plant

# ES I&F Revisions

**Sales**

# ES I&F Revisions

## Retail electricity sales



Note:

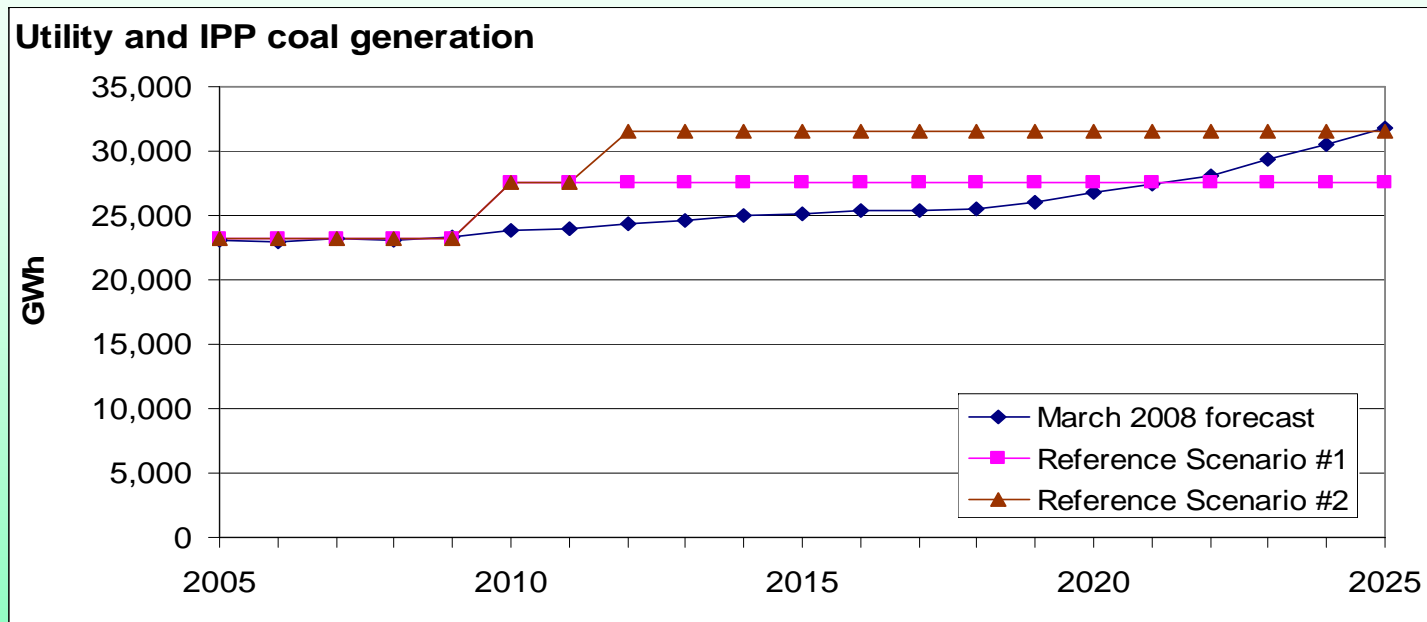
Reference Scenarios #1 and #2 agree with earlier assumptions

# ES I&F Revisions

## Electric generation

# ES I&F Revisions

## Gross coal-fired generation

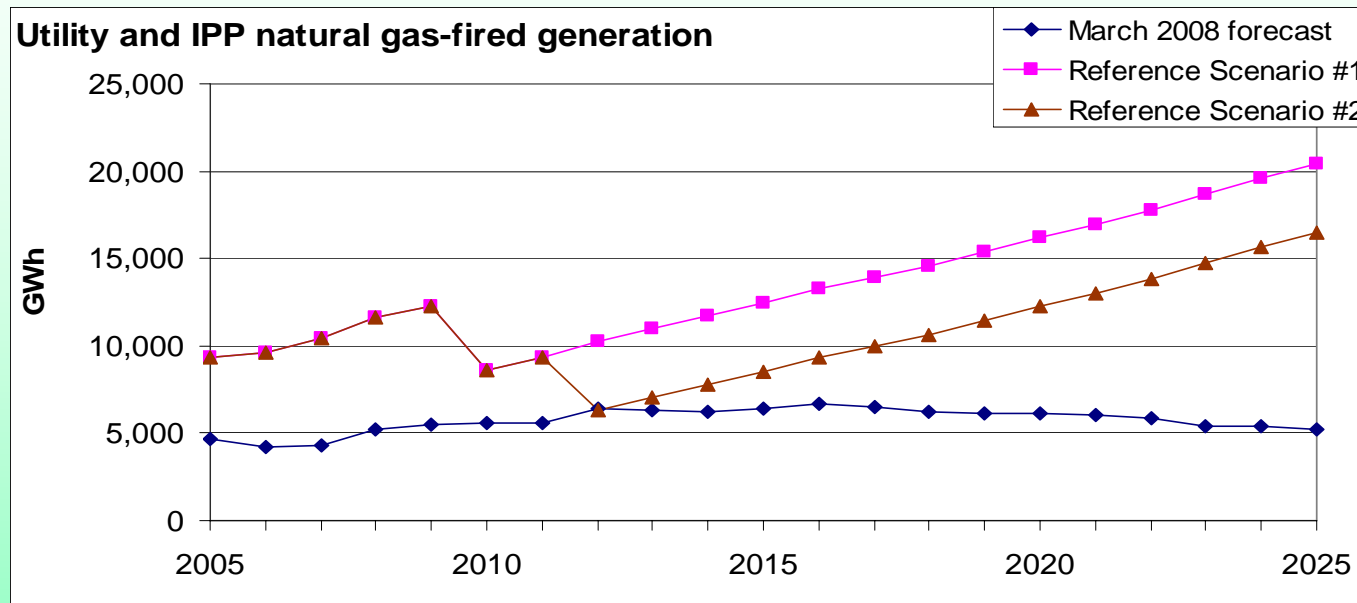


Note:

Reference Scenario #2 assumes a faster ramp-up of output from the Plum Point and Hempstead plants relative to the earlier forecast

# ES I&F Revisions

## Gross natural gas-fired generation

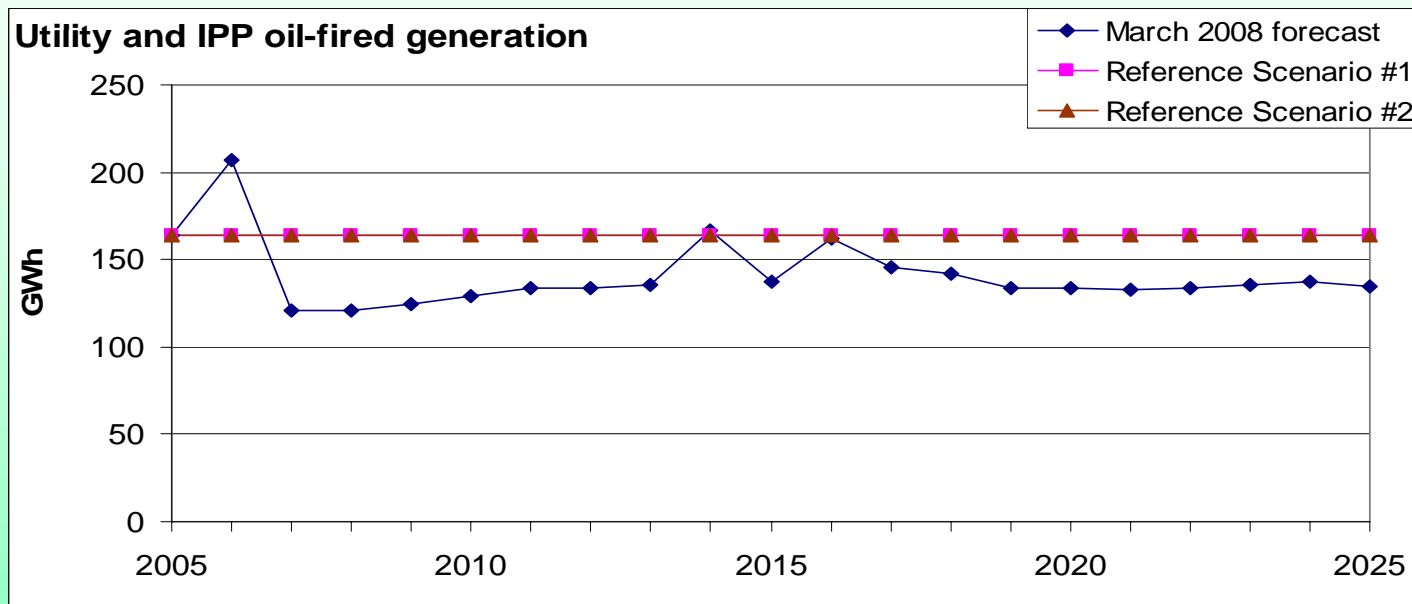


Note:

Reference Scenarios #1 and #2 include natural gas combined cycle capacity to satisfy the criteria that a) AR be self-sufficient in electricity production, and b) that there be no net exports over the planning period; the earlier forecast did not include this assumption

# ES I&F Revisions

## Gross oil-fired generation

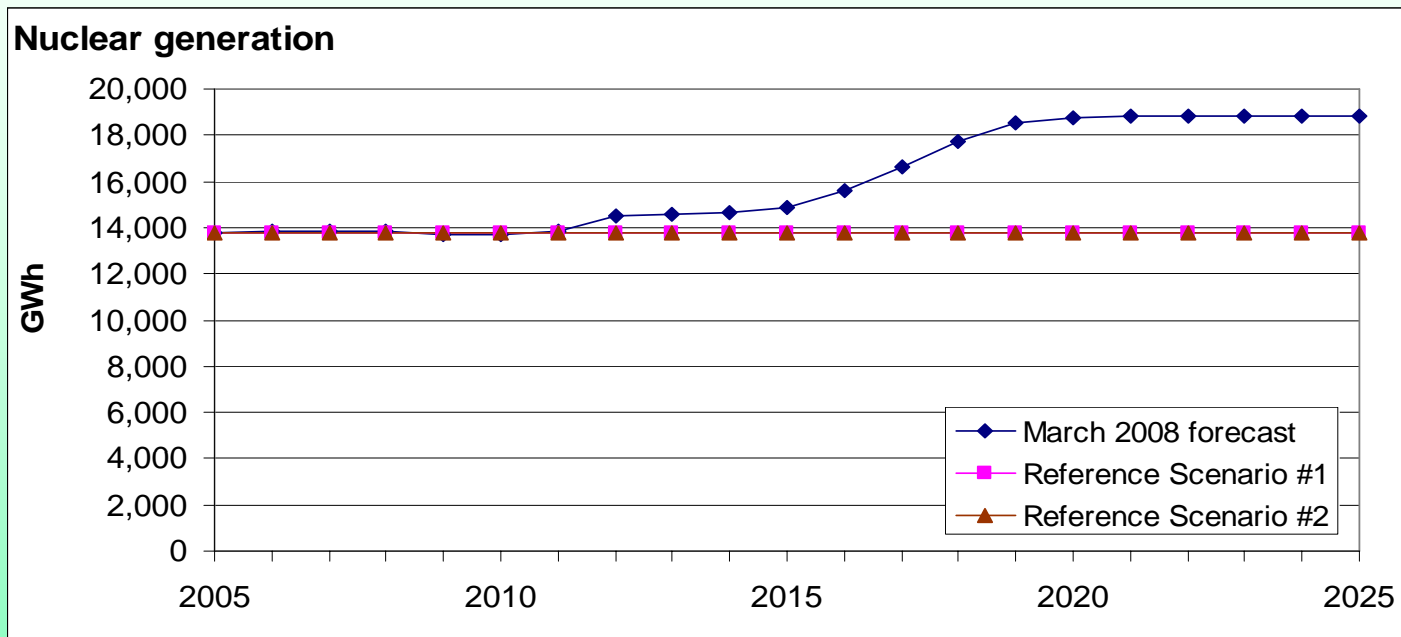


Note:

Reference Scenarios #1 and #2 are about 20% - 25% higher than the earlier forecast

# ES I&F Revisions

## Gross nuclear generation

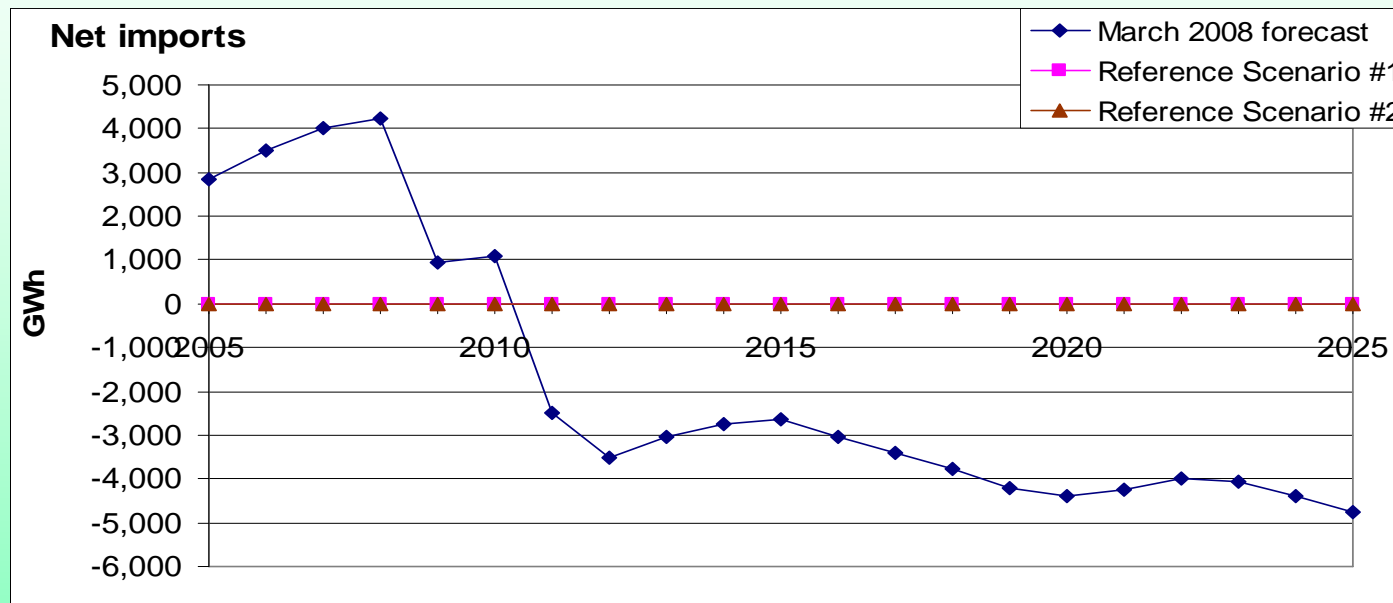


Note:

Reference Scenarios #1 and #2 are about 36% less than the earlier forecast in the 2020-2-25 period

# ES I&F Revisions

## Net imports

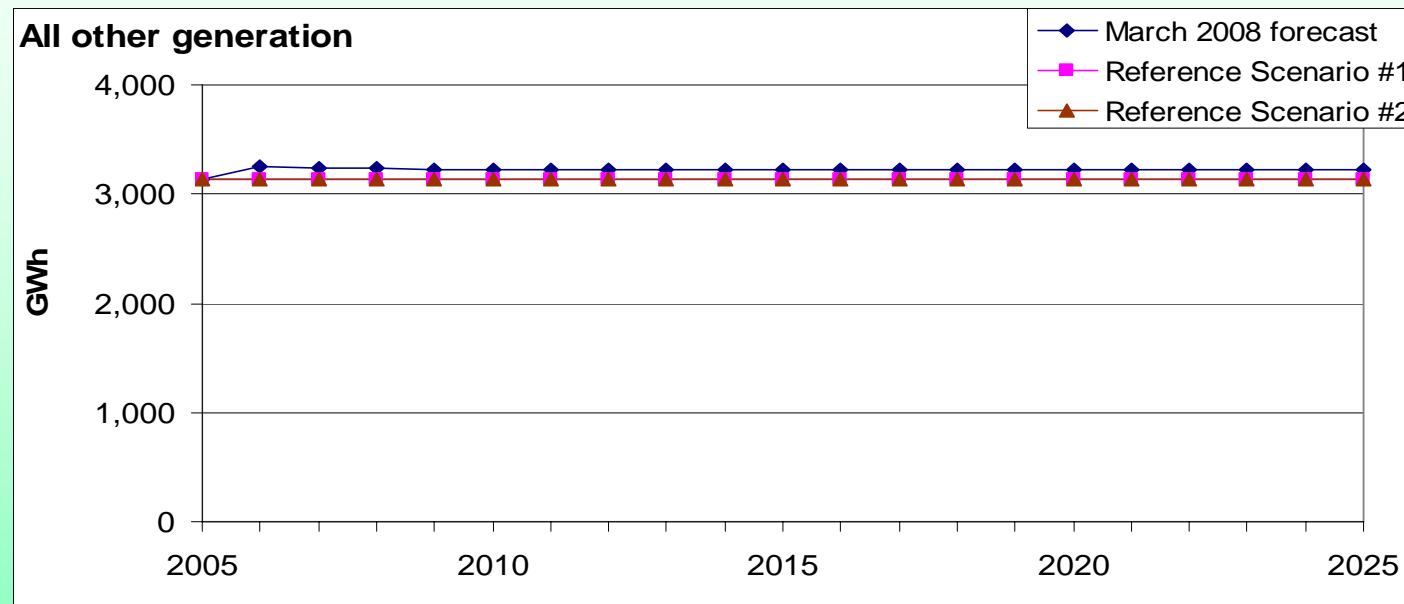


Note:

Reference Scenarios #1 and #2 have no net imports by virtue of the ES TWG criteria noted earlier

# ES I&F Revisions

## All other gross generation



Note:

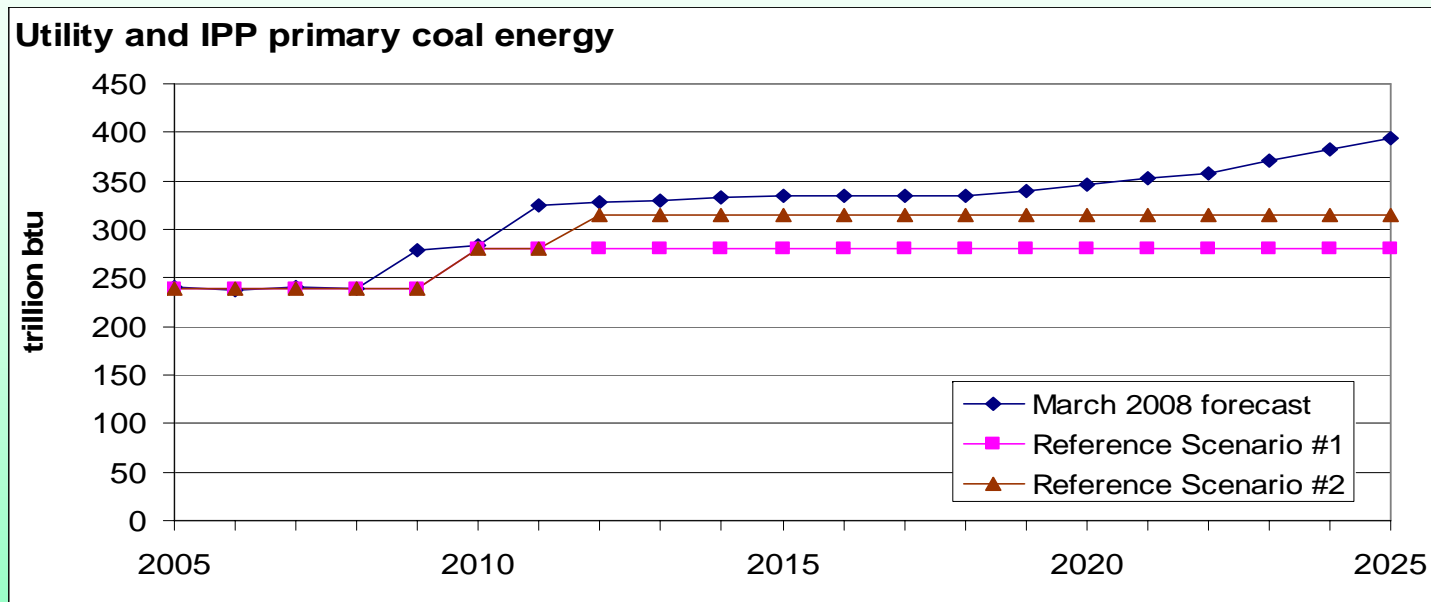
Reference Scenarios #1 and #2 are about 3% higher than the earlier forecast

# ES I&F Revisions

**Primary energy**

# ES I&F Revisions

## Coal energy use

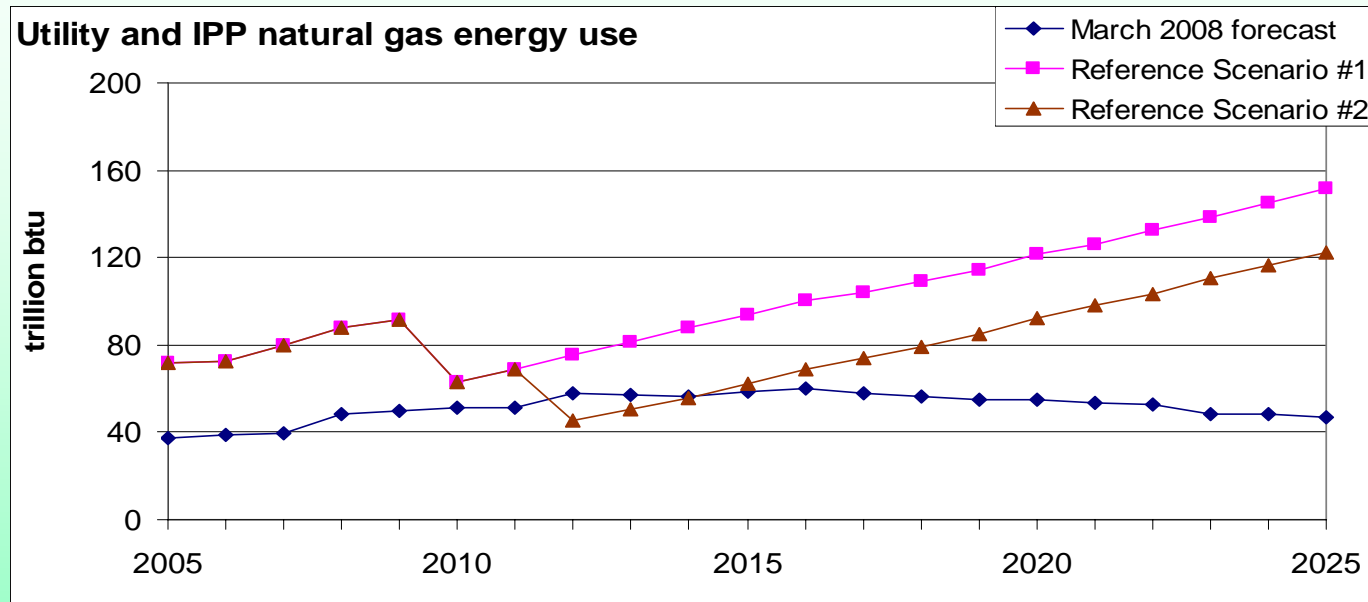


Note:

Reference Scenario #2 assumes a faster ramp-up of output from the Plum Point and Hempstead plants relative to the earlier forecast

# ES I&F Revisions

## Natural gas energy use

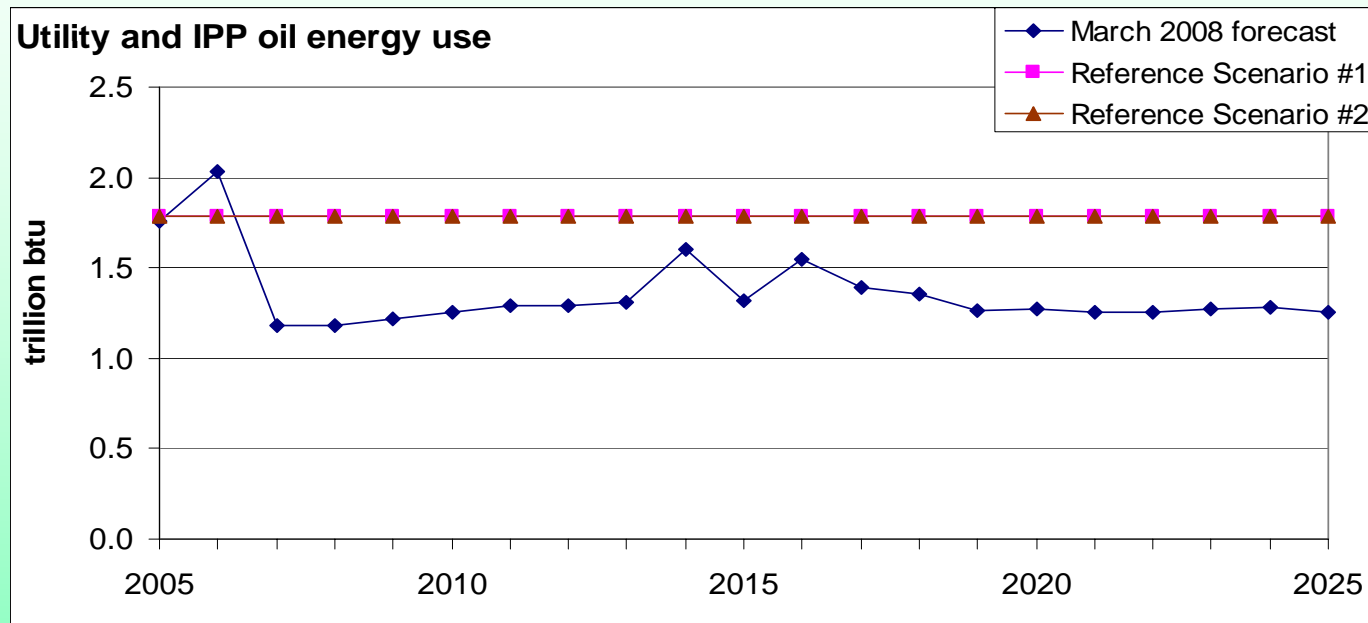


Note:

Reference Scenarios #1 and #2 include natural gas combined cycle capacity to satisfy the criteria that a) AR be self-sufficient in electricity production, and b) that there be no net exports over the planning period; the earlier forecast did not include this assumption

# ES I&F Revisions

## Oil energy use

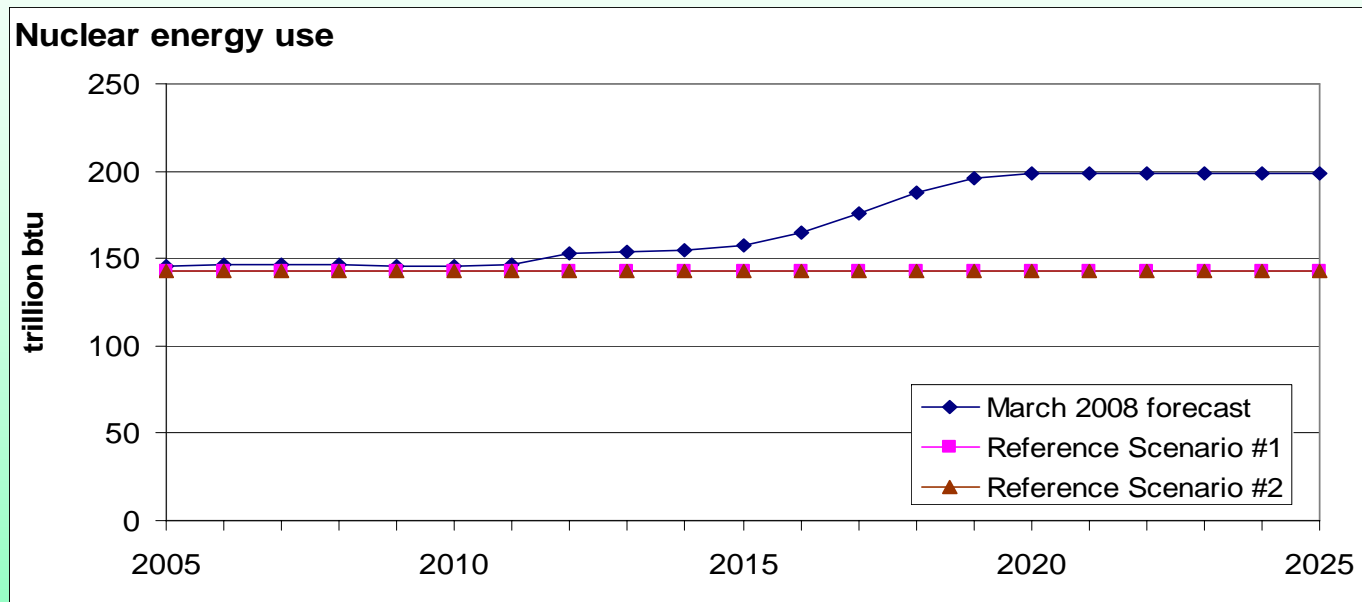


Note:

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# ES I&F Revisions

## Nuclear energy use

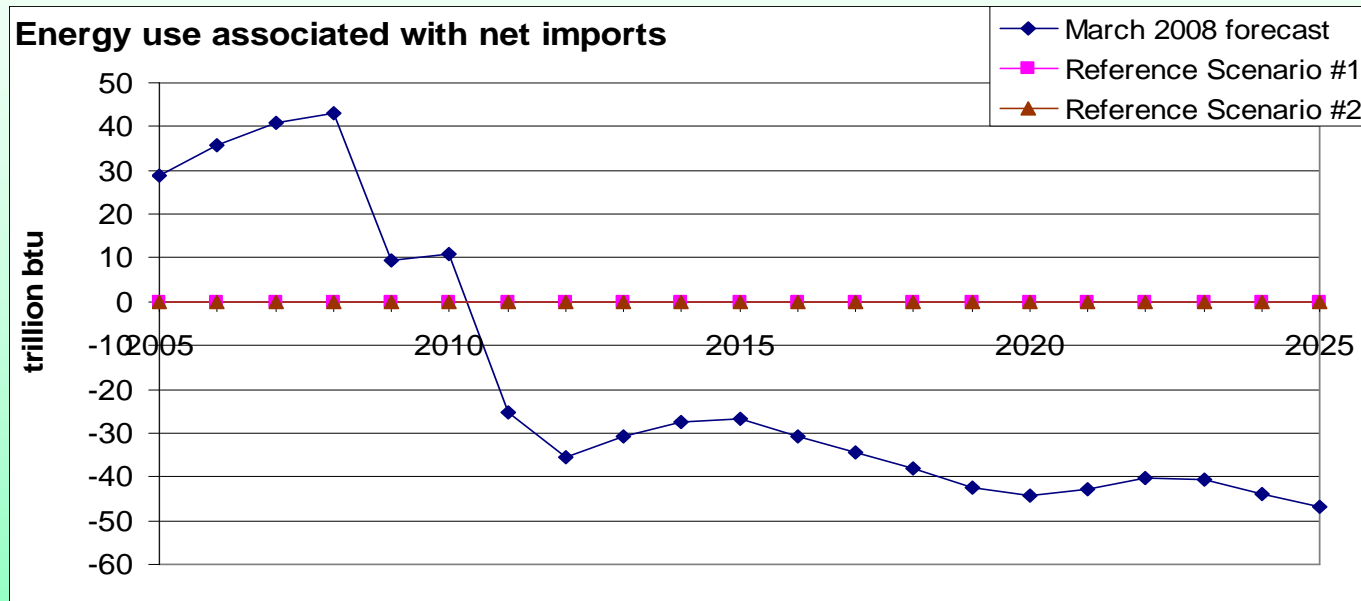


Note:

Reference Scenarios #1 and #2 are about 36% less than the earlier forecast in the 2020-2-25 period

# ES I&F Revisions

## Net imports

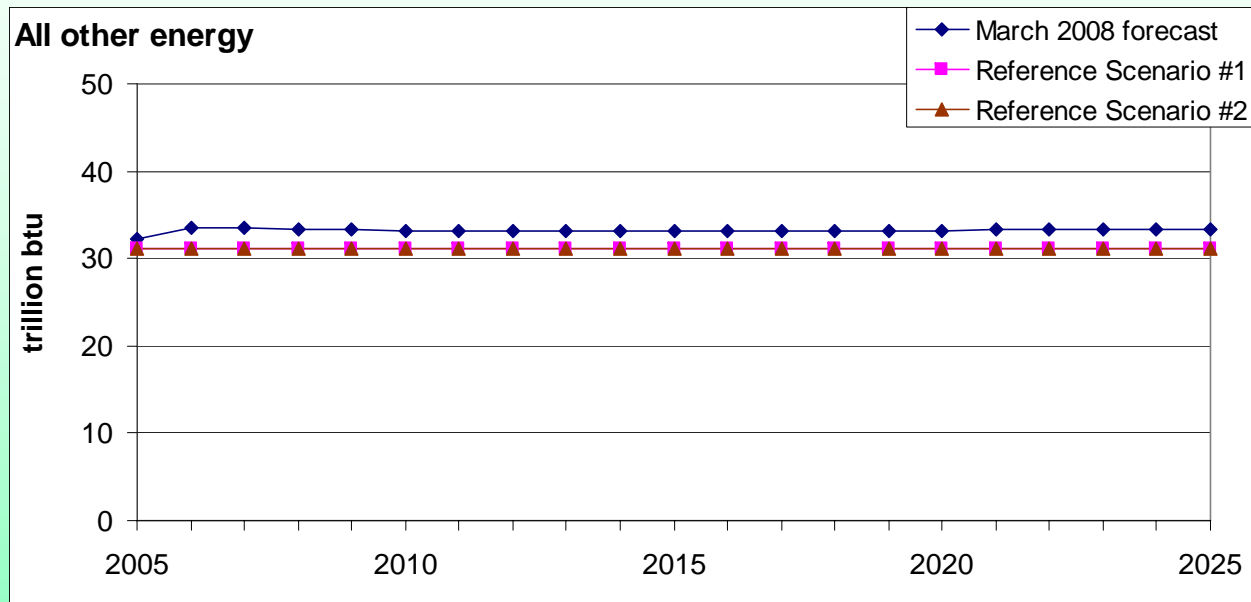


Note:

Reference Scenarios #1 and #2 have no net imports by virtue of the ES TWG criteria noted earlier

# ES I&F Revisions

## All other energy use



Note:

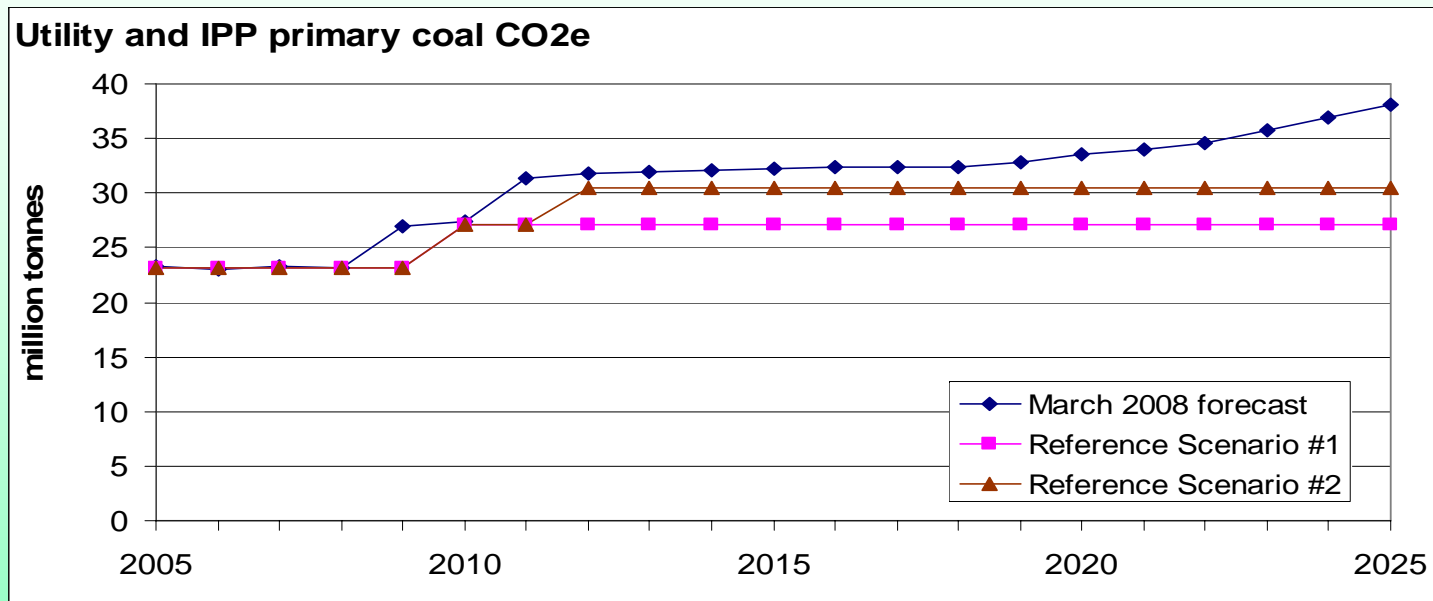
Reference Scenarios #1 and #2 are about 3% higher than the earlier forecast

# ES I&F Revisions

**GHG emissions**

# ES I&F Revisions

## Coal GHG emissions

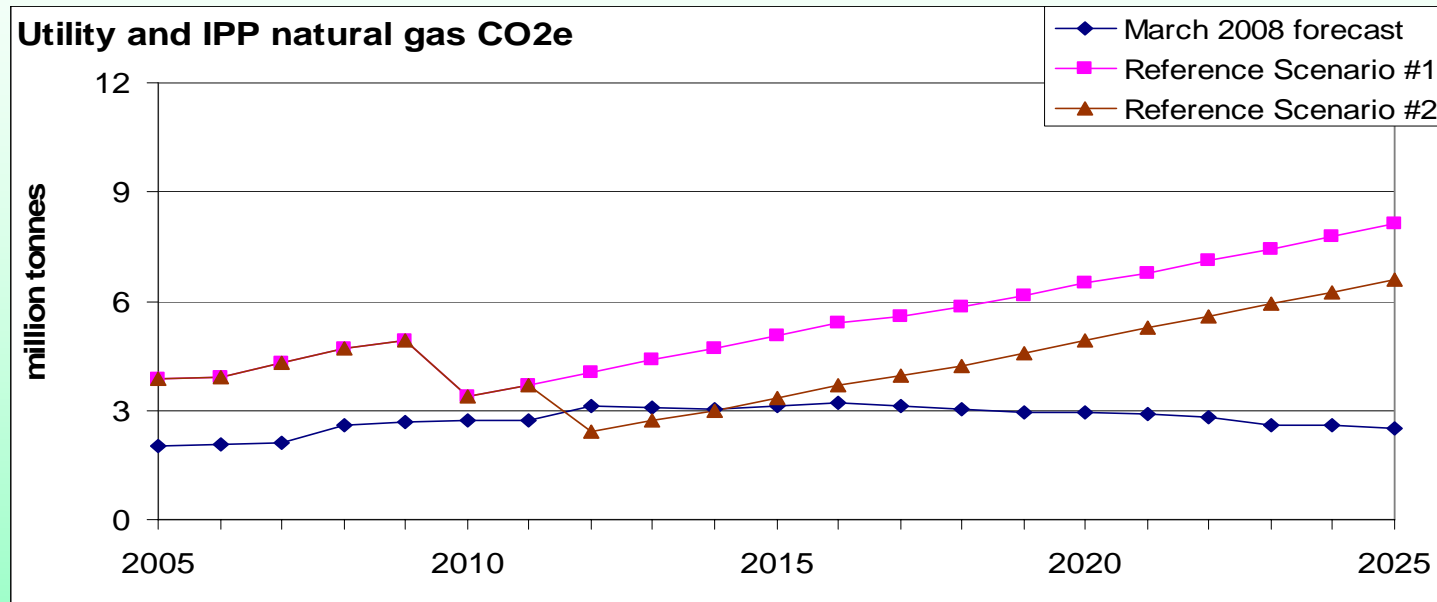


Note:

Reference Scenario #2 assumes a faster ramp-up of output from the Plum Point and Hempstead plants relative to the earlier forecast

# ES I&F Revisions

## Natural gas GHG emissions

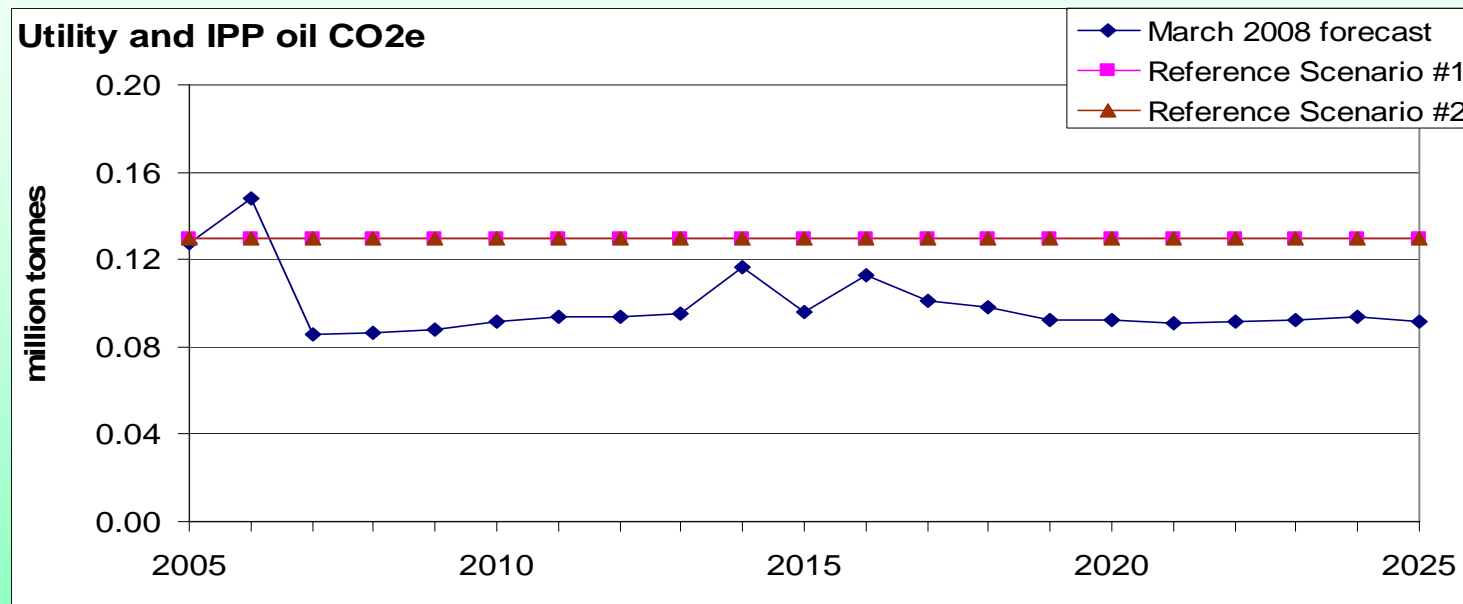


Note:

Reference Scenarios #1 and #2 include natural gas combined cycle capacity to satisfy the criteria that a) AR be self-sufficient in electricity production, and b) that there be no net exports over the planning period; the earlier forecast did not include this assumption

# ES I&F Revisions

## Oil GHG emissions

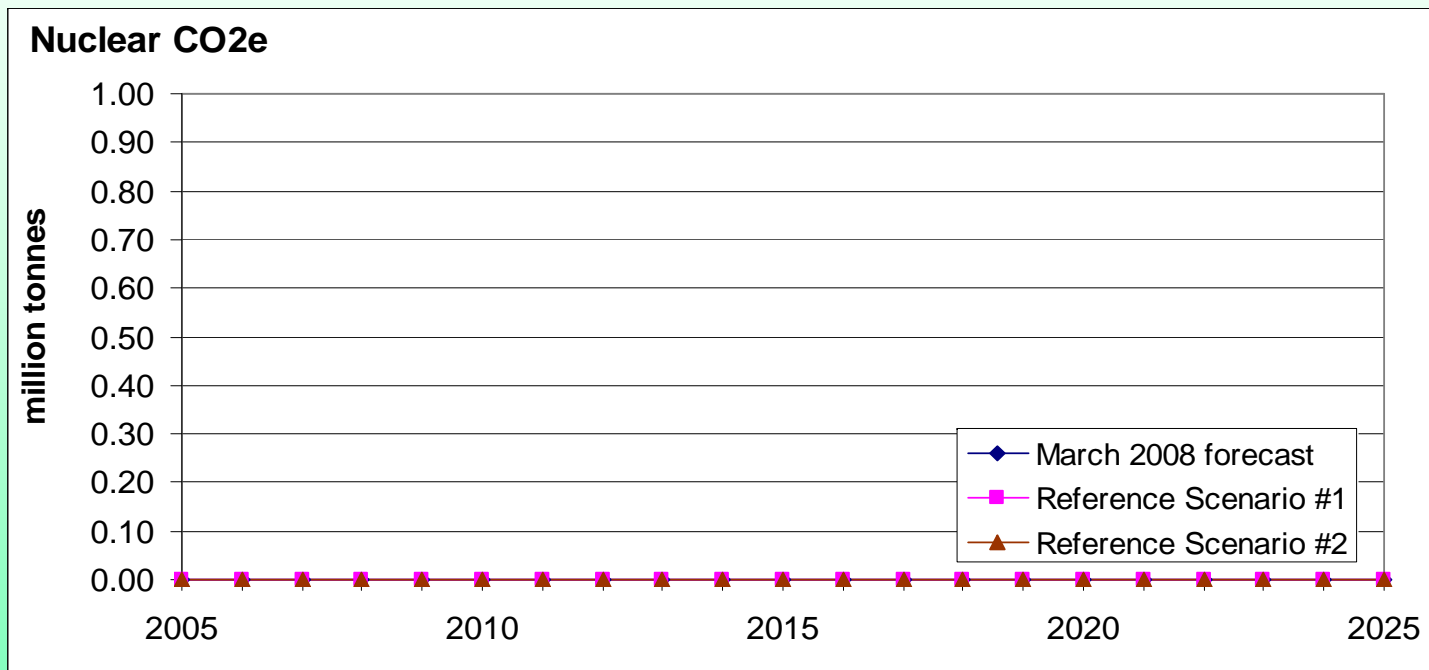


Note:

Reference Scenarios #1 and #2 are about 20% - 25% higher than the earlier forecast

# ES I&F Revisions

## Nuclear GHG emissions

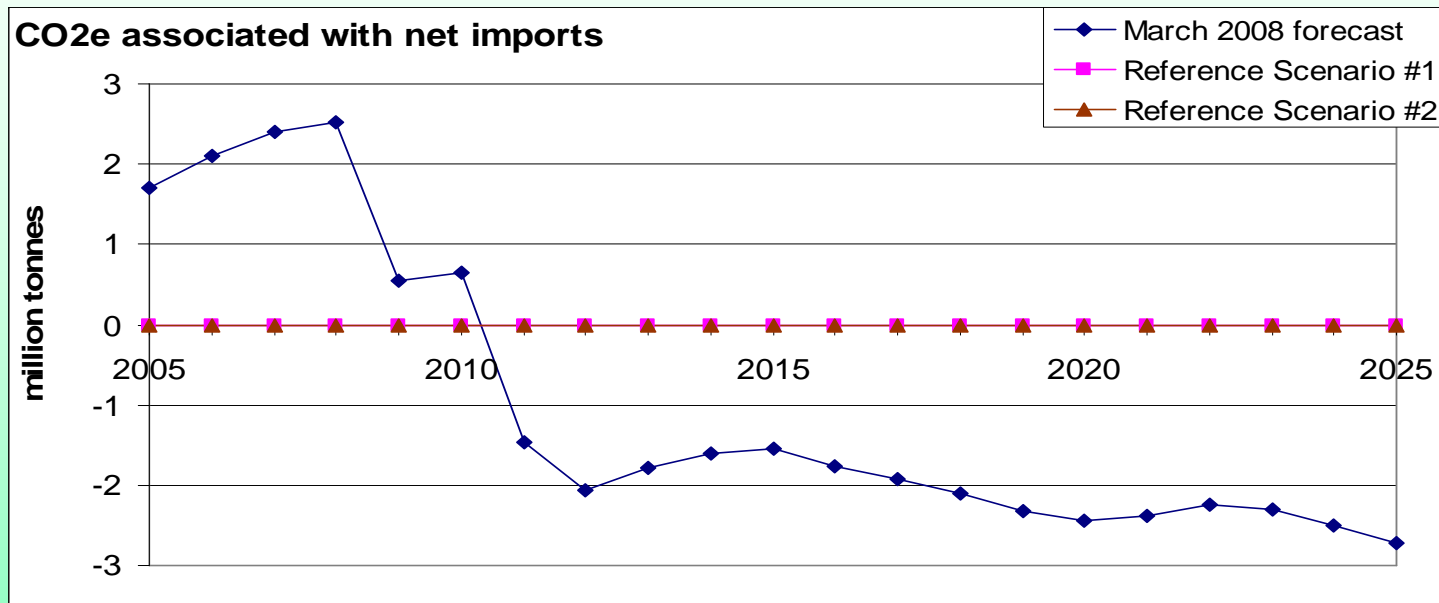


Note:

Full fuel cycle emissions were not considered

# ES I&F Revisions

## Net import GHG emissions

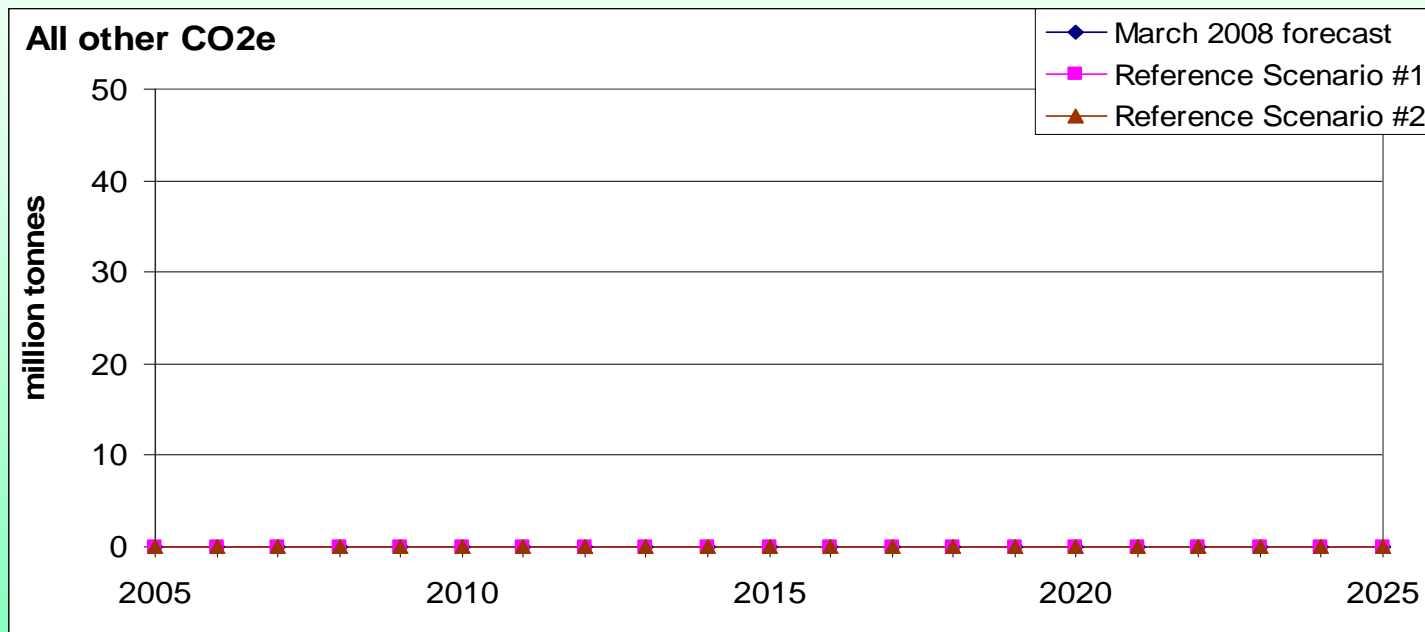


Note:

Reference Scenarios #1 and #2 have no net imports by virtue of the ES TWG criteria noted earlier

# ES I&F Revisions

## All other GHG emissions



Note:

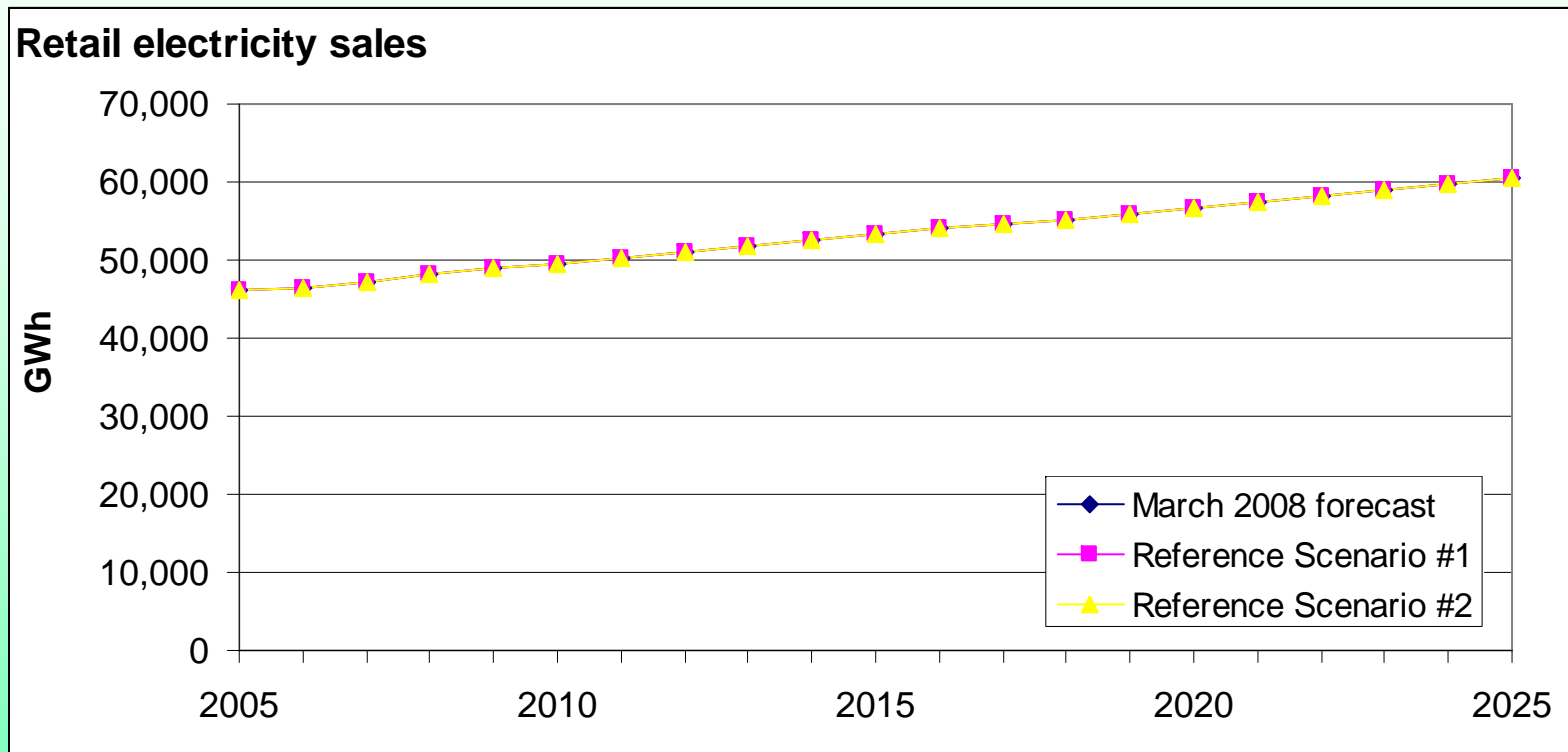
Resources noted here do not emit GHGs (i.e., wind, solar, hydro)

# ES I&F Revisions

## Summary charts

# ES I&F Revisions

## Retail electricity sales

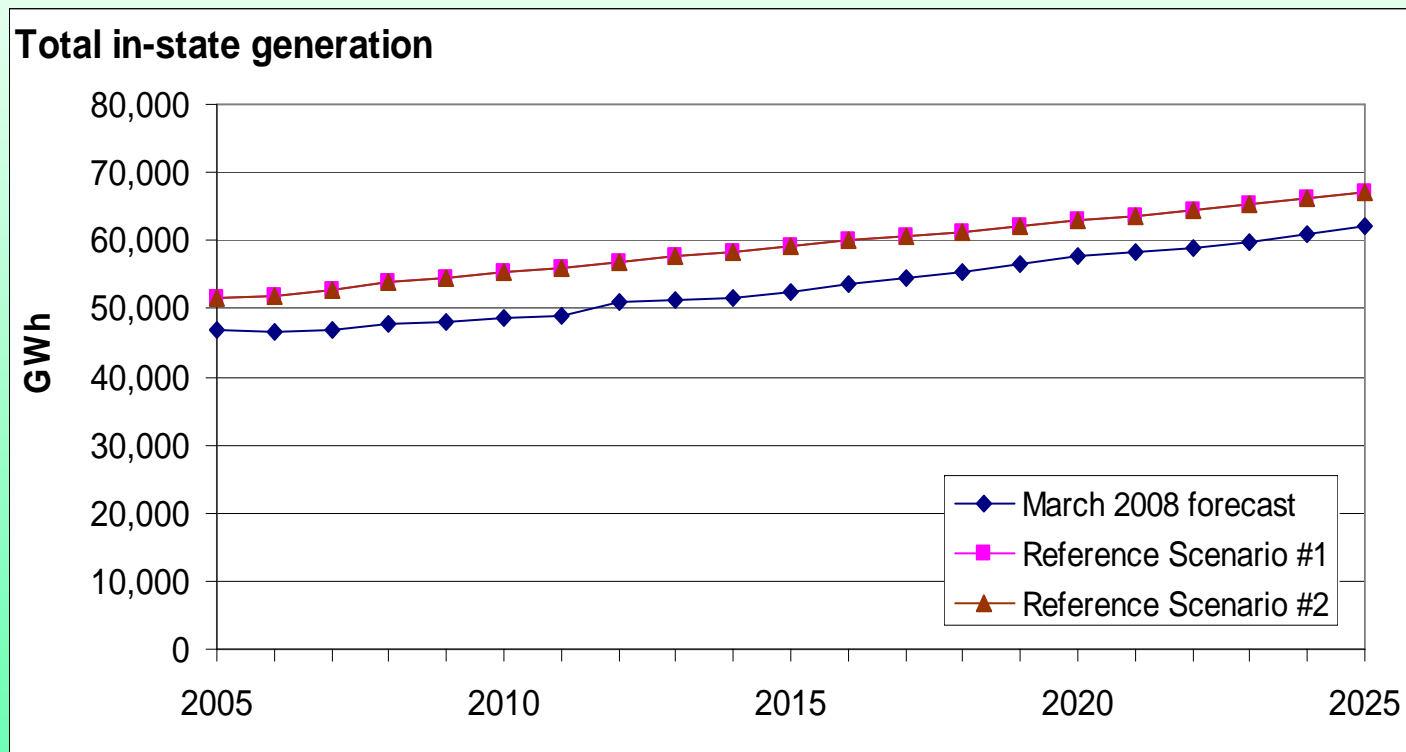


Note:

Reference Scenarios #1 and #2 agree with earlier assumptions

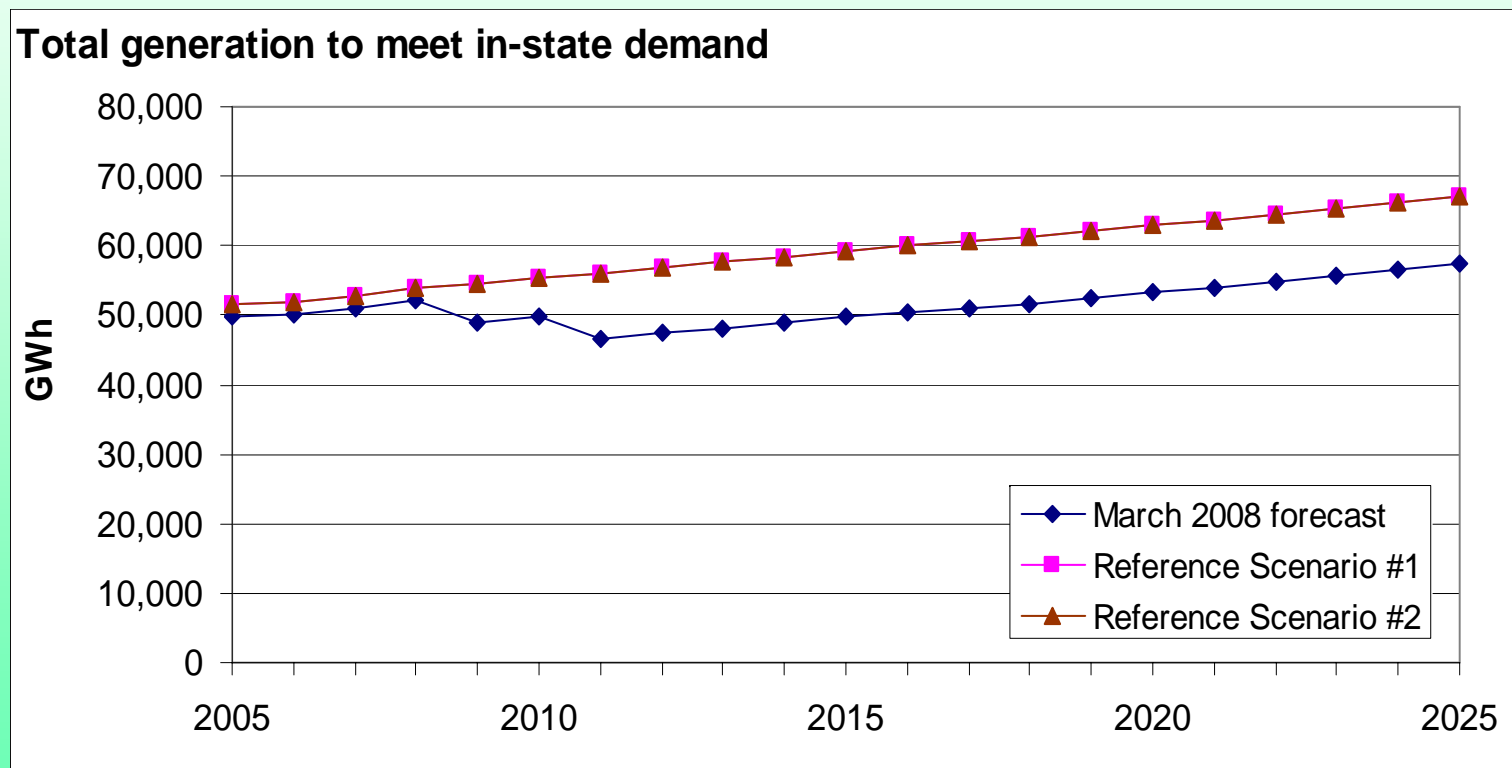
# ES I&F Revisions

## Total in-state gross generation (production basis)



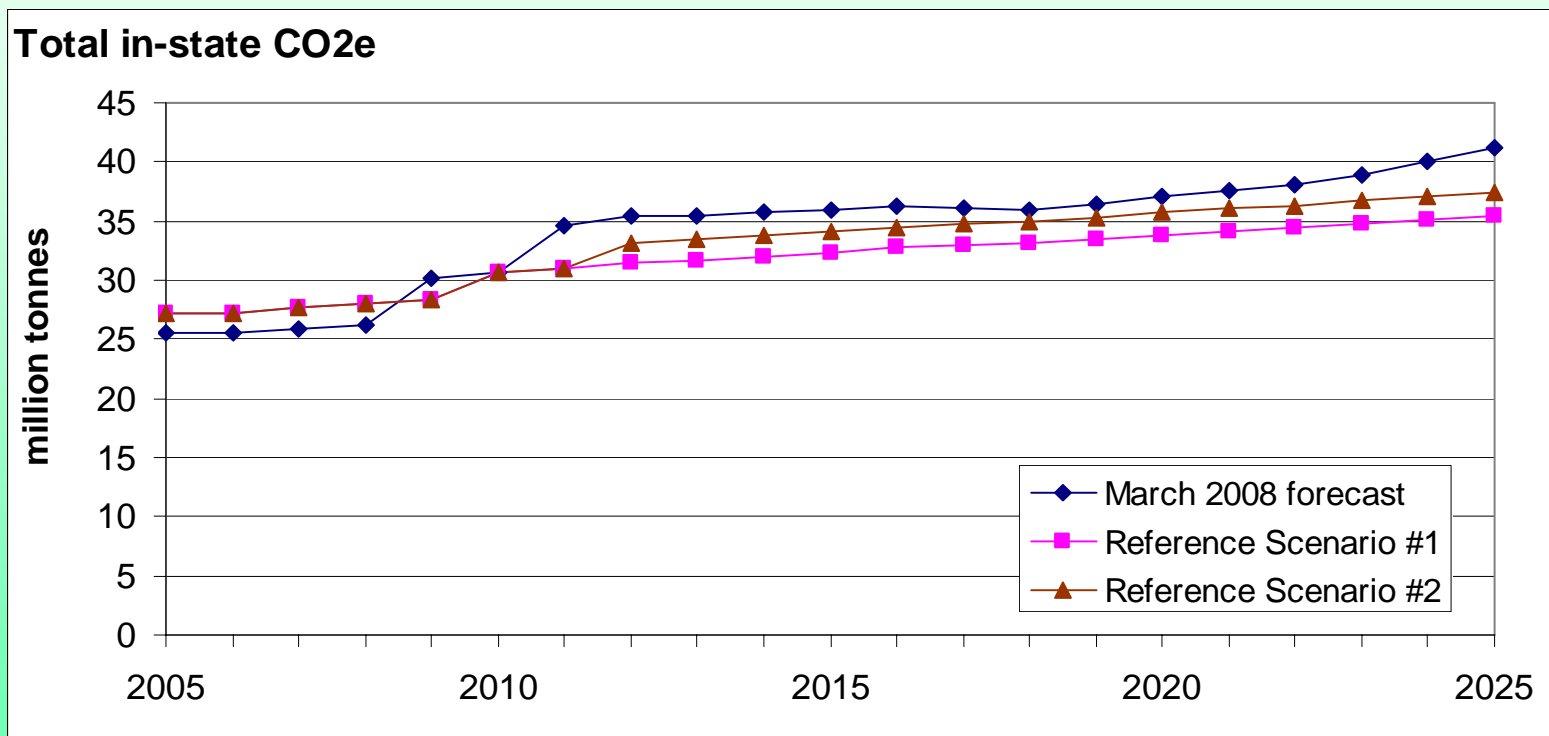
# ES I&F Revisions

Total gross generation to meet in-state demand (consumption basis)



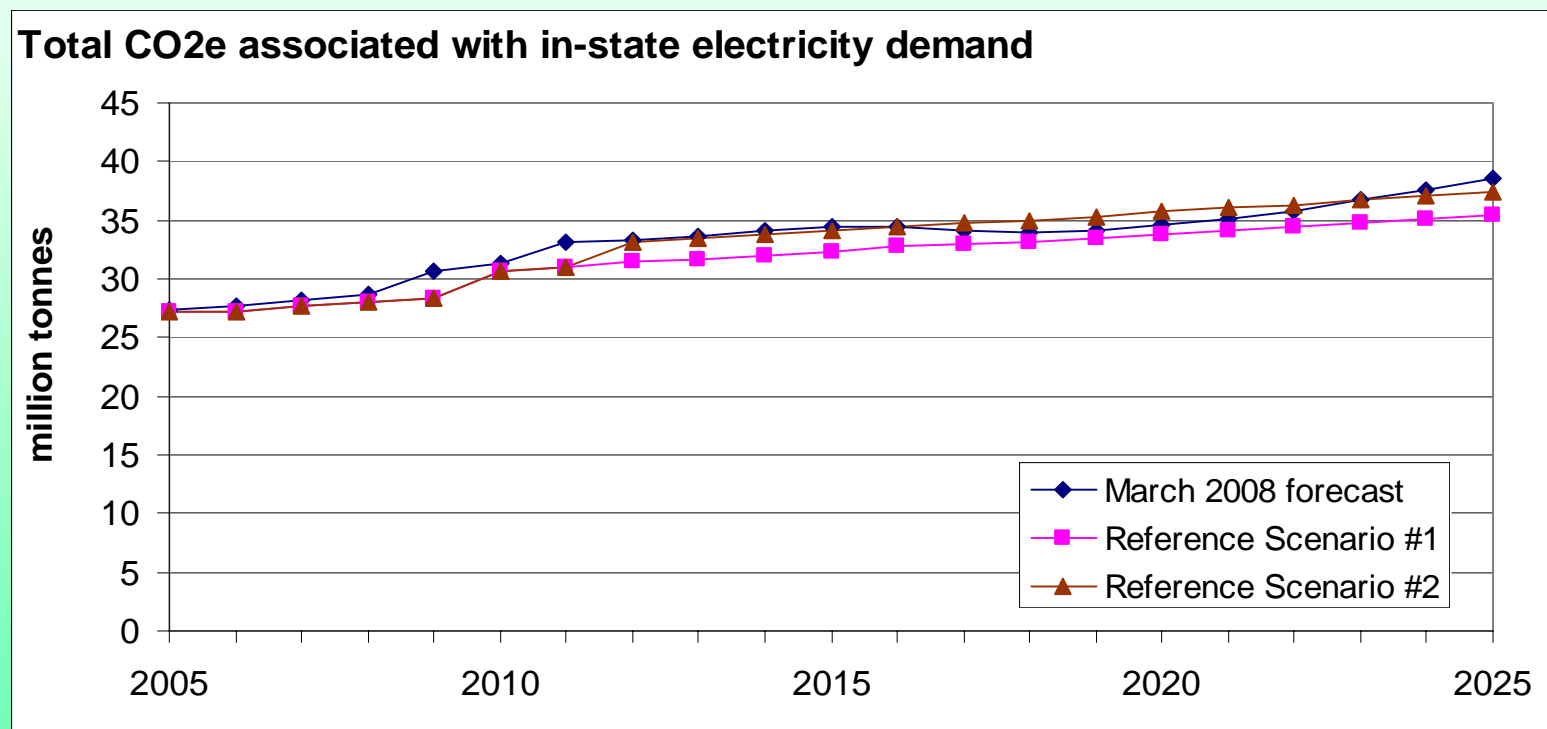
# ES I&F Revisions

## Total in-state GHG emissions (production basis)



# ES I&F Revisions

Total GHGs associated with in-state electricity demand (consumption basis)



# ES I&F Revisions

## Conclusions

# ES I&F Revisions

## Summary of changes

- Two Reference Scenarios are now considered instead of just one in the earlier forecast
- Electricity sales forecast is the same for earlier and current forecasts;
- In-state coal generation/energy/GHG for the new Reference Scenarios varies considerably from the earlier forecast during years up until 2025;
- In-state natural gas-fired generation/energy/GHG for the new Reference Scenarios varies considerably from the earlier forecast for all years due to the self-sufficiency and no net exports criteria;
- In-state oil generation/energy/GHG for the new Reference Scenarios varies by about 20% -25% from the earlier forecast;
- Net import generation/energy/GHG for the new Reference Scenarios varies significantly from the earlier forecast due to the self-sufficiency and no net exports criteria;
- In-state “all other” generation/energy/GHG for the new Reference Scenarios varies by about 3% from the earlier forecast

# Break



Sept. 9, 2008

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55

# Residential, Commercial, Industrial (RCI)

- RCI-1: Improved Building Codes
- RCI-2a: Utility and Non-Utility DSM for Peak Use Electricity
- RCI-2b: Utility and Non-Utility DSM and Energy Efficiency for Electricity
- RCI-3a: Reduced Energy Use in New and Retrofitted State-Owned Buildings: Government "Lead by Example"
- RCI-3b: Reduced Energy Use in State-Owned Buildings: Government "Lead by Example"
- RCI-4a: Promotion and Incentives for Improved New Building Design and Construction
- RCI-4b: Promotion and Incentives for Improved Existing Building Design and Construction
- RCI-5: Education for Consumers, Industry Trades, and Professions
- RCI-6: Incentives and Funds to Promote Renewable Energy and Energy Efficiency
- RCI-7: Green Power Purchasing for Consumers
- RCI-8: Nonresidential Energy Efficiency
- RCI-9: Support for Energy-Efficient Communities, Including Smart Growth
- RCI-10: Energy-Savings Sales Tax

# Inventory & Forecast Update

- Update to incorporate revisions for ES and Agriculture sectors approved by the GCGW
- GCGW to provide final approval at Meeting #10

# Next Steps

- TWGs
  - Refine pending priority policy options based on GCGW input
  - Update quantification and other elements of the policy templates if/as needed
  - Review and update the draft inventory and forecast if/as needed
- GCGW
  - Review and approve draft pending policy options
  - Review and approve final proposed revisions to the inventory and forecast

# Final Report Process

- Completion of policy templates, inventory and forecast report, based on GCGW meeting results
- Production of first draft of full report and appendices by CCS for GCGW review and comment
- Final draft completed by CCS for final review and comment
- Report transmitted by CCS to the Governor on behalf of GCGW

# Table of Contents for Report

Acknowledgments .....ii  
Members of the Arkansas Governor’s Commission on Global Warming.....iii  
Acronyms and Abbreviations .....iv

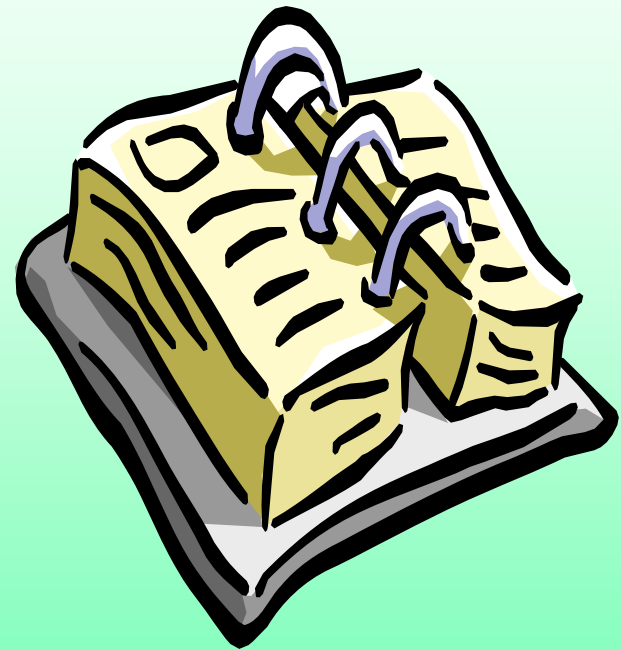
Executive Summary ..... EX-1  
Chapter 1 – Background and Overview .....1-1  
Chapter 2 – Inventory and Forecast of GHG Emissions .....2-1  
Chapter 3 – Cross-Cutting Issues.....3-1  
Chapter 4 – Residential, Commercial, and Industrial Sectors.....4-1  
Chapter 5 – Energy Supply Sector.....5-1  
Chapter 6 – Transportation and Land Use Sectors .....6-1  
Chapter 7 – Agriculture, Forestry, and Waste Management Sectors.....7-1

## Appendixes

A. Act 696 - An Act To Establish the Governor’s Commission on Global Warming.....A-1  
B. Description of GCGW Process.....B-1  
C. Members of Technical Work Groups.....C-1  
D. Greenhouse Gas (GHG) Emissions Inventory and Reference Case Projections.....D-1  
E. Methods for Quantification.....E-1  
F. Cross-Cutting Issues – Policy Recommendations ..... F-1  
G. Residential, Commercial, and Industrial Sectors – Policy Recommendations ..... G-1  
H. Energy Supply Sector – Policy Recommendations. .... H-1  
I. Transportation and Land Use Sectors– Policy Recommendations ..... I-1  
J. Agriculture, Forestry, and Waste Management Sectors – Policy Recommendations .....J-1  
K. List of References ..... K-1  
L. Public Comments.....L-1

# Next Commission Meeting

- Agenda:
  - Review and approval of remaining draft pending GCGW policy options
  - Review and approval of Arkansas' GHG inventory and forecast
- Sept. 25, Little Rock



# Public Input, Announcements