Modeling Aggressive Renewable Energy Policy

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Overview

- Background
- Recent and Ongoing Analyses
  - RPS (Coleman, REMAP, Bingaman)
  - Carbon Policy
  - Other (tax policy)
- Modeling Challenges
  - Policy
  - Resources
  - Technologies
  - New market interactions

Background

- EIA is an independent energy statistical and analysis agency within U.S. DOE
- NEMS - National Energy Modeling System
- A comprehensive model of the U.S. energy economy
- Represents supply, demand, and conversion sectors
  - Energy price feedback to macroeconomic parameters
  - Endogenously determined energy prices and quantities
  - World oil price is exogenous
- Annual Projections to 2030
- Extensive reporting detail

Coleman

- "Clean Energy Portfolio Standard" proposed by Sen. Coleman (R-MN)
  - Like an RPS, but nuclear and fossil with sequestration can count
    - Nuclear gets half credit
    - Limited use of external carbon offsets
  - 20% target by 2025, 2.5 cent price cap
  - Increase in target cannot exceed load growth
  - Other limitations and exemptions

REMAP

- Part of REMAP process, not a formal EIA study
- 20% “no frills” RPS
  - No credit multipliers
  - No load exemptions
  - No price caps
- Intended to exercise models to learn about differences
  - NOT intended as a policy proposal

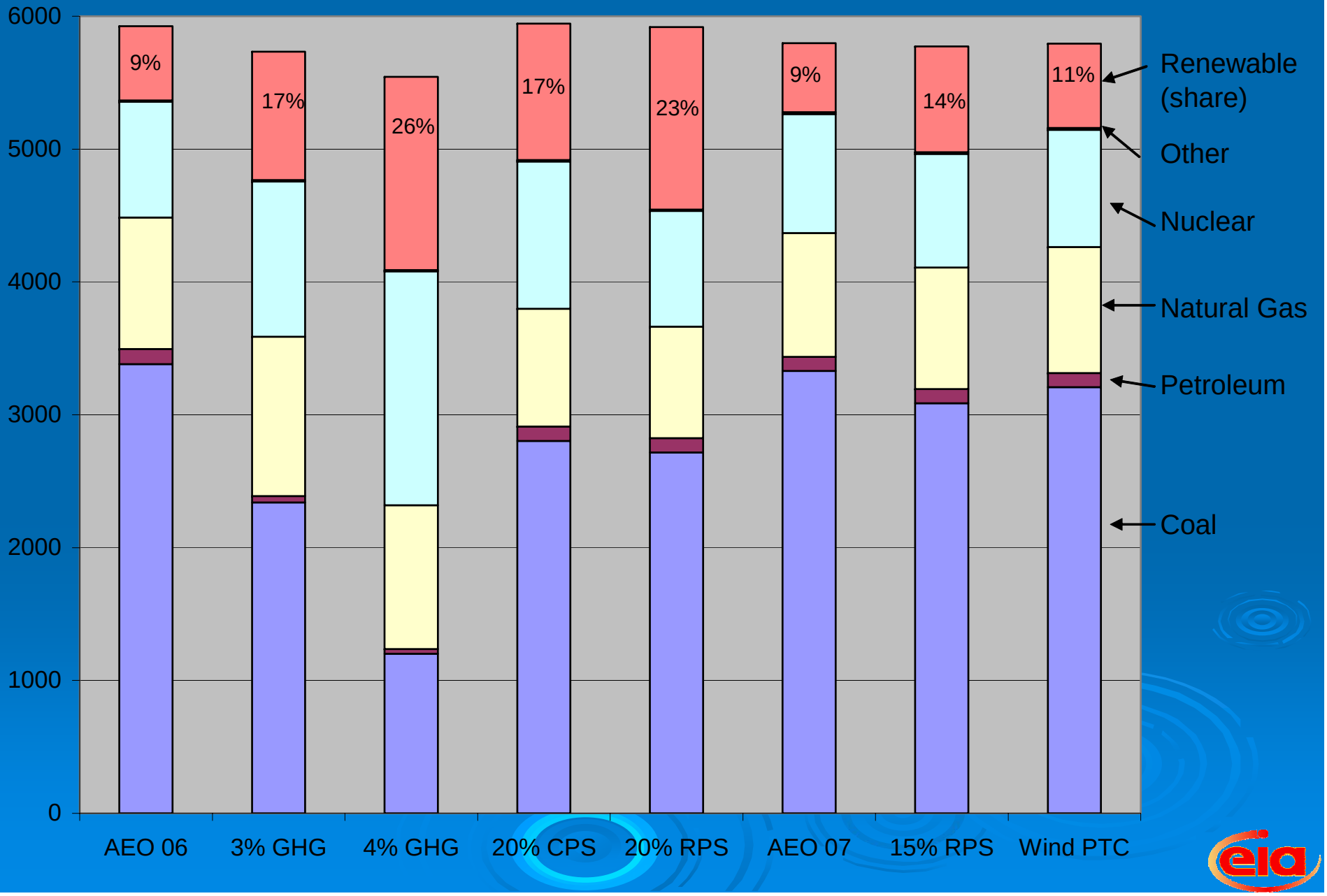
Bingaman

- Proposed by Sen. Bingaman (D-NM)
- 15% RPS by 2020
- 1.9 cent price cap, 2030 sunset
- Load exemptions and exclusions
- Effective target is 12%
- Triple credits for distributed renewables (PV), double credit for Indian lands

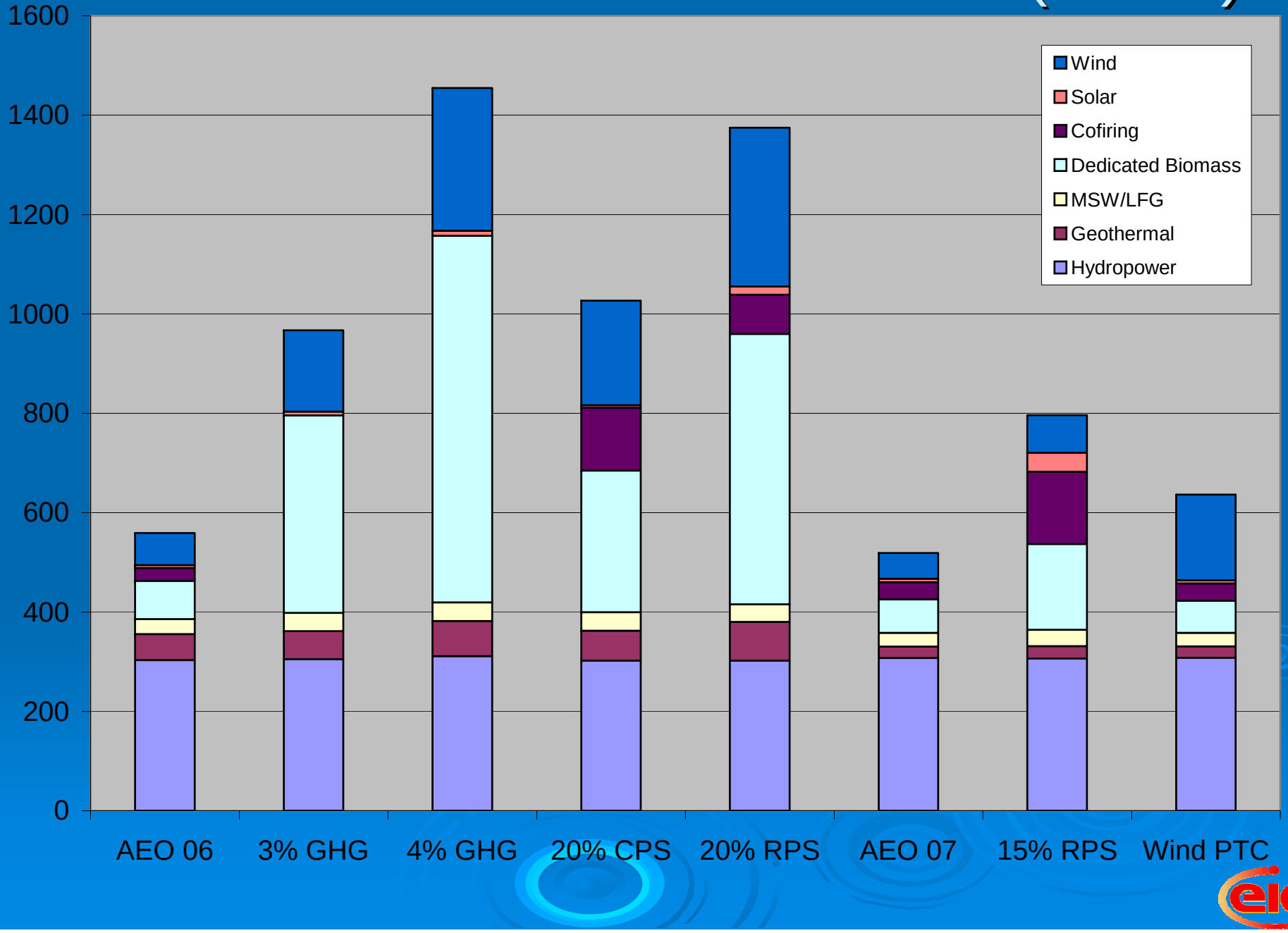
Carbon and Other

- Recent requests from Salazar (D-CO), Bingaman and others (BLLMSS)
  - Salazar reports 4% GHG intensity reduction
  - BLLMSS reports 3% GHG intensity reduction
  - Renewables compete against other generation, but also against load reduction, offsets, and usage in other sectors
- Ways and Means PTC Study
  - Various PTC extensions for wind ONLY
    - Examined extension dates and credit value
  - Included a permanent extension of the 1.9 cent credit

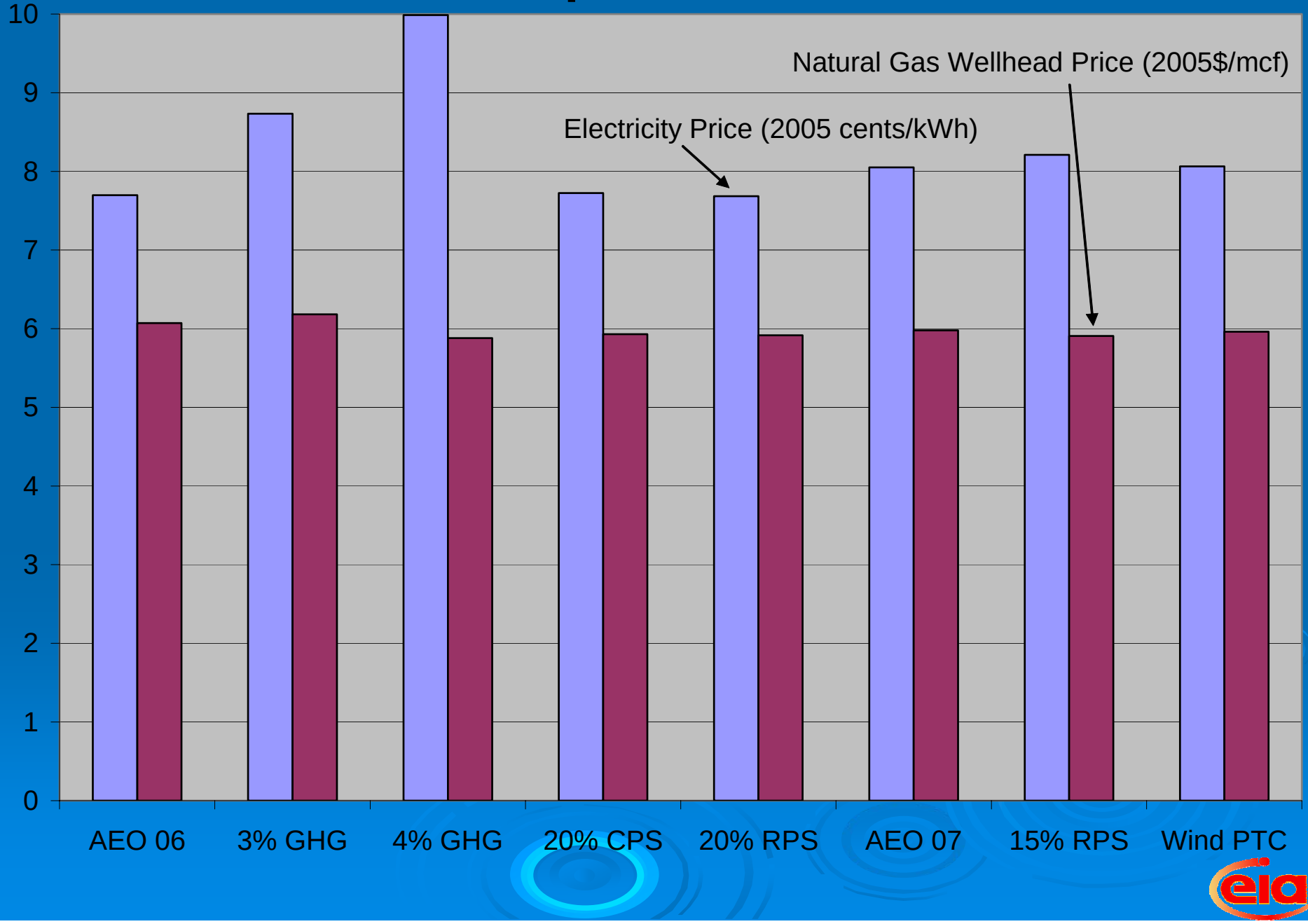
Generation in 2030 (bkwh)



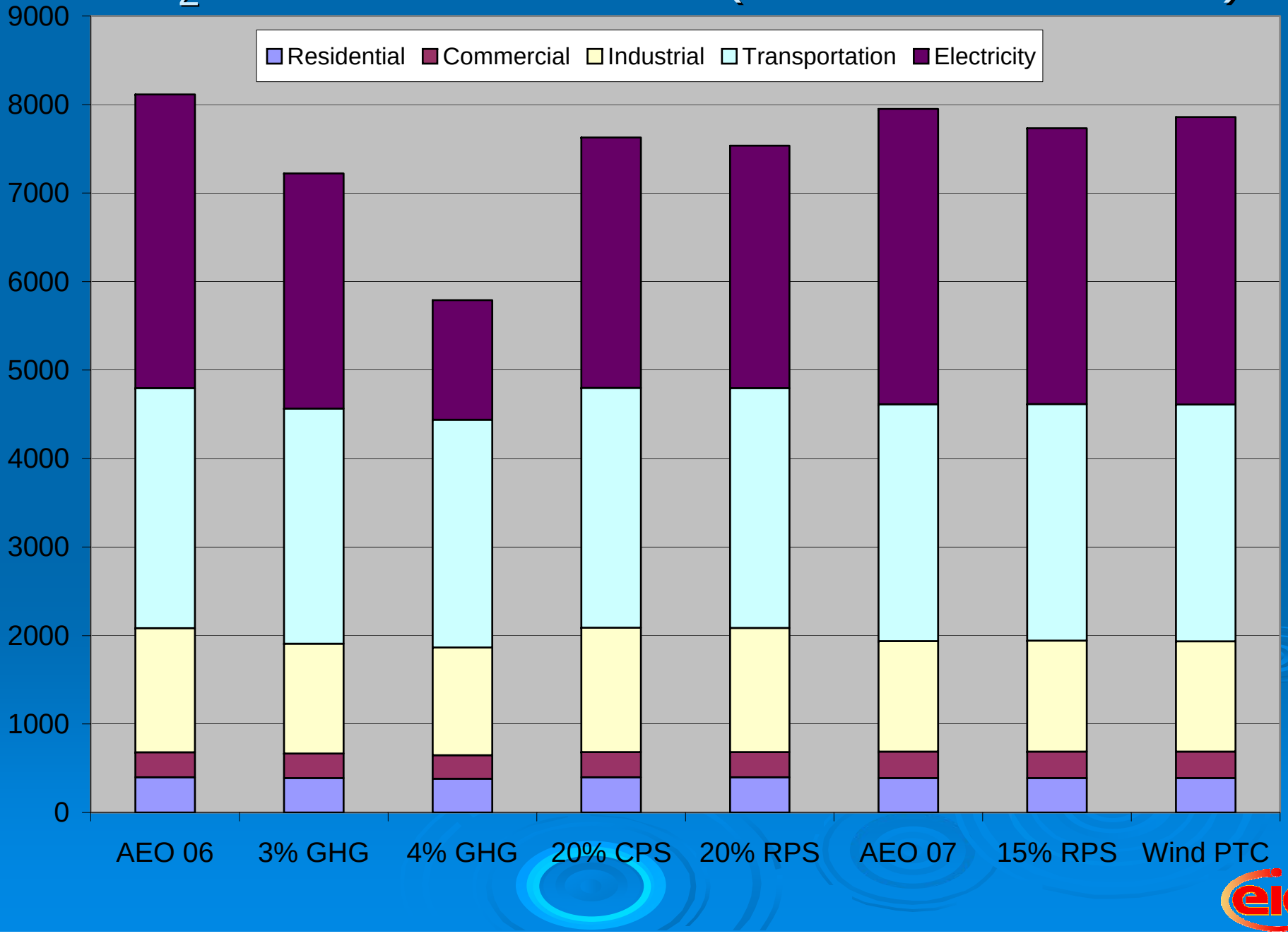
Renewable Generation in 2030 (bkWh)



Price Impacts in 2030



CO_2 Emissions in 2030 (million metric tons)



Results Conclusion

- Details matter
  - How you get there is *at least* as important as where you are going
- Modeling policy mechanisms and provisions can have a significant impact on
  - What (and how much) gets built
  - What gets displaced
  - How much it costs
  - Who pays

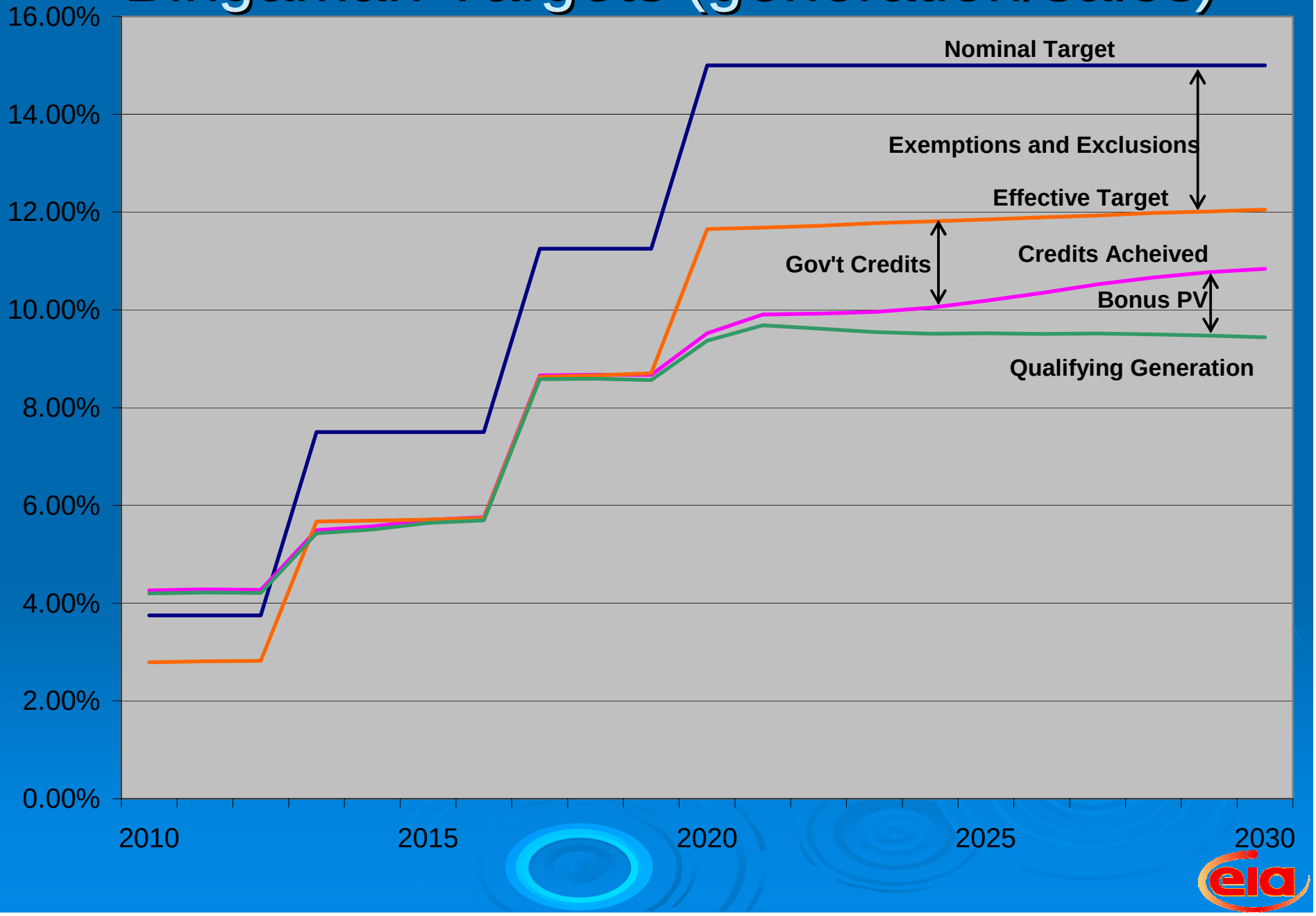
Modeling Challenges

- Getting the policy right
- Getting the technology right
- Getting the resources right
- Getting the interactions right

Getting the Policy Right

- Subtle policy provisions can have a significant impact on results
  - EIA has spent quite a bit of time incorporating features such as price caps, sunsets, exemptions, and exclusions into the model
  - Some policies we can only partially model (require some exogenous intervention)
    - Triple PV credits for distributed generation
    - Certain load exemptions
  - Some policies we cannot model at this time
    - Double credits for Indian lands
    - Energy efficiency credits
- Some policies are not well specified
  - Potential trade between transportation fuels and generation energy credits
  - Interaction with Federal and state RPS policy not always clear
  - Discretionary provisions

Bingaman Targets (generation/sales)



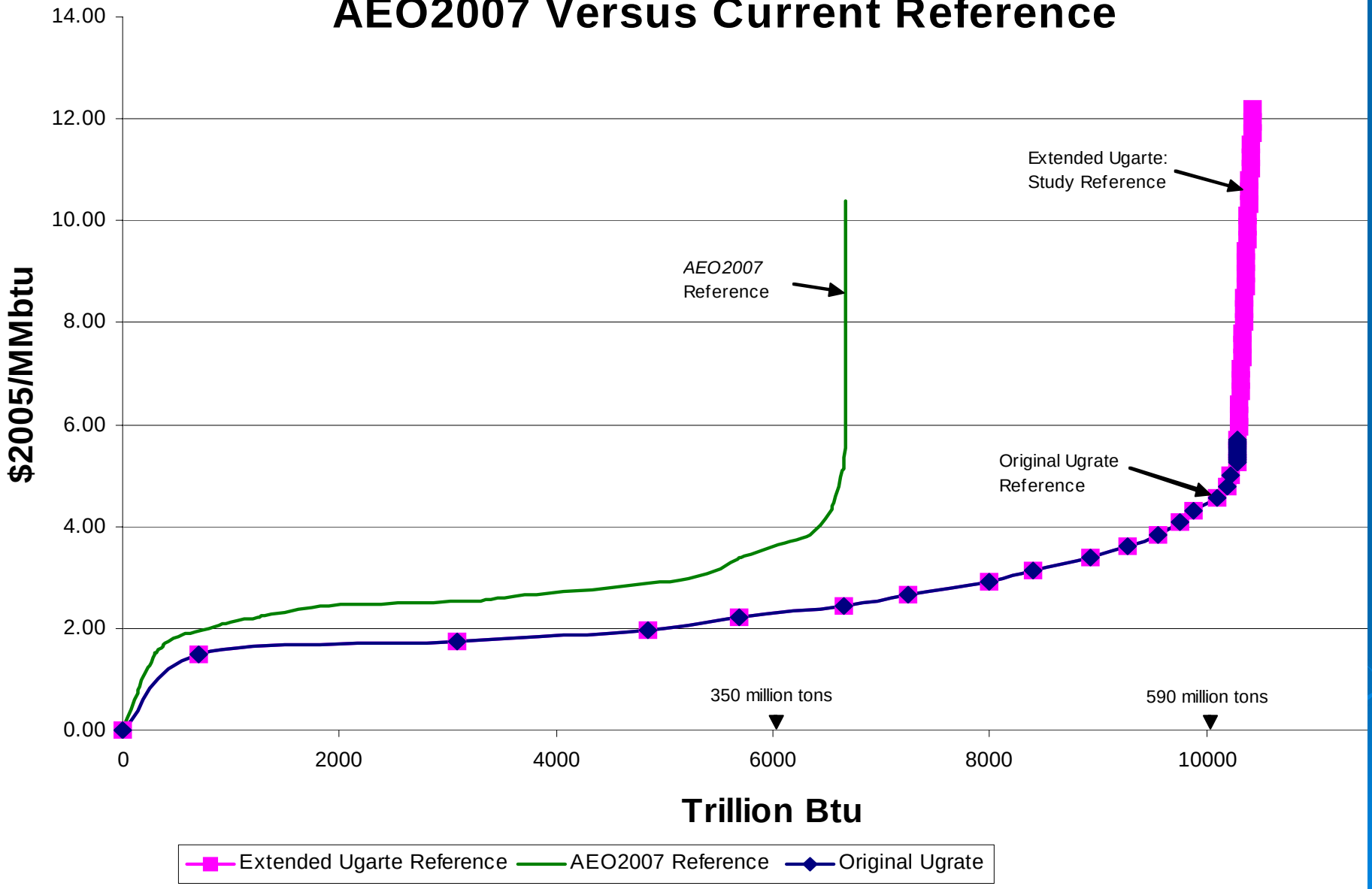
Getting the Technology Right

- Determining current cost and performance
  - Limited data, questionable quality
- Determining future cost and performance
  - Even more limited data, even more questionable quality
- Representing novel technologies
  - Technologies now in the lab
  - Technologies not even in someone's dreams
- Non-financial interactions (intermittency and such)
  - Little real-world experience
  - Some costs are reasonably represented, others are very much unknown

Getting the Resources Right

- Related to technology characterizations
  - Especially for renewables
- At least *some* data is available for the "major" resources
  - Recent updates for wind, biomass, and geothermal
  - Even updated data is incomplete
- Data tends to focus on near-term viable resource
  - Some recent proposals step off of the existing "known" supply curves
  - When you step off the curve for one resource, it's hard to say what happens

2030 Biomass Resource Supply Comparisons
AEO2007 Versus Current Reference



Note: AEO2007 Curve was used for all analyses in this presentation

Getting the Interactions Right

- Market interactions necessarily calibrated to current world
  - Current world may not apply in extreme policy scenarios
- Recent changes made to NEMS to accommodate aggressive renewable targets:
  - Added offshore wind
  - Added inter-regional wind capacity planning
  - Added/improved transportation/electricity bidding for biomass resources
  - Significant improvement to ethanol production and ethanol demand (transportation) models
- Potential for further improvement identified
  - Comprehensive “agricultural” sub-module to better account for feedbacks among energy feedstocks as well as food production

Conclusion

- EIA has made significant progress in representing renewable resources
  - Detailed policy specification
  - Updated technology and resource characteristics
  - Addressed many key interactions
- Significant work left to be done
  - Policy makers always ready to throw a curve
  - Data is necessarily tied to current conditions
    - Far end of supply curve will always be uncertain
    - Need continued progress in data and systems analysis
  - Aggressive scenarios highlight or reveal often overlooked model interactions

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