
EPRI Funded RGGI Modeling Runs Investigating the Impact of Nuclear Power Plant License Renewal

September, 2005

Modeling performed by ICF Consulting for EPRI



EPRI Funded Model Runs

- EPRI hired ICF, and used RGGI modeling assumptions to investigate impact of nuclear power plant license renewal on the region
- Three model runs were performed assuming that 31% of the nuclear capacity in the region does NOT receive license renewal
 - Using RGGI Reference Case* assumptions (labeled as EPRI Ref)
 - Using RGGI High Emissions Reference Case* assumptions (labeled as EPRI High Ref)
 - Using RGGI Reference Case* and 25% Below 1990-Level Cap assumptions (labeled EPRI 25% Cap)
- Agreement with RGGI Staff Working Group (SWG) that these modeling runs and data would be made publicly available when complete

*The RGGI Reference and High Emissions Reference Cases used were those available to the public in July, 2005. The “new” reference cases were released by RGGI SWG on August 30, and September 8, 2005, and could not be incorporated into this analysis.

Reduced Nuclear Power Plant License Renewal

- As of September, 2005, over 54% of nuclear capacity in the RGGI region have operating licenses that expire before 2020, and over 62% by 2024.
- To simulate a reduced nuclear power capacity that might result if some plants do not seek or receive operating license renewals, each plant that is currently scheduled to retire before 2024 was reduced to half its capacity in the model run year closest, but not preceding, its current license expiration year.
- These simulated reductions bring the nuclear power capacity modeled for EPRI in 2020 to 31% less than current capacity and 37% lower than the 2020 nuclear capacity modeled in all RGGI SWG runs, because uprates at potentially retiring plants were not performed.
- The modeled reduction in nuclear capacity in 2020, 31% less than current capacity, is less than the 54% of nuclear capacity scheduled to retire. Thus, these scenarios assume some plants do apply for and receive license renewal.
- All RGGI SWG modeled scenarios assume that all nuclear power plants in the region apply for and receive license renewal.

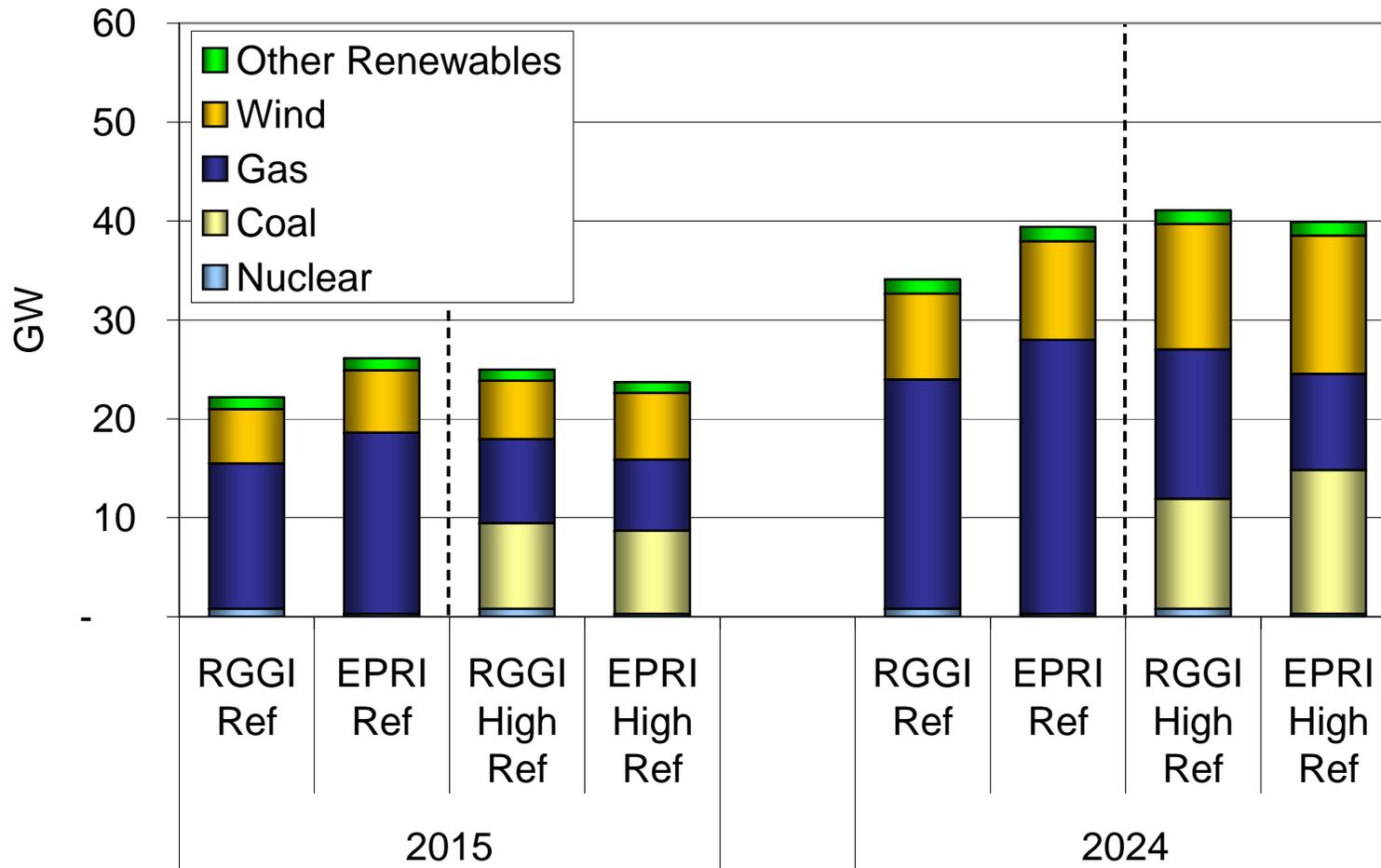
Reference and High Emission Reference Cases

- Except for the change in nuclear capacity, all assumptions were taken from the RGGI Reference Case, the RGGI High Emission Reference Case, and the 25% Below 1990 Level CO2 Cap Case – all of which can be found on the RGGI website, www.rggi.org.
- The key differences between the two reference cases are:

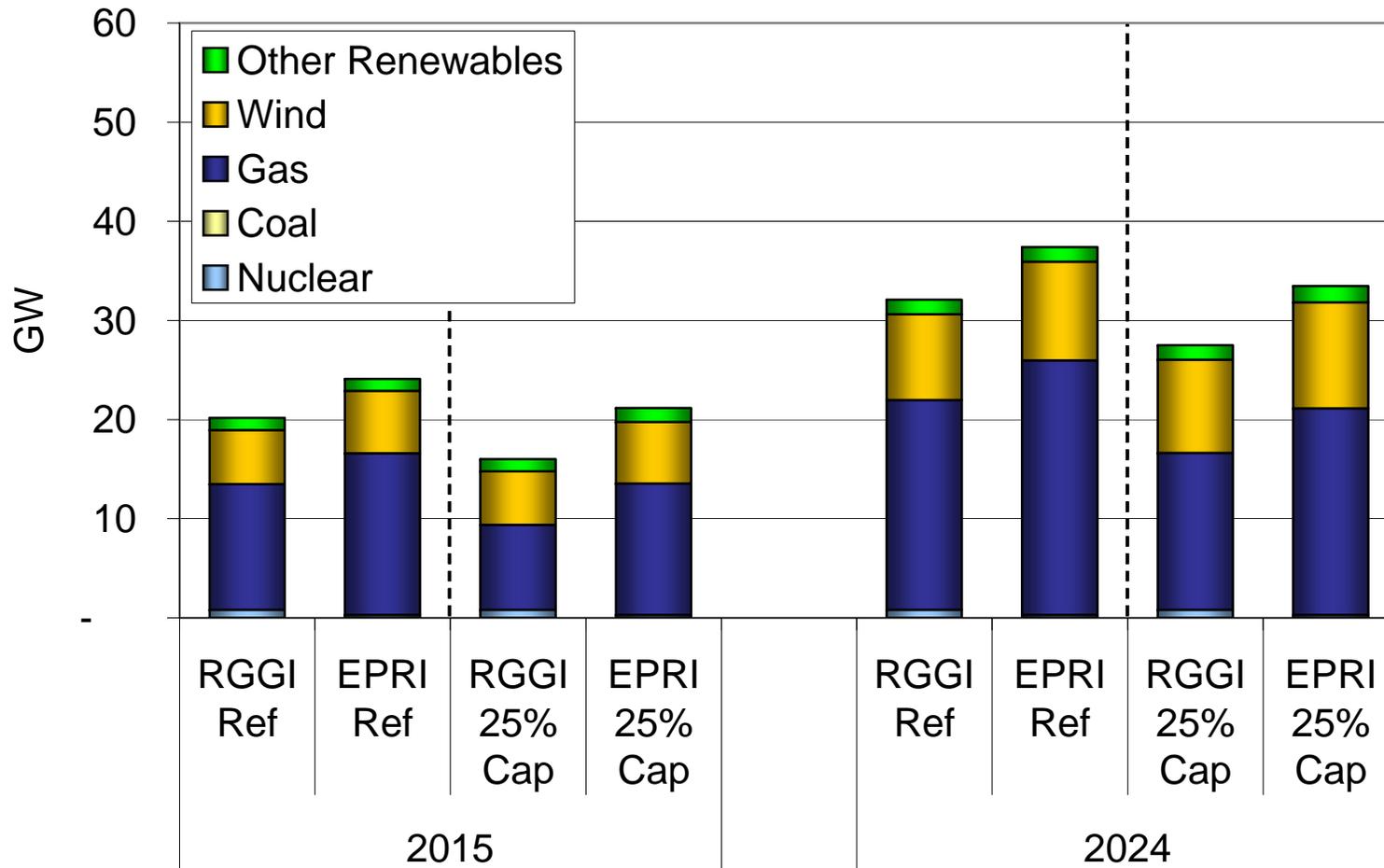
Reference Case	Natural gas prices start at \$6.50/MMBtu in 2006, drop to below \$4.50 in 2015 and flatten to about \$4.70 by 2024	New coal plants are not allowed built in the RGGI region
High Emission Reference Case	Gas prices flat at \$6.50/MMBtu over all years	New coal capacity allowed in RGGI region (excluding urban areas)



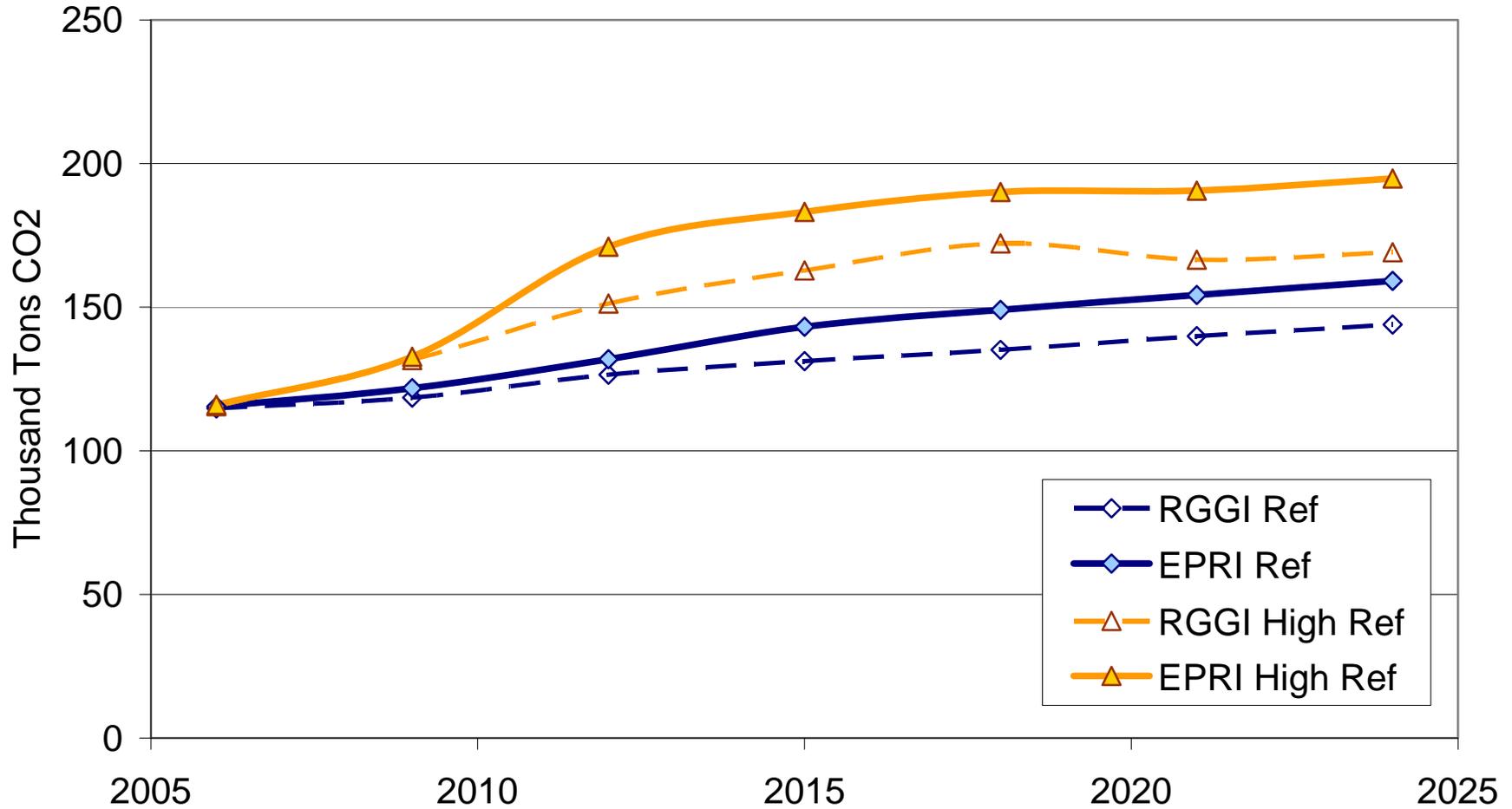
Capacity Additions - RGGI Reference v. EPRI Reduced Nuclear Scenarios, No CO2 Cap



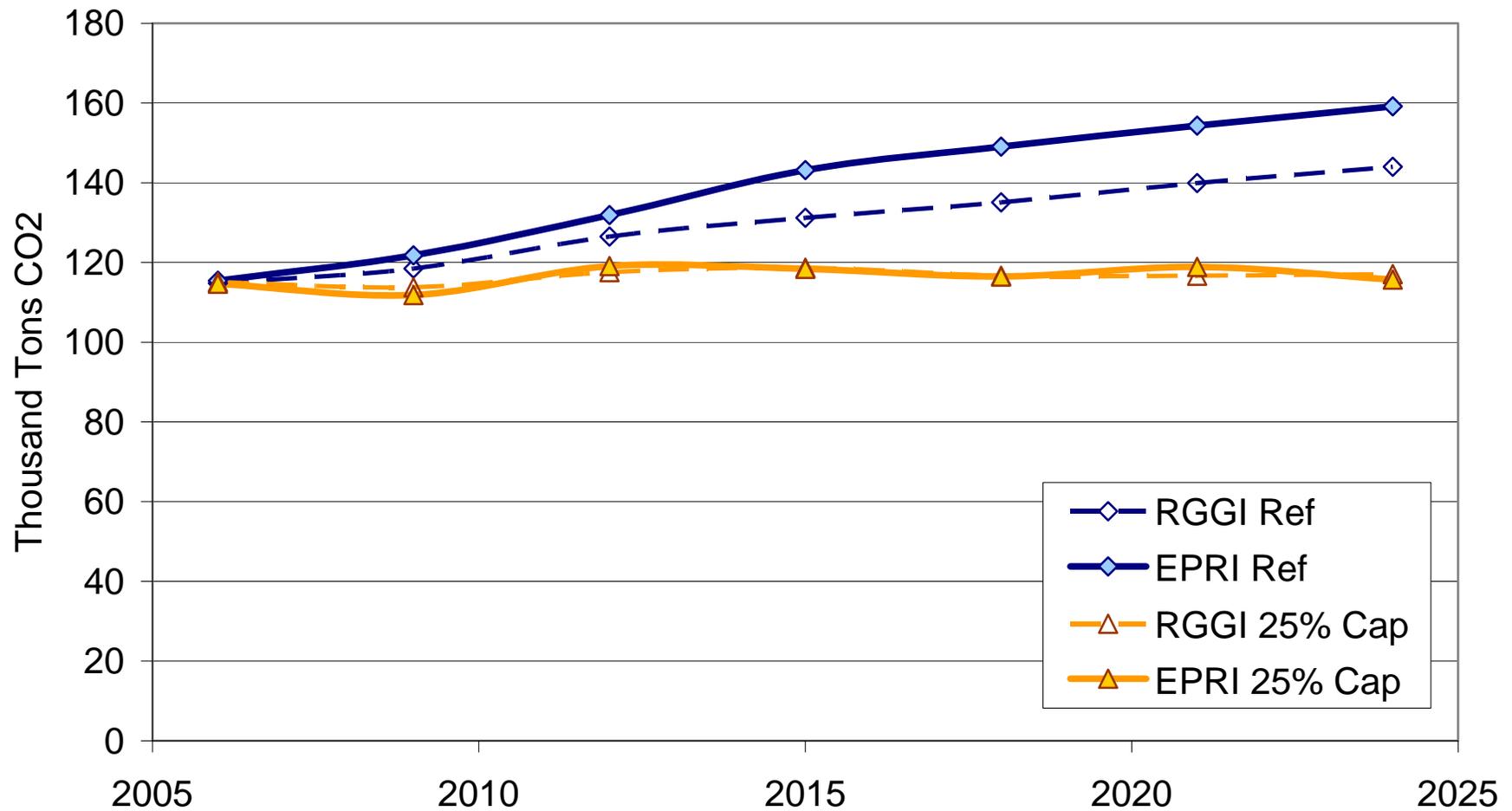
Capacity Additions - RGGI 25% Cap v. EPRI 25% Cap with Reduced Nuclear Scenario



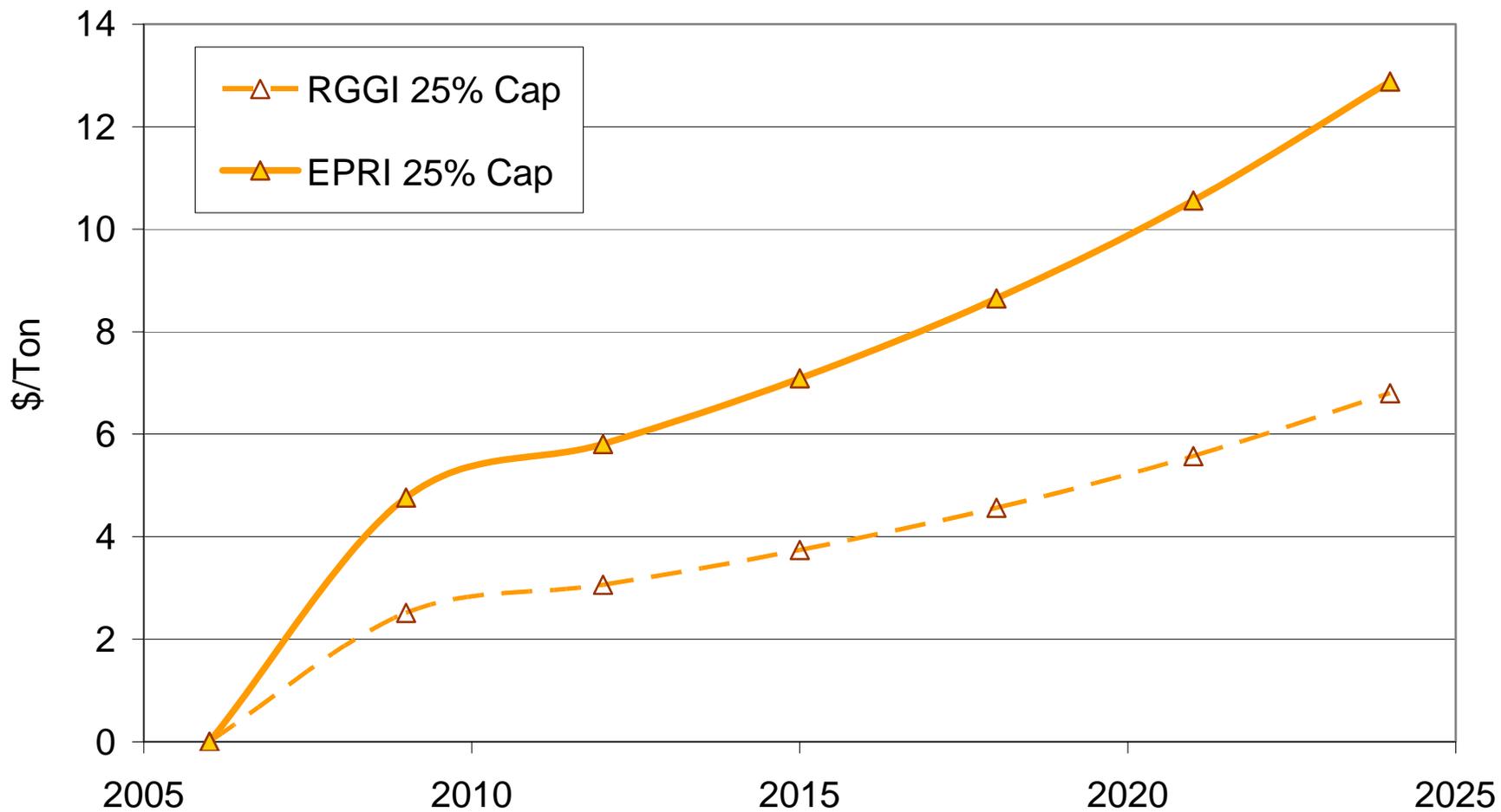
CO₂ Emissions - RGGI Reference v. EPRI Reduced Nuclear Scenarios, No CO₂ Cap



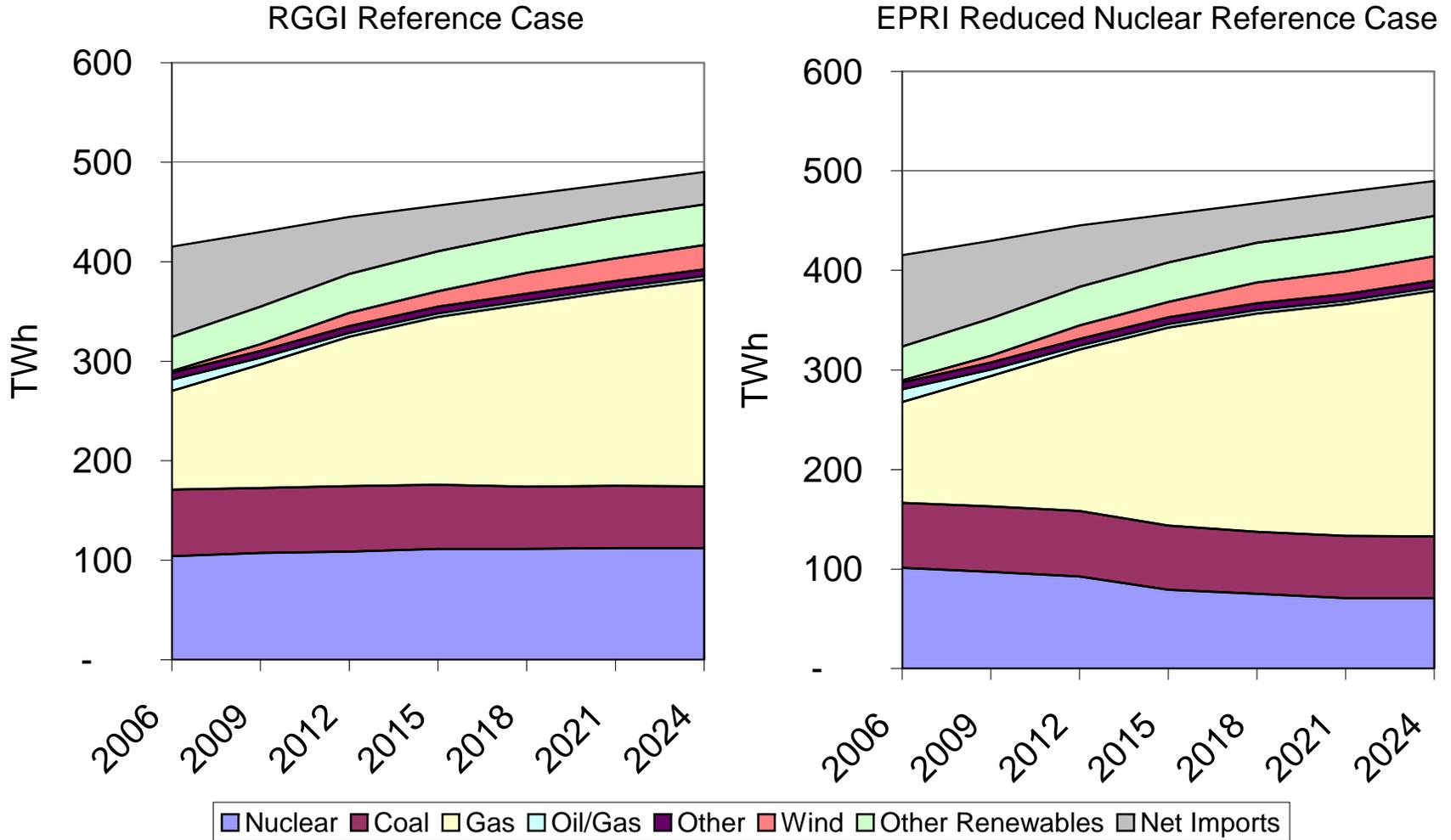
CO₂ Emissions - RGGI 25% Cap v. EPRI 25% Cap with Reduced Nuclear Scenario



CO₂ Allowance Prices - RGGI 25% Cap v. EPRI 25% Cap with Reduced Nuclear Scenario



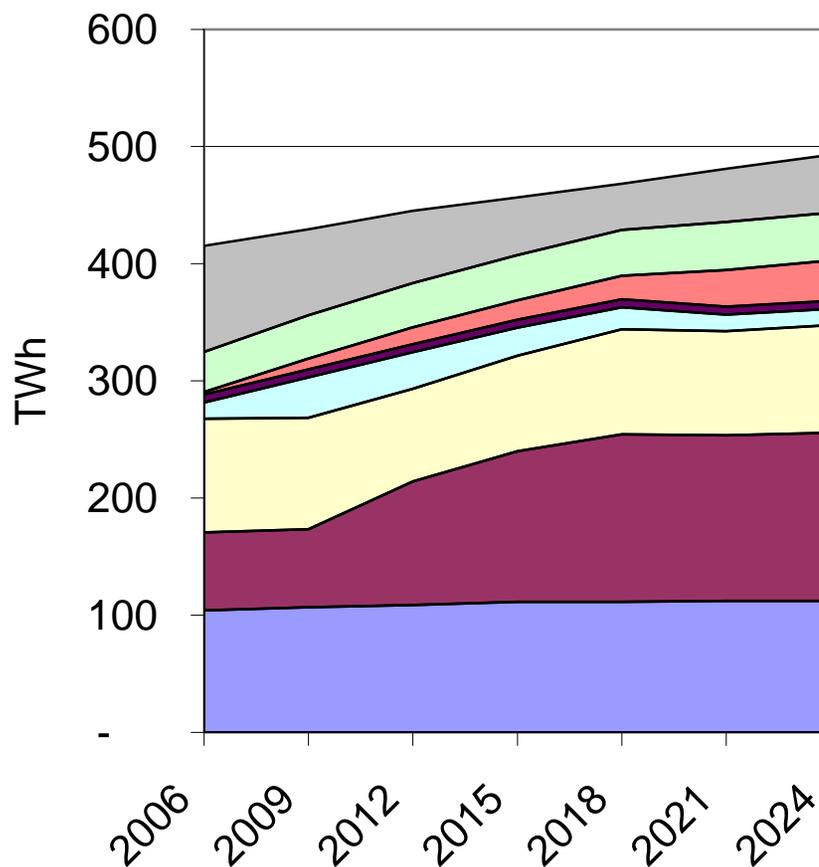
Generation – RGGI Reference v. EPRI Reduced Nuclear Scenarios, No CO2 Cap



Generation – RGGI High Emissions Reference v. EPRI High Emissions Reduced Nuclear Scenario, No CO2 Cap

The generation mix over time found with the RGGI High Emissions Reference Case has not yet been released to the public.

EPRI High Emissions Reduced Nuclear Scenario



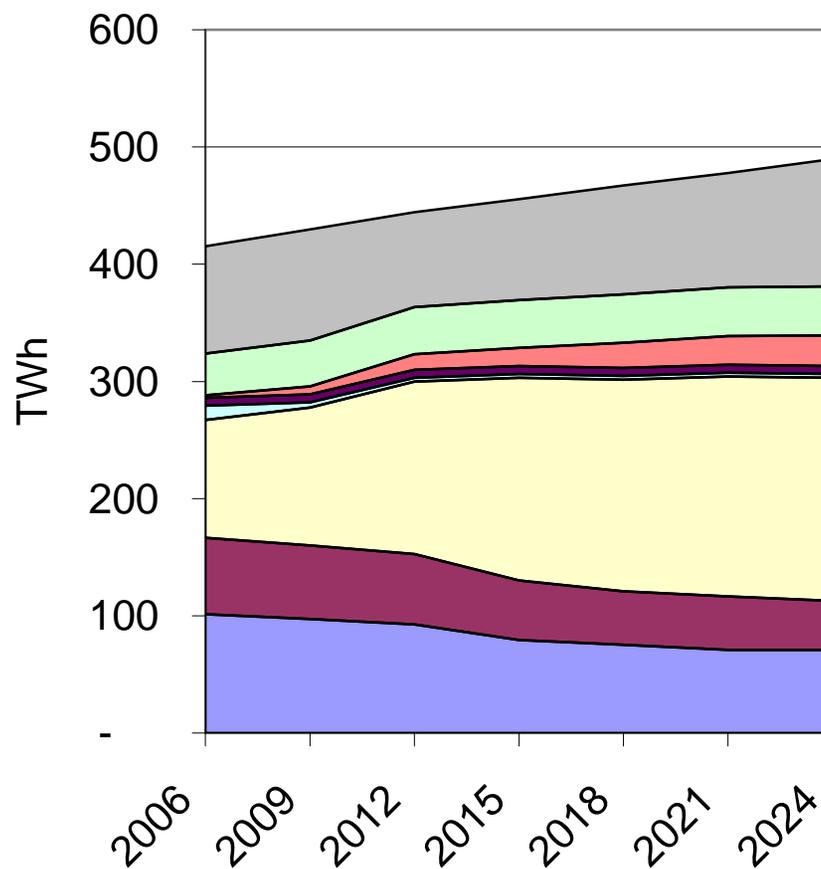
■ Nuclear ■ Coal ■ Gas ■ Oil/Gas ■ Other ■ Wind ■ Other Renewables ■ Net Imports

Generation – RGGI 25% Cap v. EPRI 25% Cap with Reduced Nuclear Scenario

RGGI 25% Carbon Cap Scenario

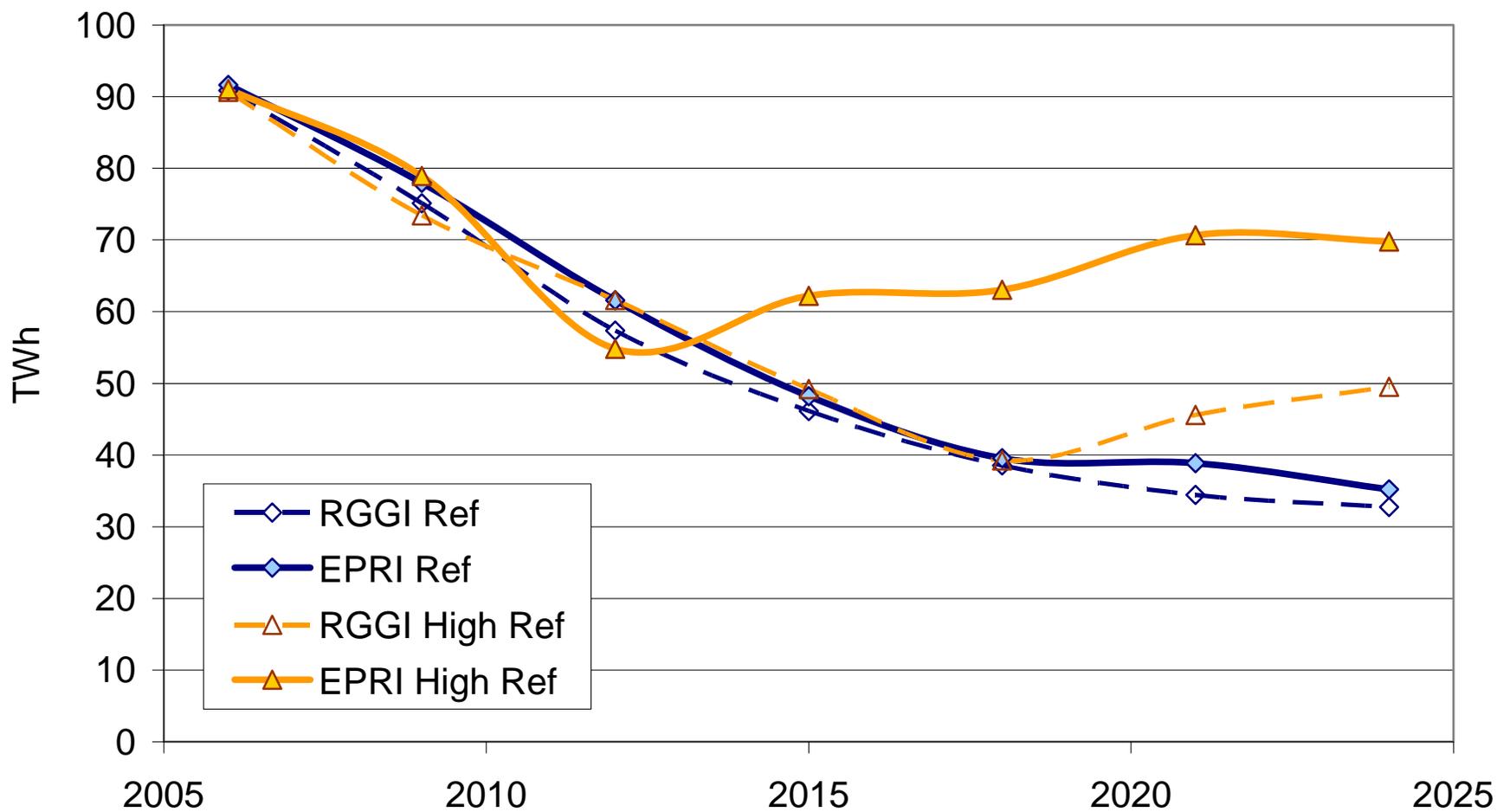
EPRI 25% Carbon Cap Reduced Nuclear Scenario

The generation mix over time found with the RGGI 25% Carbon Cap Scenario has not yet been released to the public.

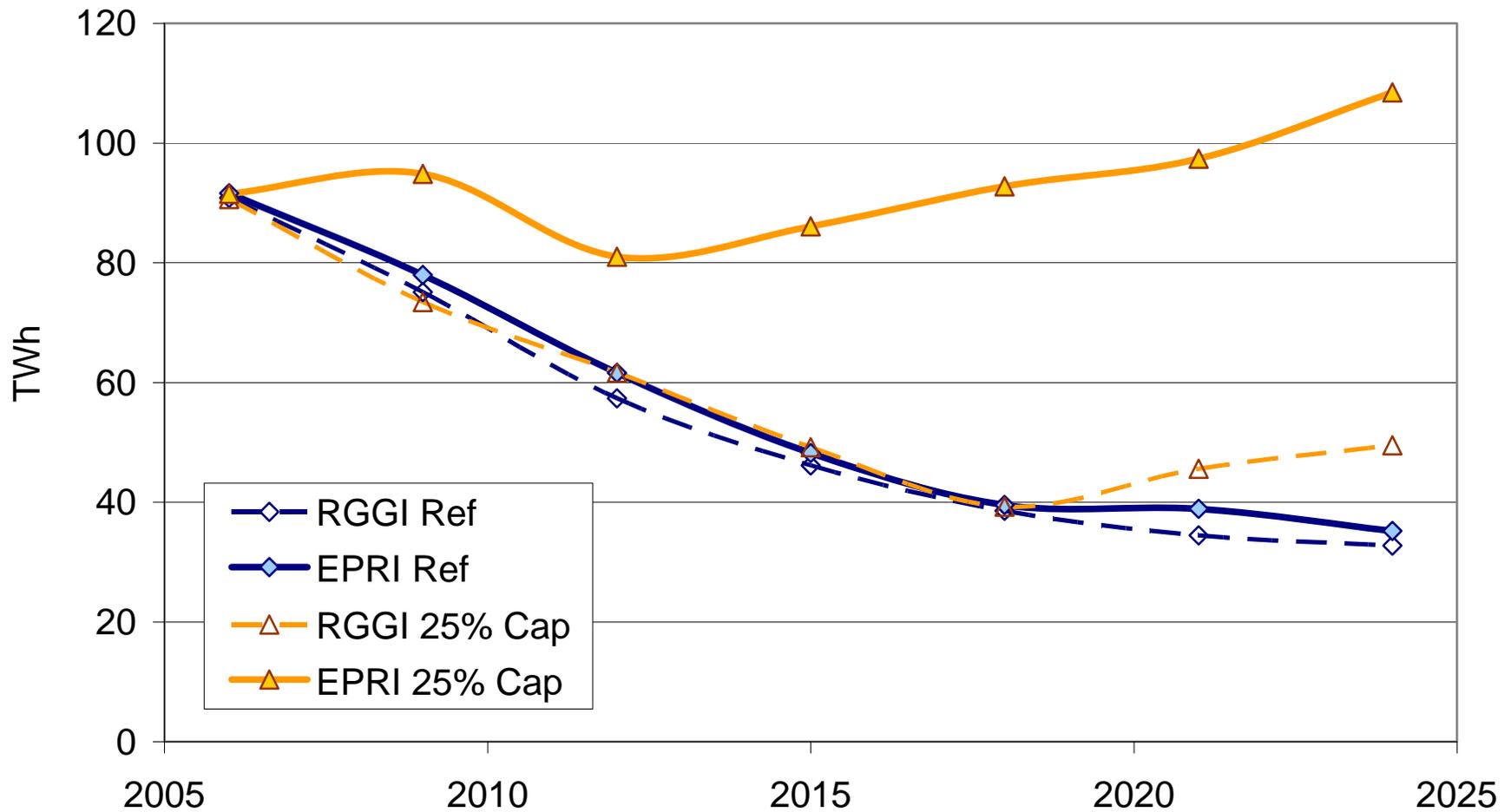


■ Nuclear
 ■ Coal
 ■ Gas
 ■ Oil/Gas
 ■ Other
 ■ Wind
 ■ Other Renewables
 ■ Net Imports

Imports - RGGI Reference v. EPRI Reduced Nuclear Scenarios, No CO2 Cap



Imports - RGGI 25% Cap v. EPRI 25% Cap with Reduced Nuclear Scenario



Key Findings – Reduced Nuclear Capacity Scenarios, No CO2 Cap

Under the Reference Case Assumptions:

- Natural gas builds increase from 21 GW in the RGGI region in 2024 when all nuclear power plants receive license renewal to approximately 26 GW in the Reduced Nuclear Scenario where capacity is 31% less than today's level
- CO2 emissions rise from 144 million tons in 2024 to 159 million tons in the Reduced Nuclear Scenario

Assuming a High Emissions Reference Scenario:

- Coal builds in the RGGI region increase from 11 GW to 15 GW in the High Emissions Reduced Nuclear Scenario, while natural gas additions drop from 13 GW to 8 GW
- Imported electricity rises from almost 50 TWh to 70 TWh
- CO2 emissions rise from 169 million tons in 2024 to 195 million tons in the High Emissions Reduced Nuclear Scenario

Key Findings – Reduced Nuclear Capacity Scenarios, 25% Below 1990-Level CO2 Cap

Under the Reference Case and 25% Below 1990 Level CO2 Cap Scenario:

- Natural gas builds increase from 16 GW in the RGGI region in 2024 when all nuclear power plants receive license renewal to approximately 21 GW in the Reduced Nuclear Scenario where capacity is 31% less than today's level
- CO2 allowance prices almost double over the whole analysis period, rising from \$7/ton to \$13/ton in 2024.
- Imports are significantly increased, more than doubling in 2024 to above 100 TWh.