EEI Preliminary Reference Case and Scenario Results

May 21st, 2010

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Updated Reference Case

- Nuclear build limits – from NEI
  - Hard-wired units (5,500 MW)
  - Candidate units (4,300 MW) – allowed to be built on or after specified date, but only if deemed economic
  - Economic units – including 8 units above, up to 45 units by 2030 on national basis, regional limits based on existing brownfield sites
- Run year mapping
- Capacity credit update (10%) for wind
- Calibrated coal prices to AEO 2010
  - Minemouth prices calibrated to AEO 2010
  - Transportation prices based on EPA

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EEI Master Assumptions Matrix – Reference Case

	EPA ARRA Analysis	EEI Base Case
Electric Demand – National Annual Average	EPA/AEO2009	EPA/AEO2009
Electric Demand -Regional	EPA/AEO2009	EPA/AEO2009
Electric Demand Elasticity	na	na
Natural Gas Supply Curves (Henry Hub)	EPA	EPA
Natural Gas Basis Differentials	EPA	EPA
Coal Price Supply Curves and Coal Transportation Costs	EPA	AEO2010/EPA
Biomass Supply Curves	EPA/AEO2009	EPA/AEO2009
New Build Capital Costs	EPA	EIA AEO/2010
Retrofit Capital Costs	EPA	EVA/NERC
Mercury and HAP Retrofit Structure	EPA	EVA/NERC
Technology Limits	EPA	EPA/NEI
Financing Assumptions – New Builds	EPA	EPA
Financing Assumptions – Retrofits	EPA	EPA for regulated EIA for merchant
3P Policy	CAIR w/ 1.6 million ton bank carryover into 2012	CAIR plus state mercury limits
Carbon	None	None

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EEI Reference Case Regulations

	SO_2 Program	NO_X Program		Mercury Program	CO_2 Program
		Annual	Ozone Season		
CAIR Phase I (2010 -2014)	25 States + DC 2010 retirement ratio: 2:1 Existing Title IV for unaffected states	25 States + DC 1.522 million tons	25 States + DC 0.568 million tons	State Level Regulations CT, CO, DE, GA, IL, MA, MD, ME, MI, MN, MT, NC, NH, NJ,NM, NY, OR, WA, WI	None
CAIR Phase II (2015+)	25 States + DC Retirement ratio: 2.86:1 Existing Title IV for unaffected states	25 States + DC 1.268 million tons	25 States + DC 0.485 million tons		

- BART is included for all BART effected units not included in CAIR for SO_2 and NO_x and WRAP for SO_2.
- WRAP SO_2 is included.
- All existing state regulations for NO_x, SO_2, Hg and CO_2 are included.

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EEI Scenario Descriptions

Scenario	Description
HAPS ***(Scenario 1)***	All coal units required to have SCR, scrubber, ACI and fabric filter by 2015
HAPS+Ash+Water ***(Scenario 2)***	**Ash (2015):** All units with wet fly ash disposal and/or wet bottom ash disposal are required to convert to dry handling and install a landfill and wastewater treatment facility. Cost components are as follows: • Conversion to dry fly ash handling - $15 million per unit •Conversion to dry bottom ash handling - $20 million per unit •New Landfill - $30 million per facility •New wastewater treatment facility - $120 million per facility Costs applied to units with ponds for fly ash and/or bottom ash based on EIA-923 Schedule 8A, 2008.[1]
	Water (2015): All fossil and nuclear facilities that have at least one once-through cooling unit and would have been classified as a Phase II Facility under the remanded Phase II rule are required to install cooling towers. This does not apply to facilities that are completely closed-cycle cooling even if they use more than 50 million gallons per day. However, it does include some facilities that use helper towers to cool the thermal discharge during portions of the year. The costs are as follows: •Nuclear - $454/gpm (avg. $220/kW) •Fossil - $330/gpm (avg. $215/kW) Costs are applied to units described above based on EPRI's database of electric generating facilities.[2]
HAPS+Ash+Water+CO2 ***(Scenario 3)***	CO_2 price consistent with EIA's August 2009 analysis of HR 2454 (Waxman-Markey). Prices start in 2012 at $17/ton and increase to $60/ton in 2030 (2008$).

1 "20100507_Fly Ash and Bottom Ash Summary_Roewer.xls" received on May 7th, 2010
2 "Master List 4-29-10 Working Draft to EEI_calcv1.xls" received on May 5th 2010.

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Run Year Structure

EPA Run Year	EPA Mapped Years
2012	2012-2013
2015	2014-2017
2020	2018-2022
2025	2023-2027
2032	2028-2035

EEI Run Year	EEI Mapped Years
2010	2010
2011	2011
2012	2012
2013	2013
2014	2014
2015	2015
2016	2016
2017	2017
2018	2018
2019	2019
2020	2020-2022
2025	2023-2027
2032	2028-2035

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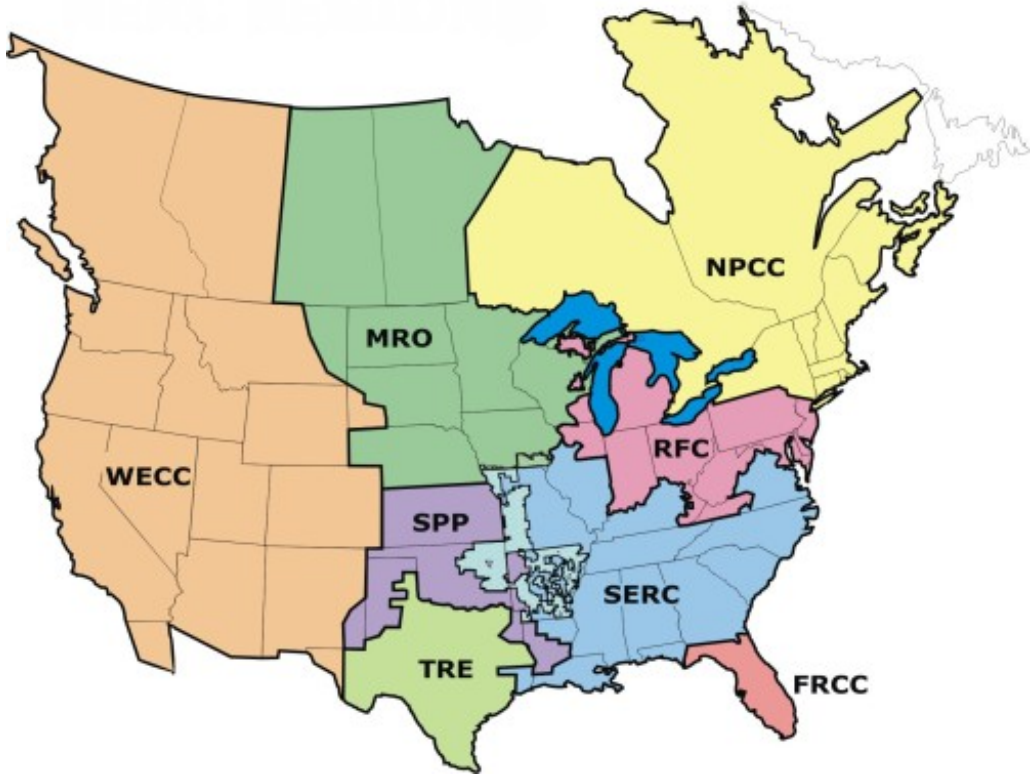
NERC Region Map



FRCC – Florida Reliability Coordinating Council	**SERC** –SERC Reliability Corporation
MRO – Midwest Reliability Organization	**SPP** – Southwest Power Pool, RE
NPCC – Northeast Power Coordinating Council	**TRE** – Texas Regional Entity
RFC – Reliability First Corporation	**WECC** – Western Electricity Coordinating Council
Note: NERC regional results shown in this presentation include the US only	

Source: http://www.nerc.com

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EEI Reference Case - National Level Results Compared to EPA ARRA 2009 Reference Case

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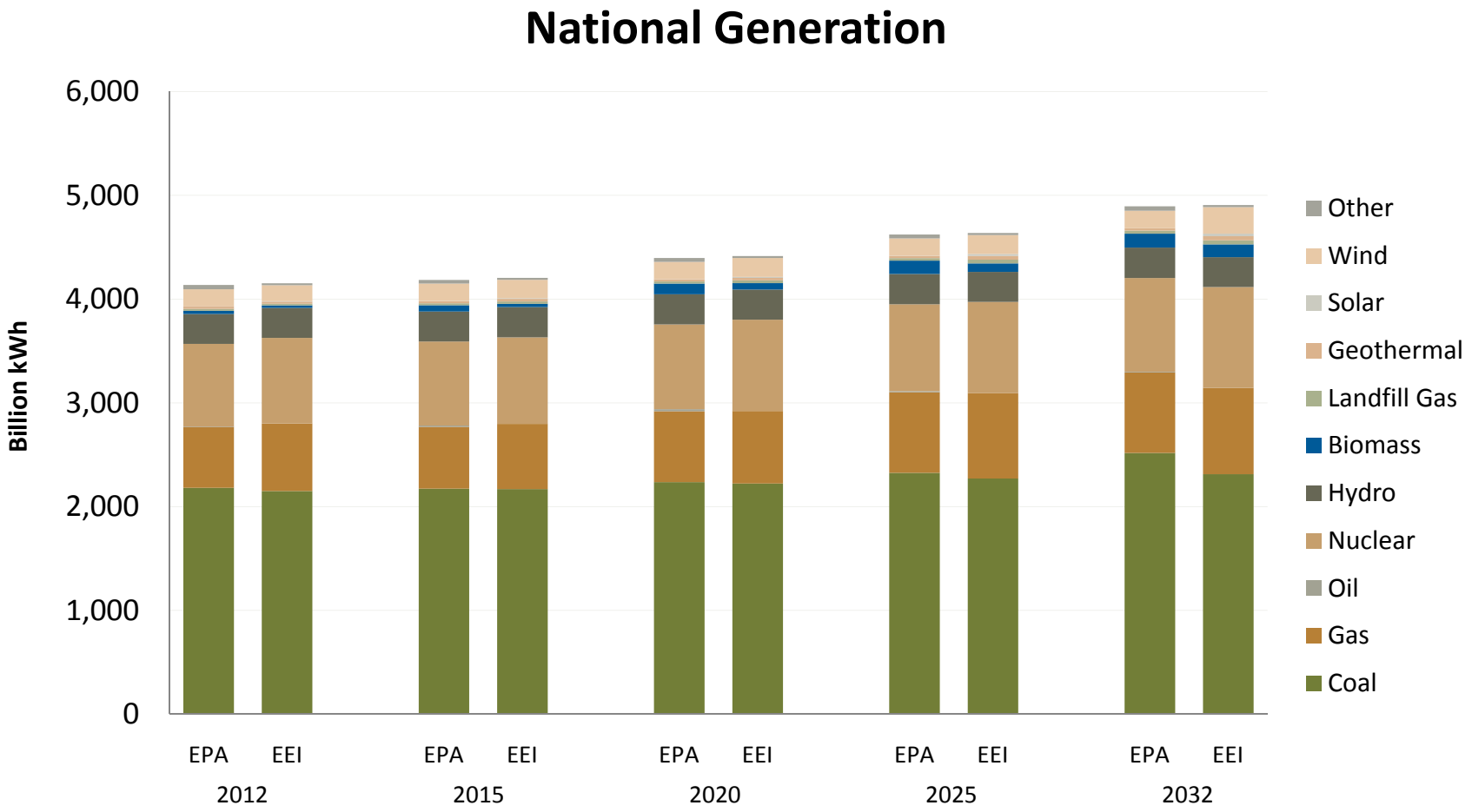
National Generation By Type



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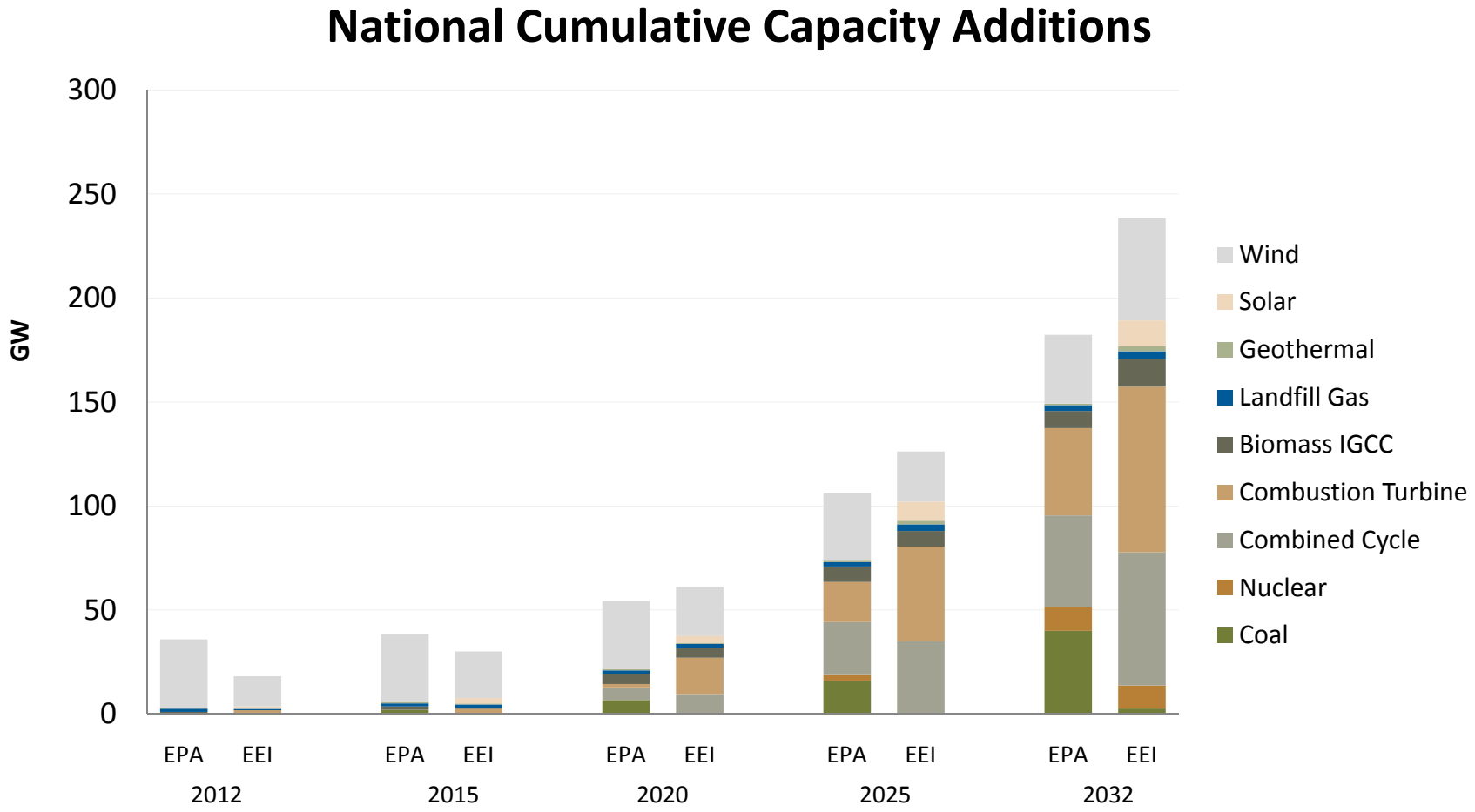
National Cumulative Capacity Additions



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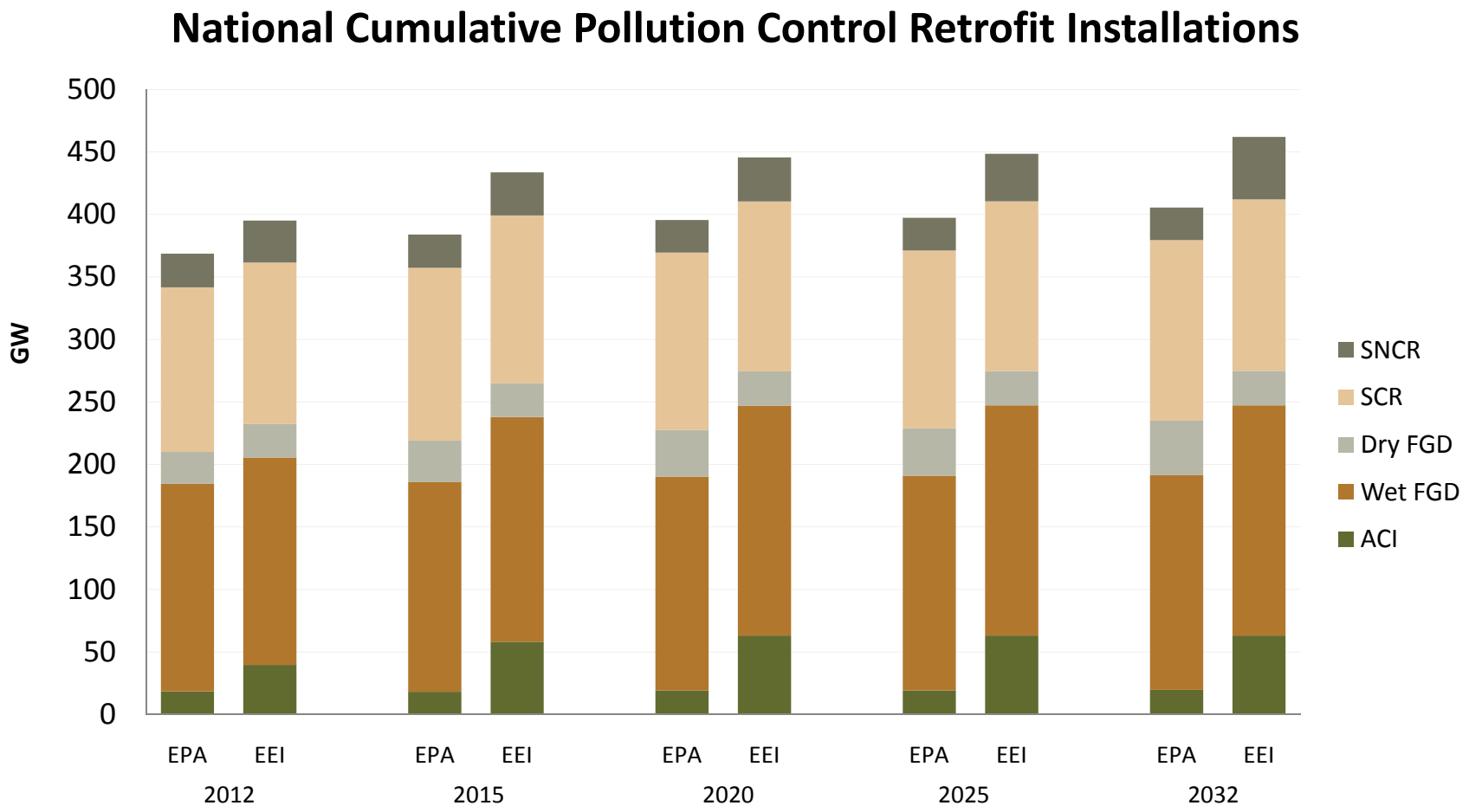
National Cumulative Pollution Control Installations (Existing + Firm + Economic)



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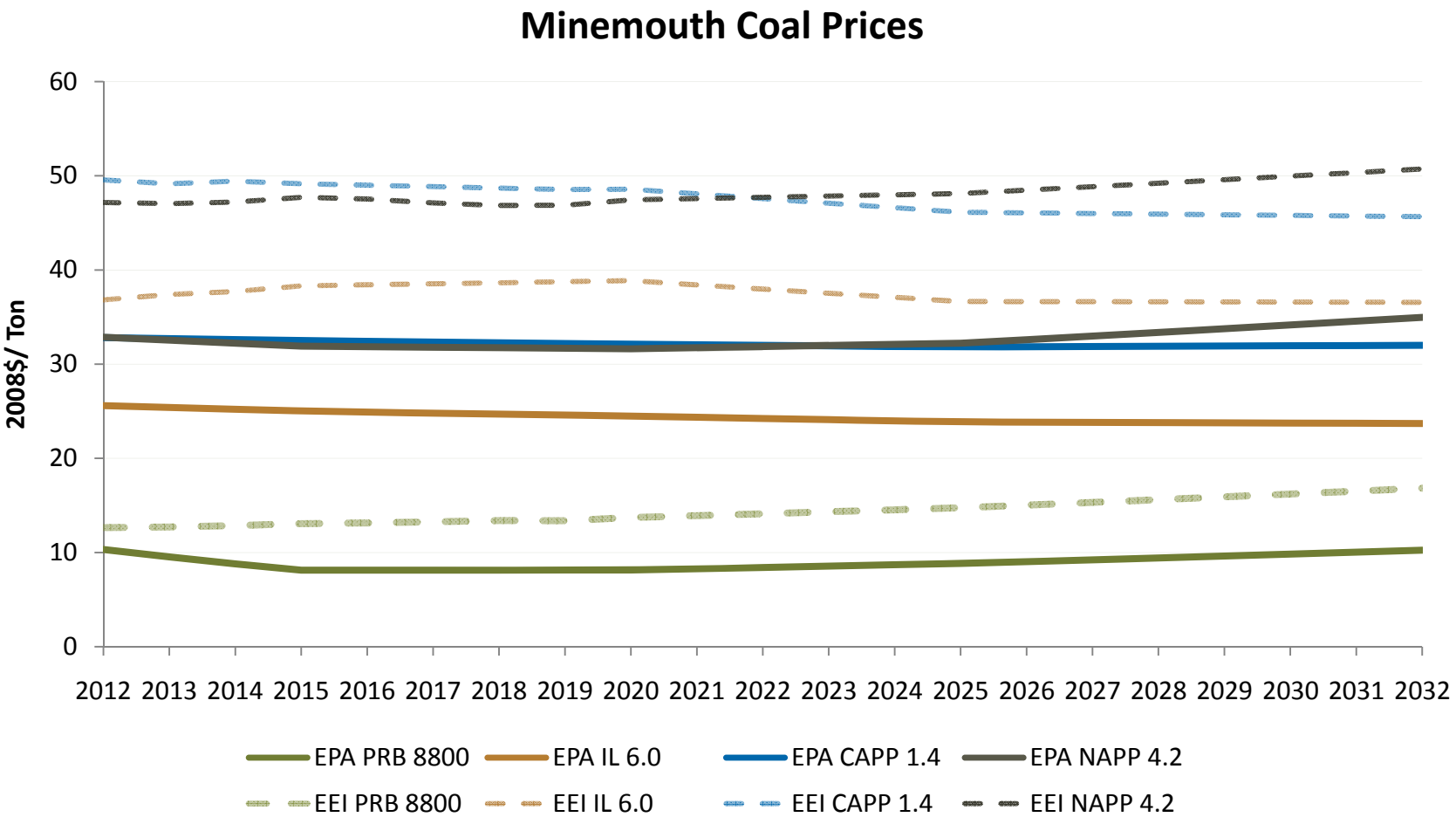
Minemouth Coal Prices



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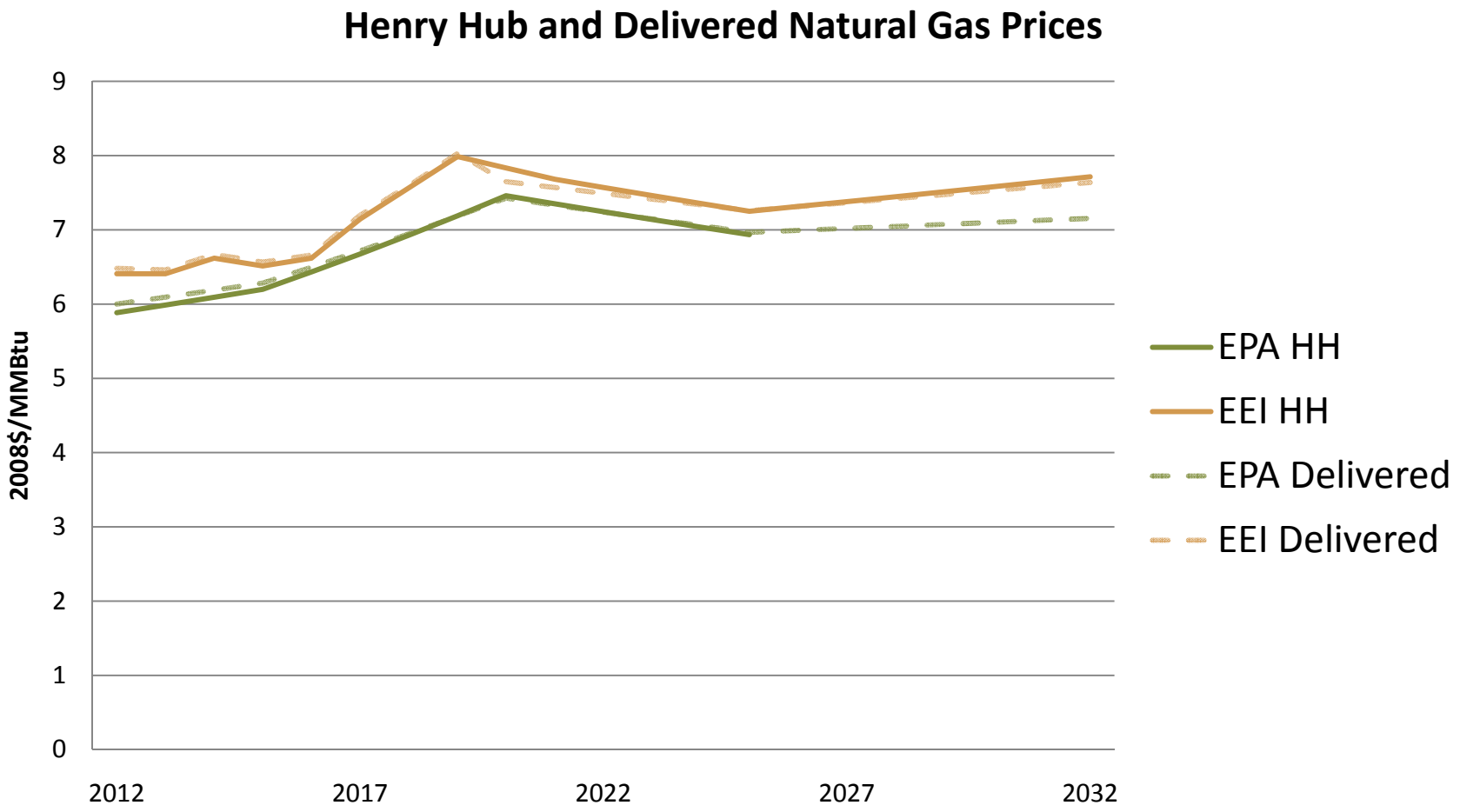
Henry Hub and Delivered Natural Gas Prices



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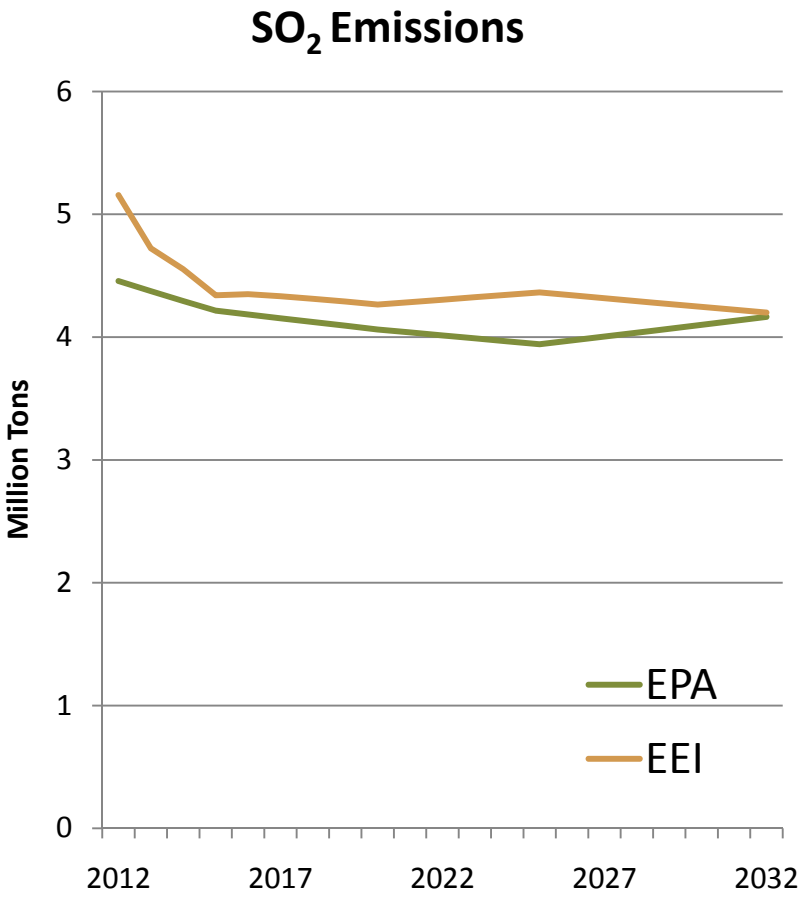
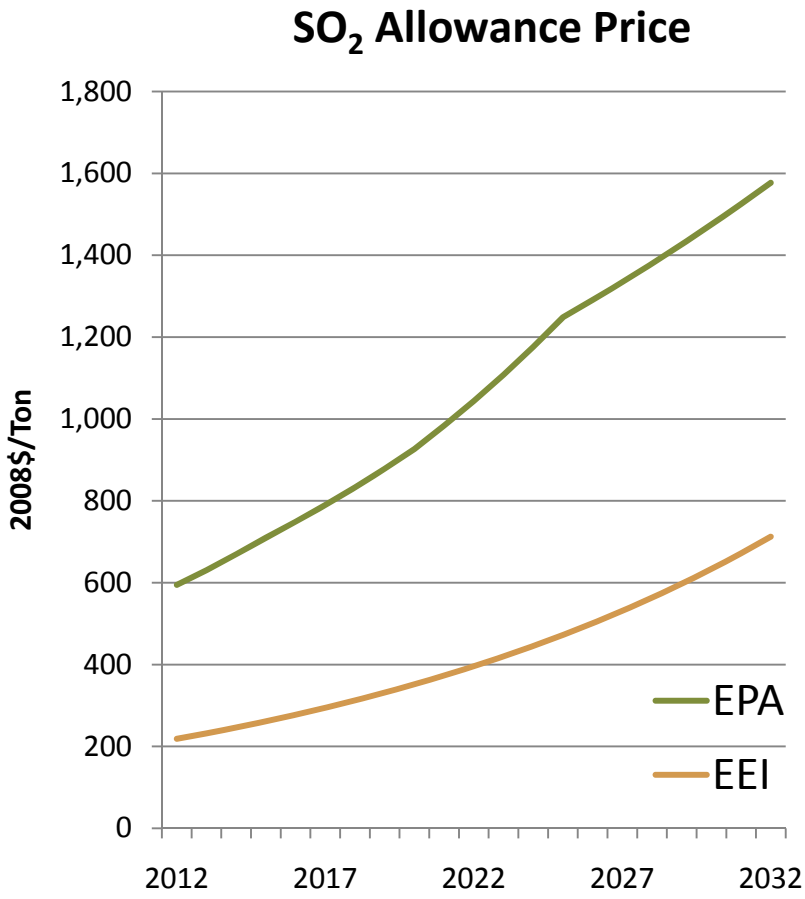
SO_2 Allowance Prices and Emissions





Note: The SO2 price is the $/ton price for units in a CAIR affected state. The $/allowance prices can be derived by dividing by 2 in 2010-2014 and 2.86 in 2015 and beyond.

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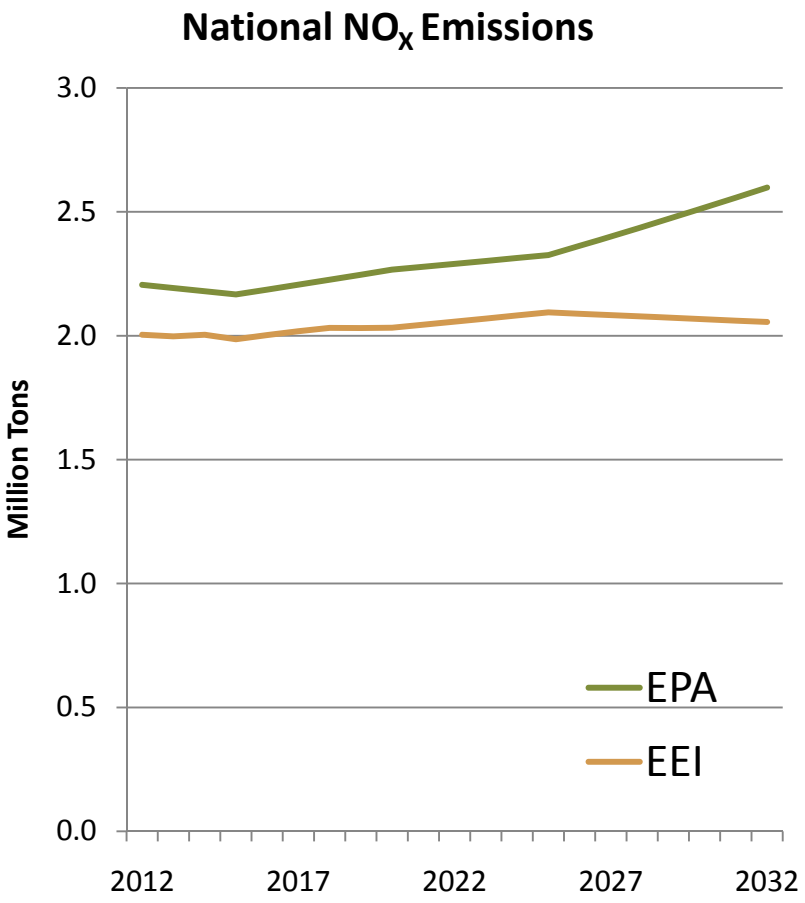
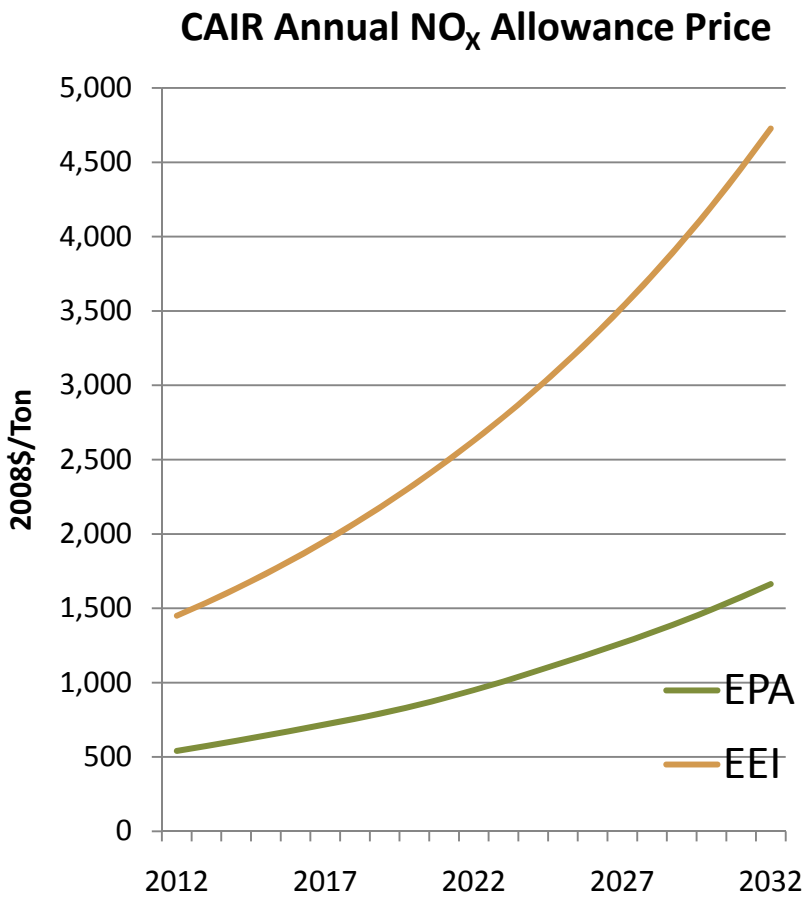
NO_X Allowance Prices and Emissions





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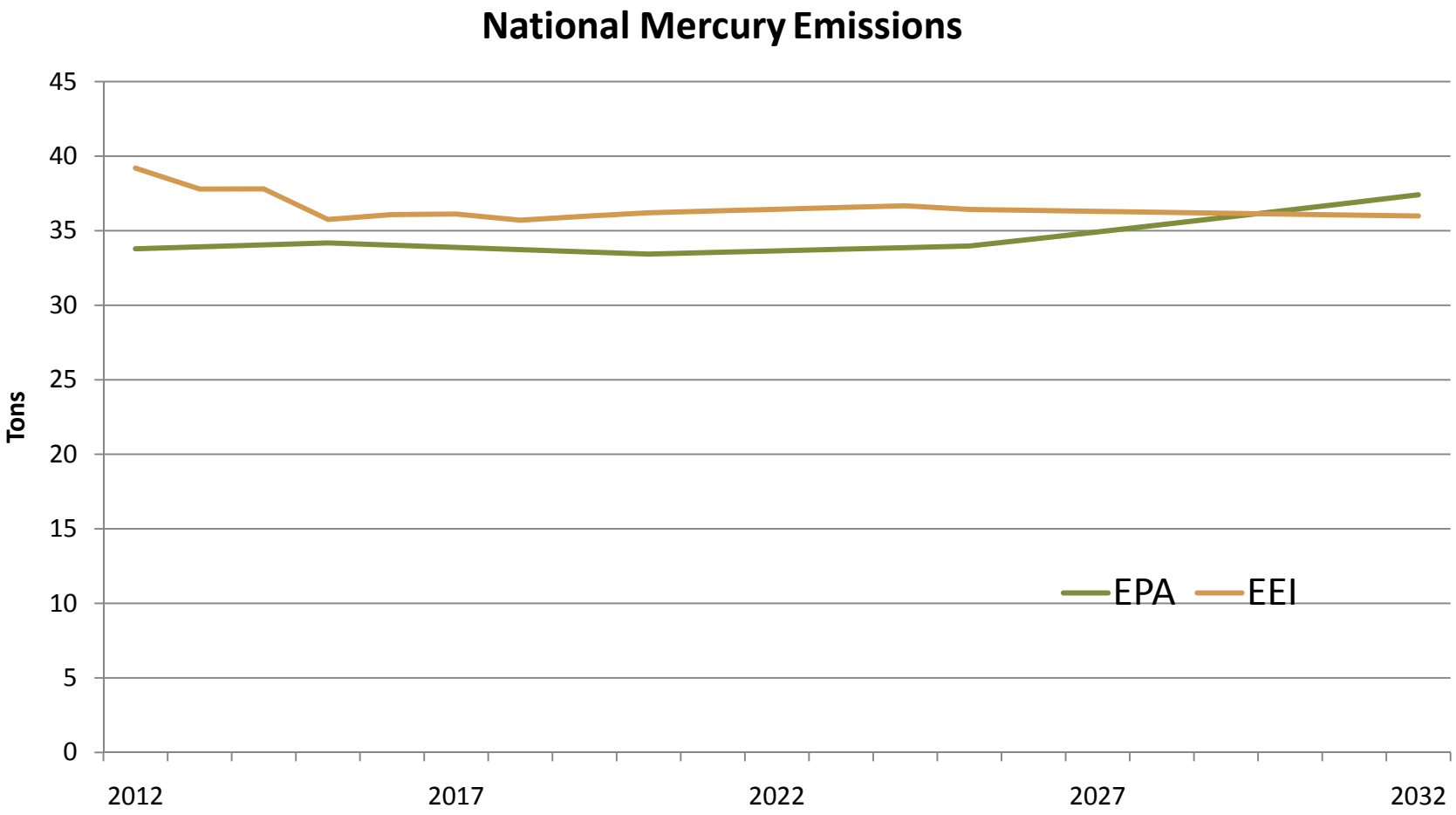
National Mercury Emissions



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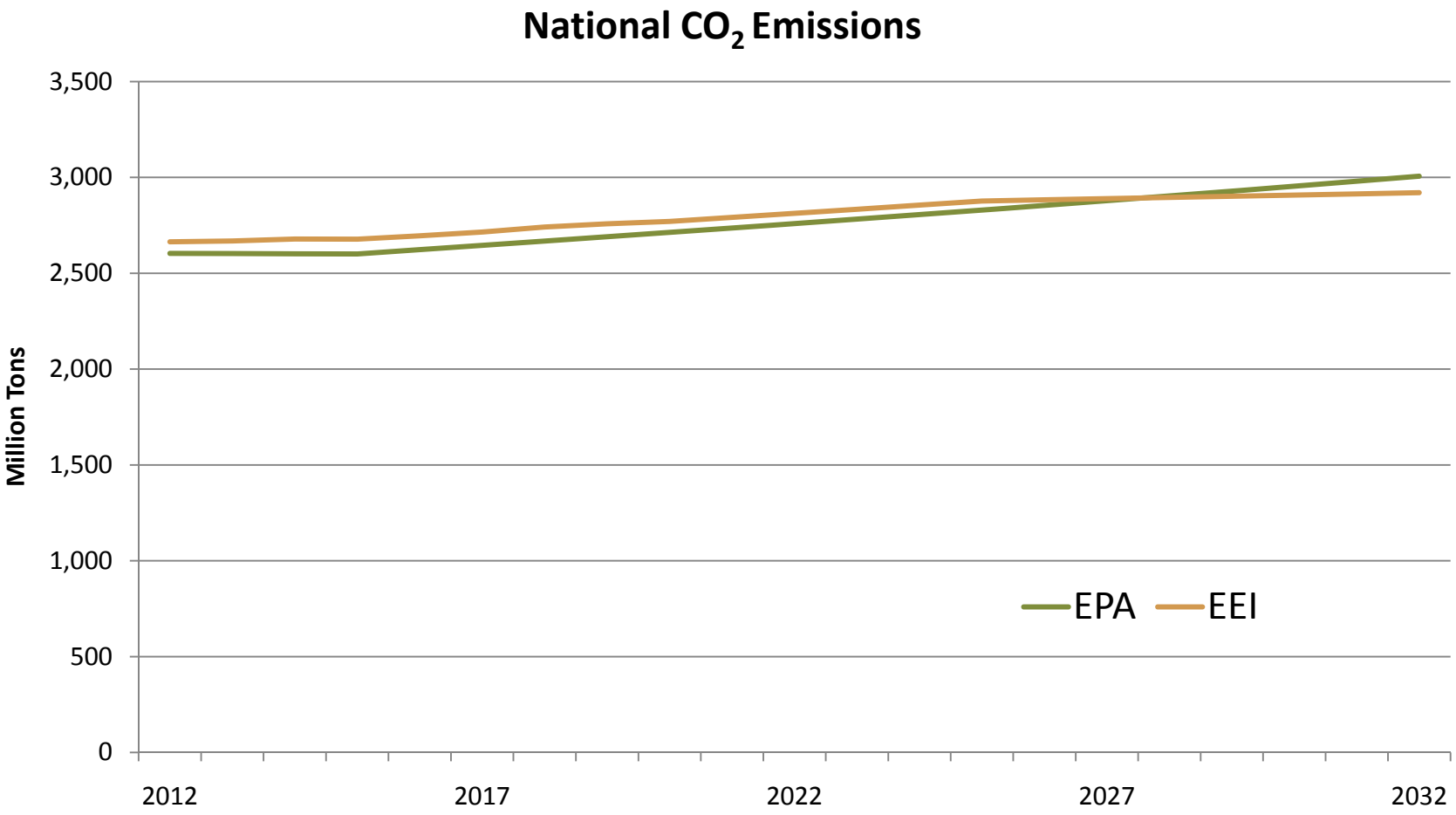
National CO_2 Emissions



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EEI Scenario Results

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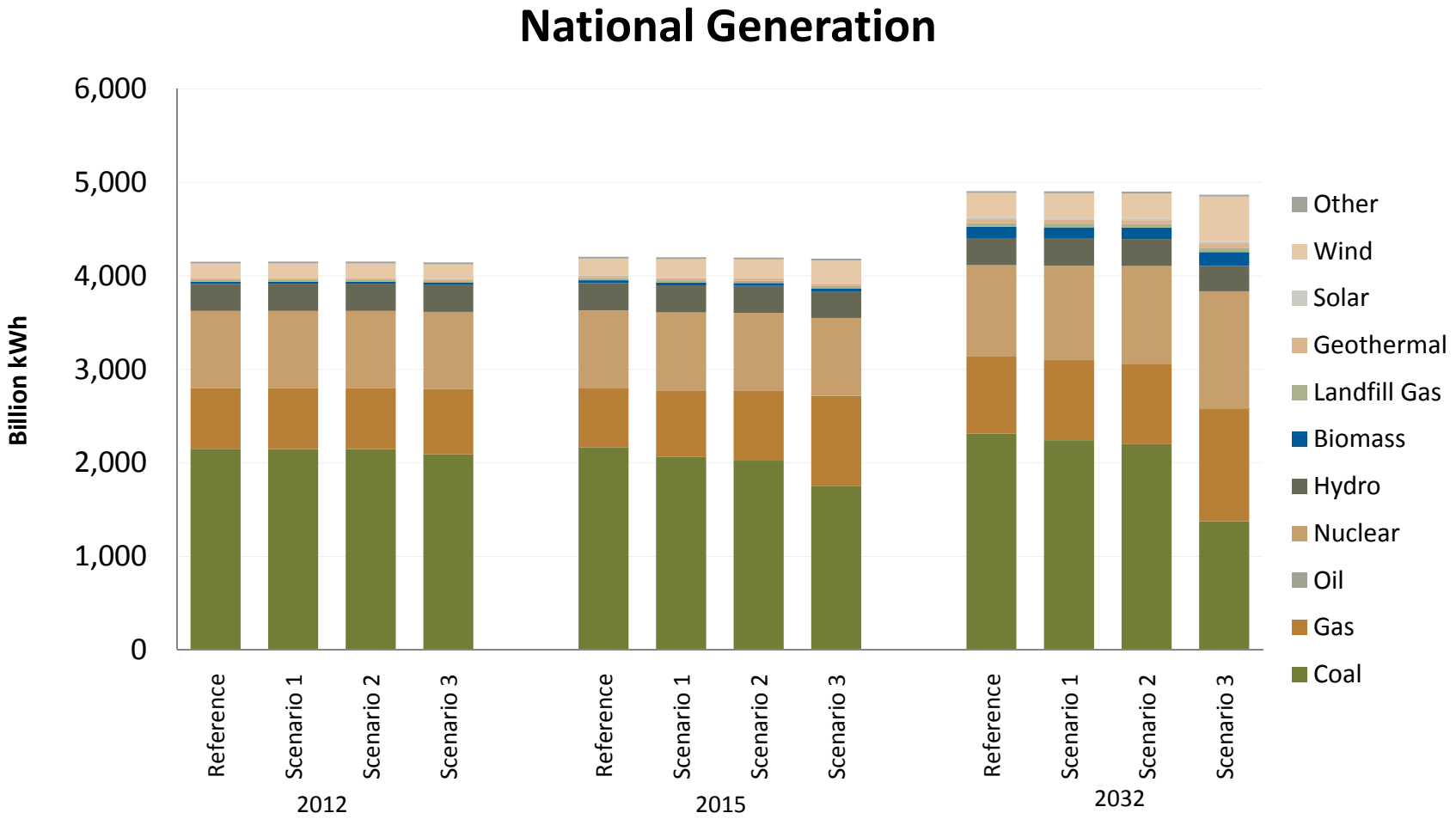
National Generation By Type



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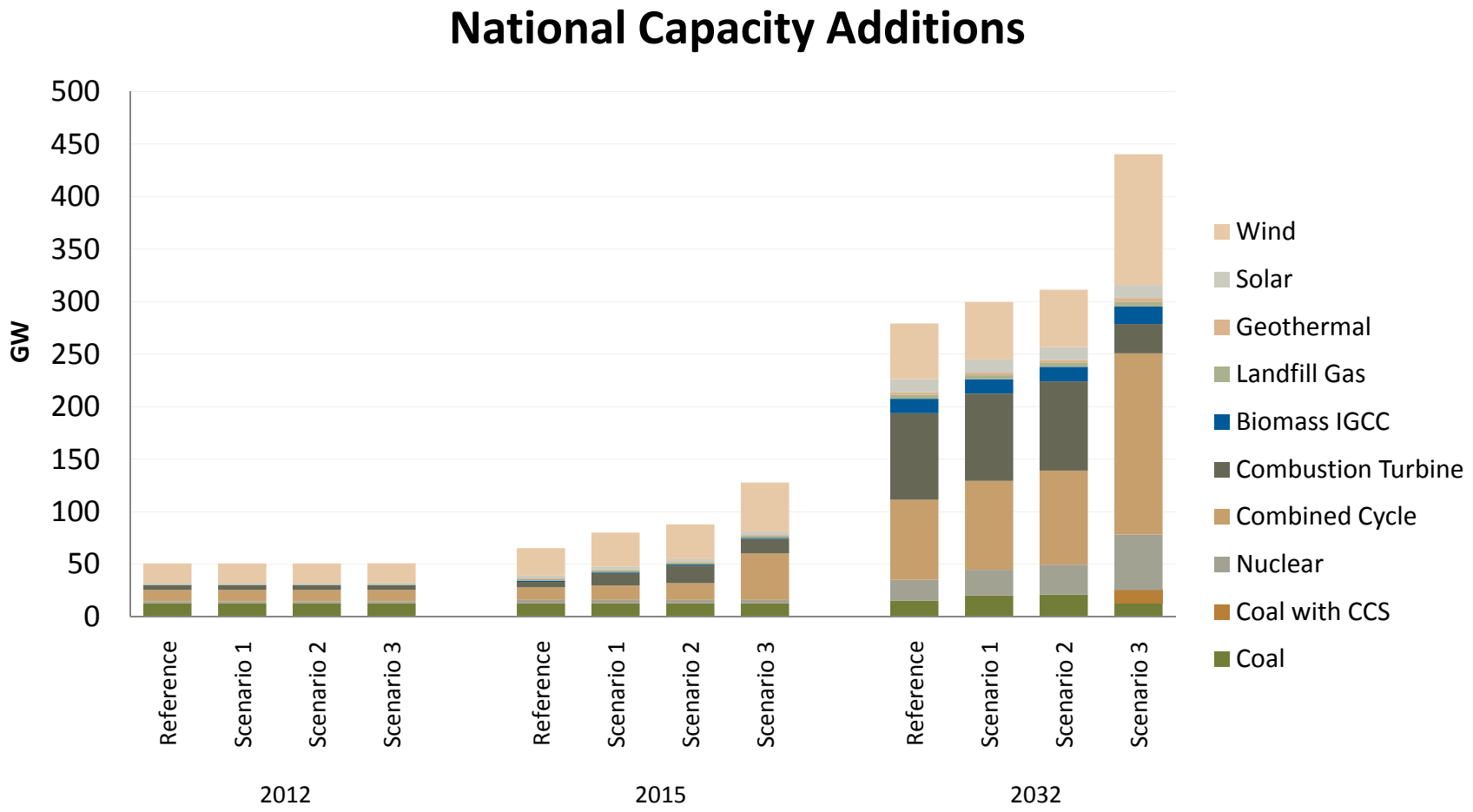
National Cumulative Capacity Additions by Scenario (Firm + Economic)



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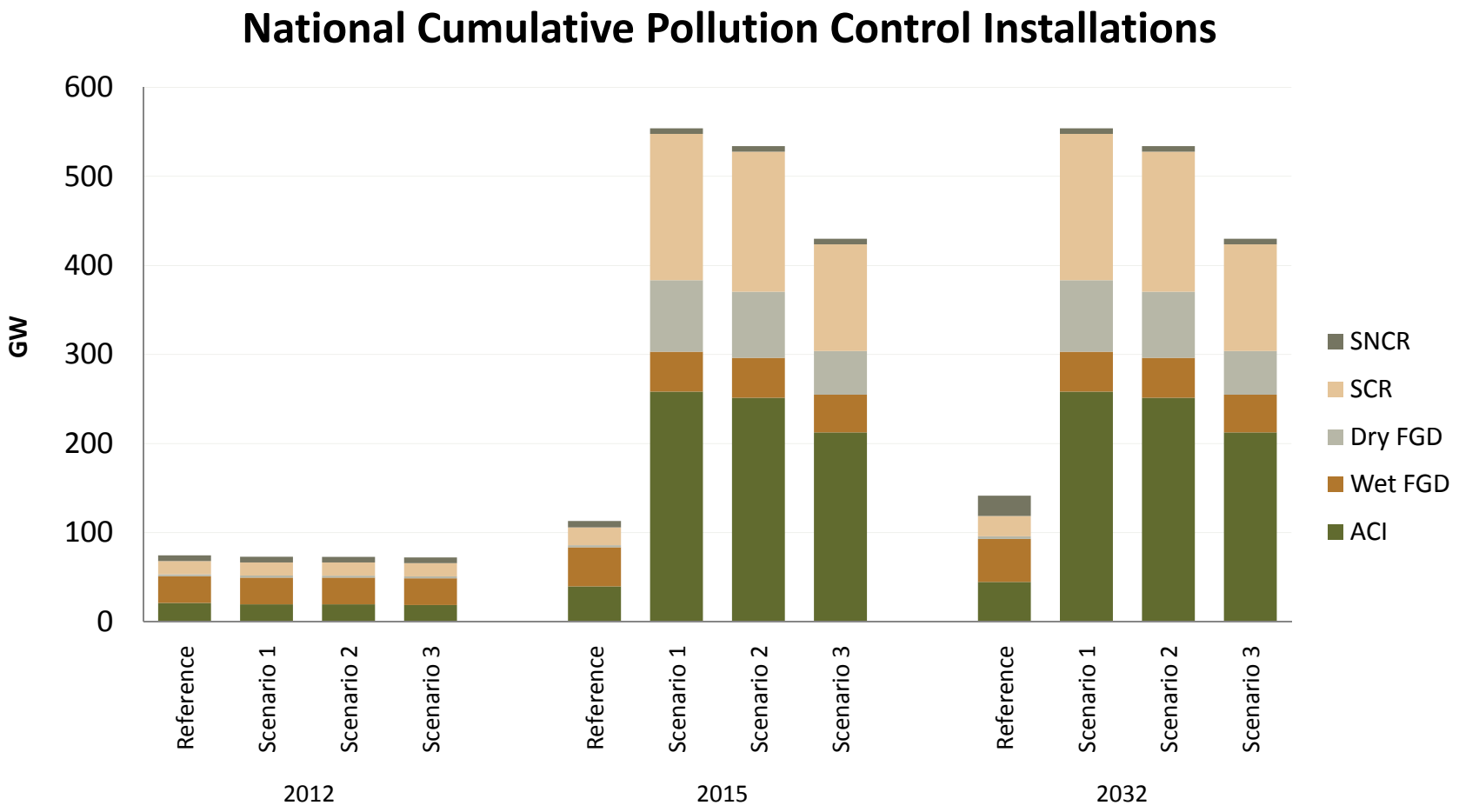
National Cumulative Pollution Control Installations by Scenario (Firm + Economic)



Note: Units may install more than one control and their capacity will be reported separately for each control.

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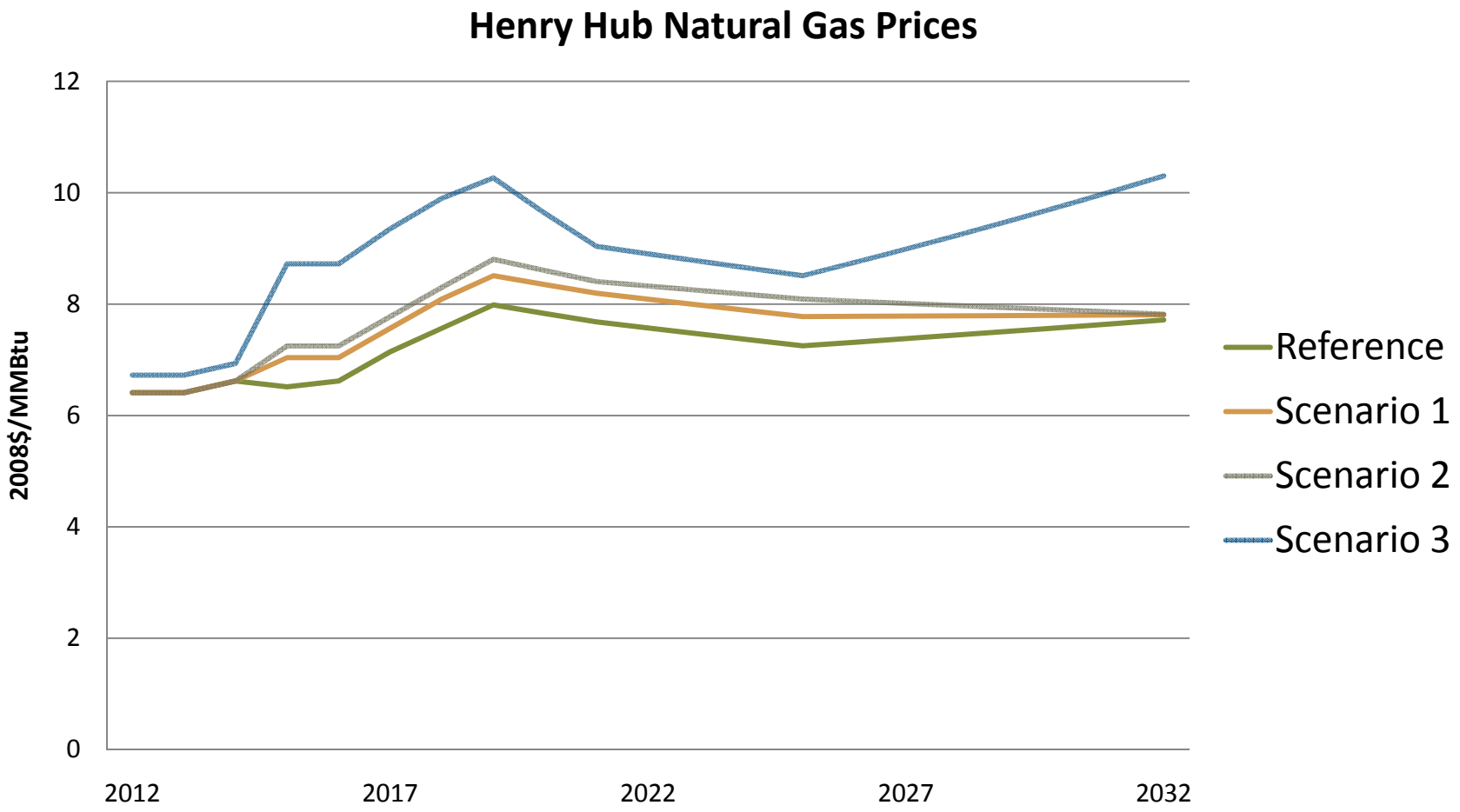
Henry Hub Natural Gas Prices



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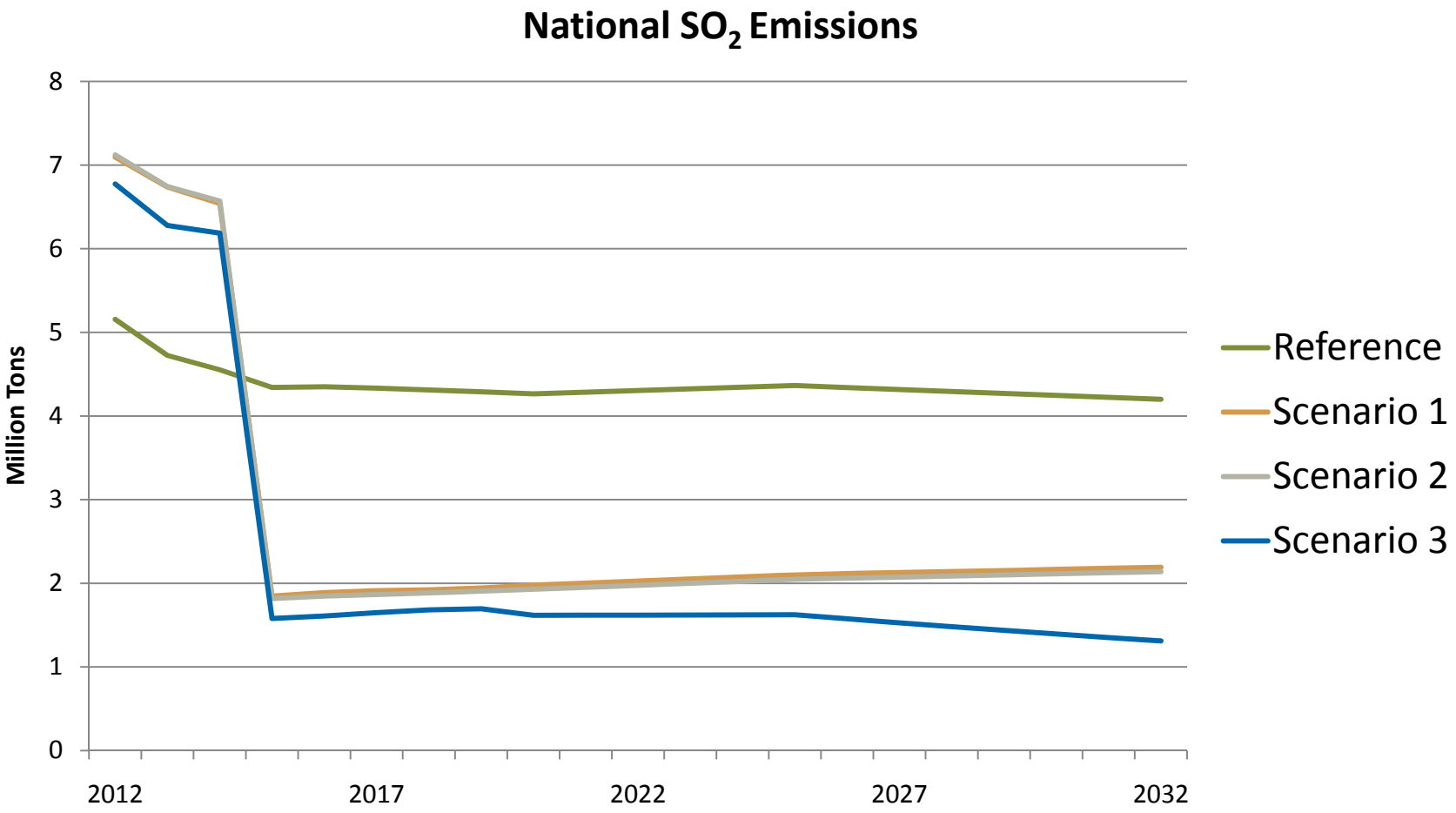
SO_2 Emissions



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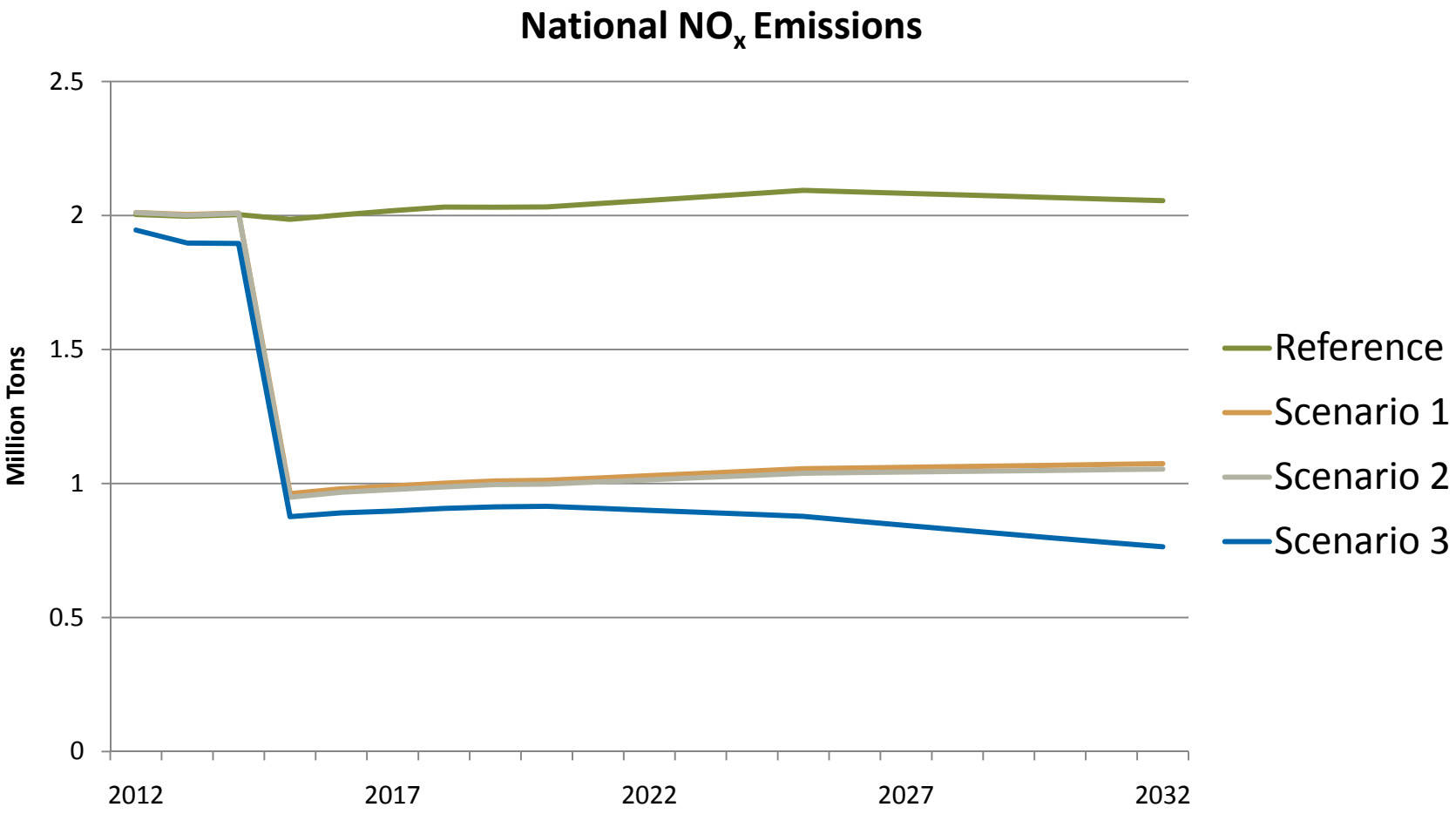
NO_X Emissions



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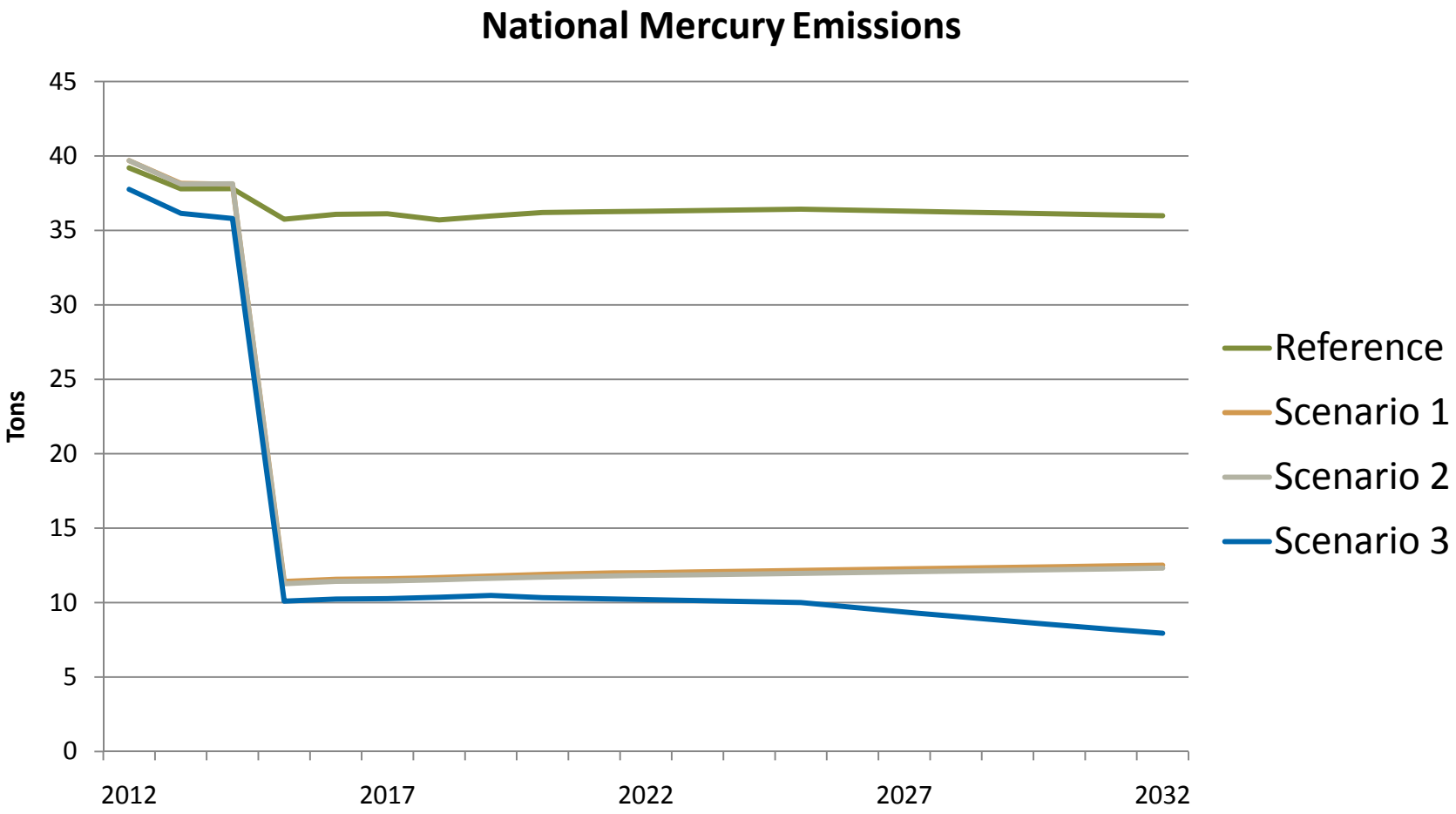
National Mercury Emissions



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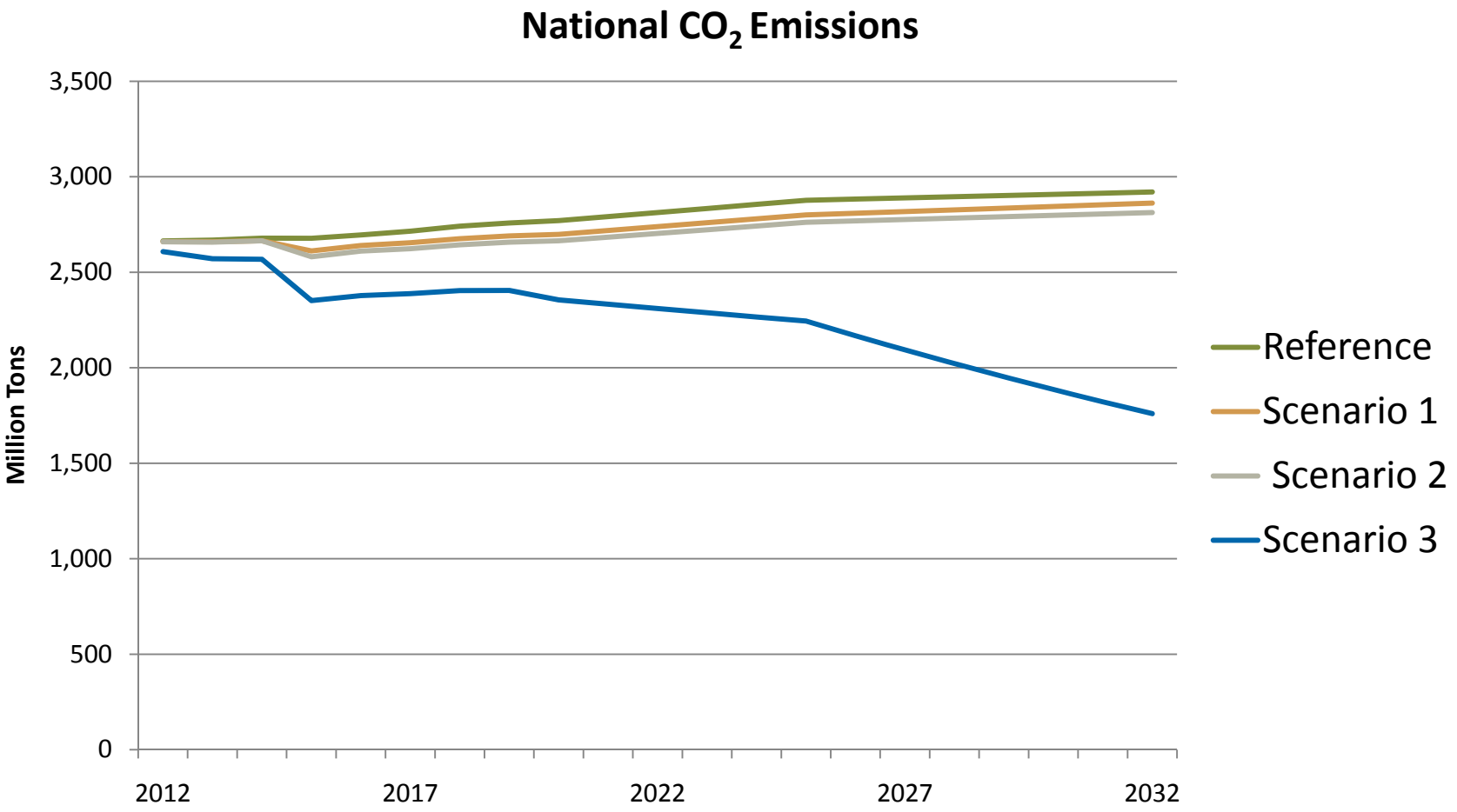
National CO_2 Emissions



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Retirements

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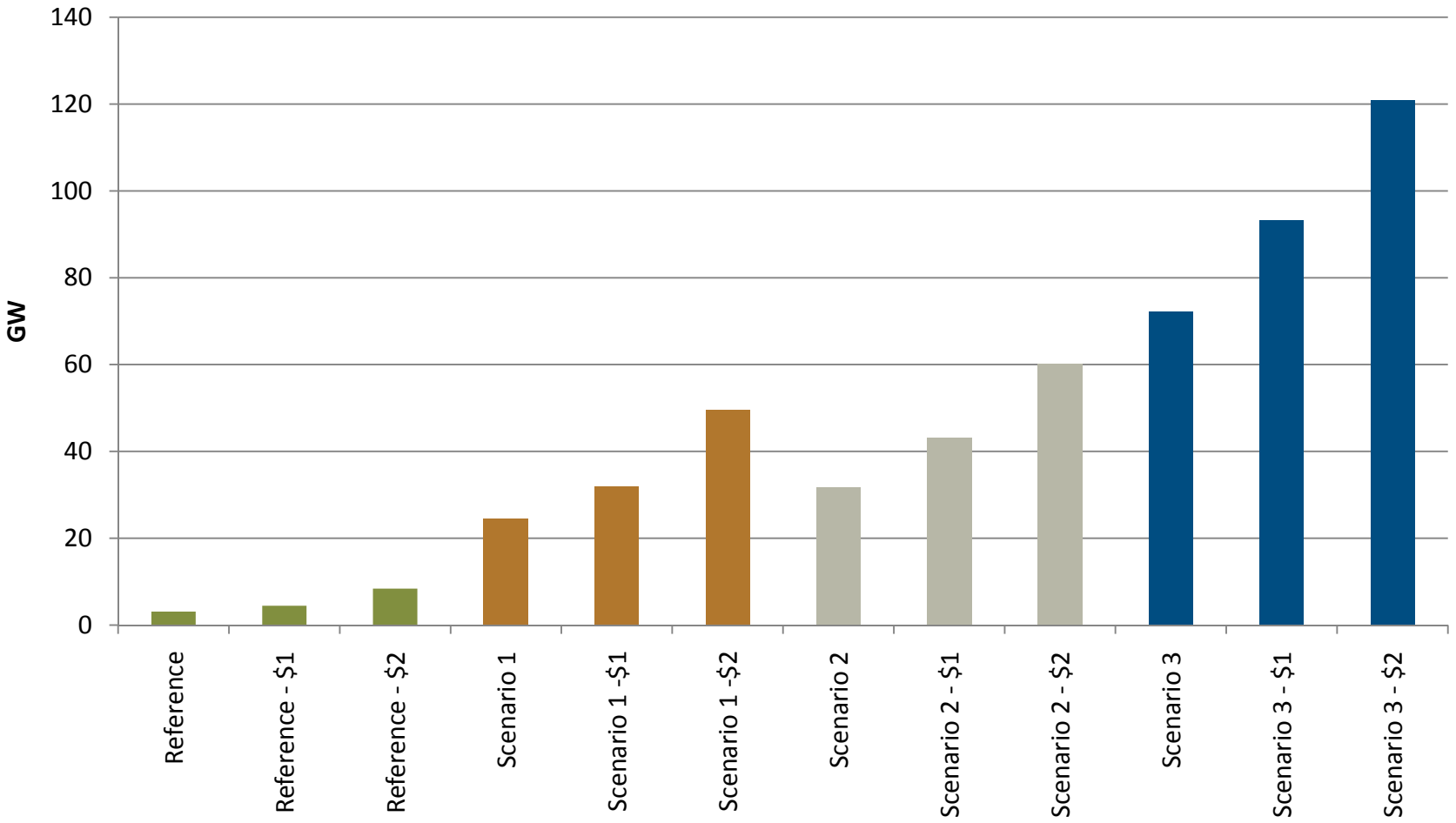
Gas Price Sensitivities - Cumulative Coal Retirements through 2015



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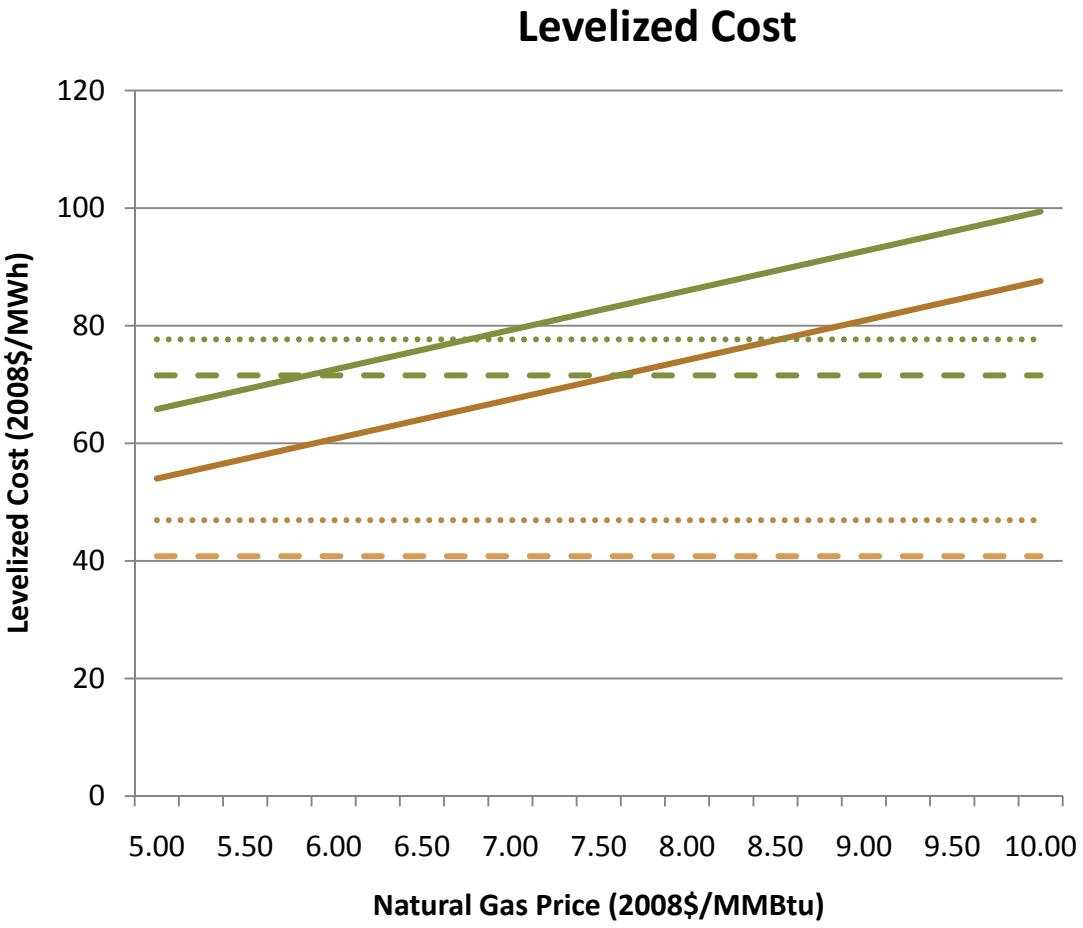
Natural Gas Prices Impact the Economics of Retrofitting Existing Coal vs. Building New – Avg. Compliance Cost



- Retrofit Existing Reg. Coal
- Retrofit Existing Mer. Coal
- Build New CC
- Retrofit Existing Reg. Coal (CO2)
- Retrofit Existing Mer. Coal (CO2)
- Build New CC (CO2)

Key Assumptions:

Coal retrofit calculations assume:
- Capital Costs - $750/kW
  - Includes ACI+FF+FGD+SCR+Ash conversion+Cooling towers
- Heat rate - 10,000 Btu/kWh
- Coal price - $2.00/MMBtu

New CC calculations assume:
- Capital cost - $1100/kW
- Heat rate - 6,720 Btu/kWh

CO_2 Price: $30/ton

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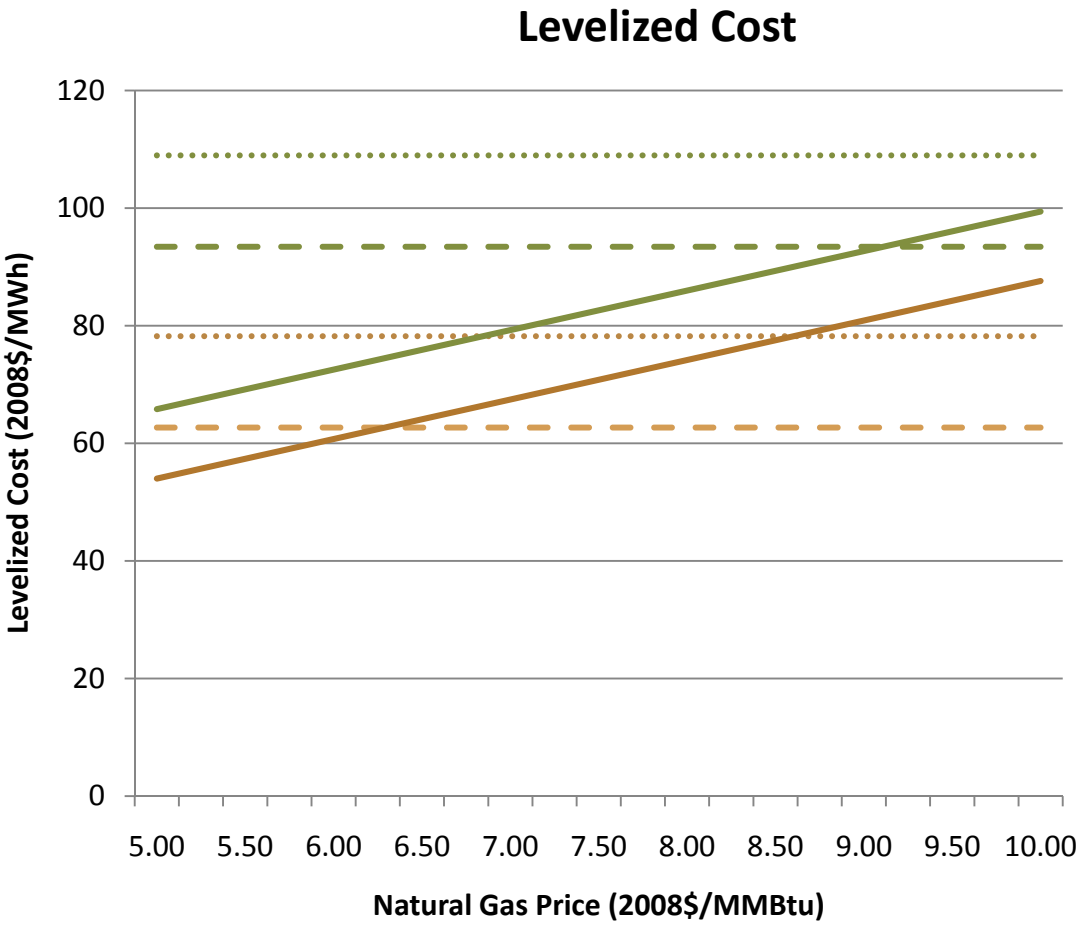
Natural Gas Prices Impact the Economics of Retrofitting Existing Coal vs. Building New – High Compliance Cost



- Retrofit Existing Reg. Coal
- Retrofit Existing Mer. Coal
- Build New CC
- Retrofit Existing Reg. Coal (CO2)
- Retrofit Existing Mer. Coal (CO2)
- Build New CC (CO2)

Key Assumptions:

Coal retrofit calculations assume:
- Capital Costs - $1900/kW
  - Includes ACI+FF+FGD+SCR+Ash conversion+Cooling towers
- Heat rate - 10,000 Btu/kWh
- Coal price - $2.00/MMBtu

New CC calculations assume:
- Capital cost - $1100/kW
- Heat rate - 6,720 Btu/kWh

CO_2 Price: $30/ton

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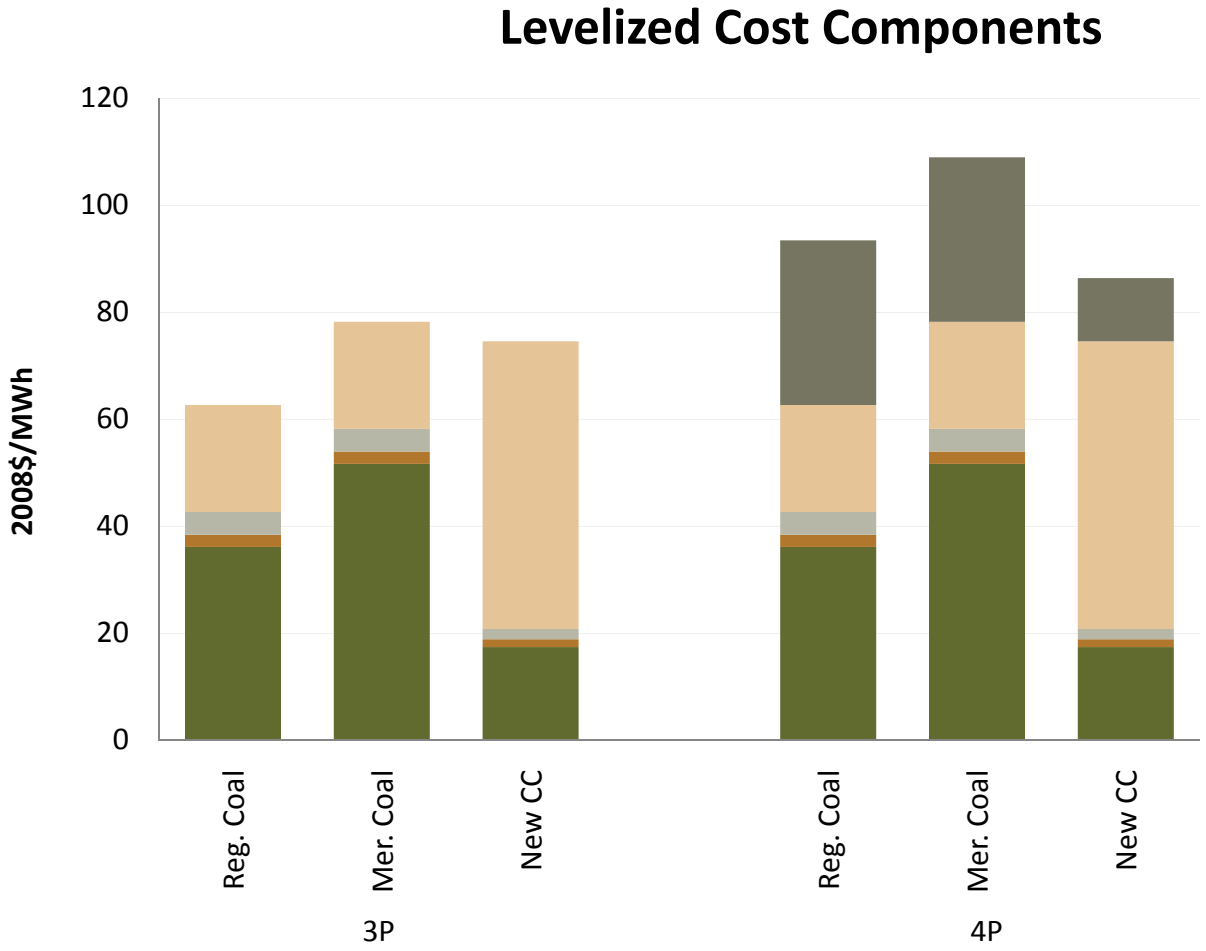
Coal vs. CC Levelized Cost Components



Key Assumptions:

Coal retrofit calculations assume:
- Capital Costs - $1900/kW
- Heat rate - 10,000 Btu/kWh
- Coal price - $2.00/MMBtu

New CC calculations assume:
- Capital cost - $1100/kW
- Heat rate - 6,720 Btu/kWh
- HH Price - $8.00/MMBtu

CO_2 Price: $30/ton

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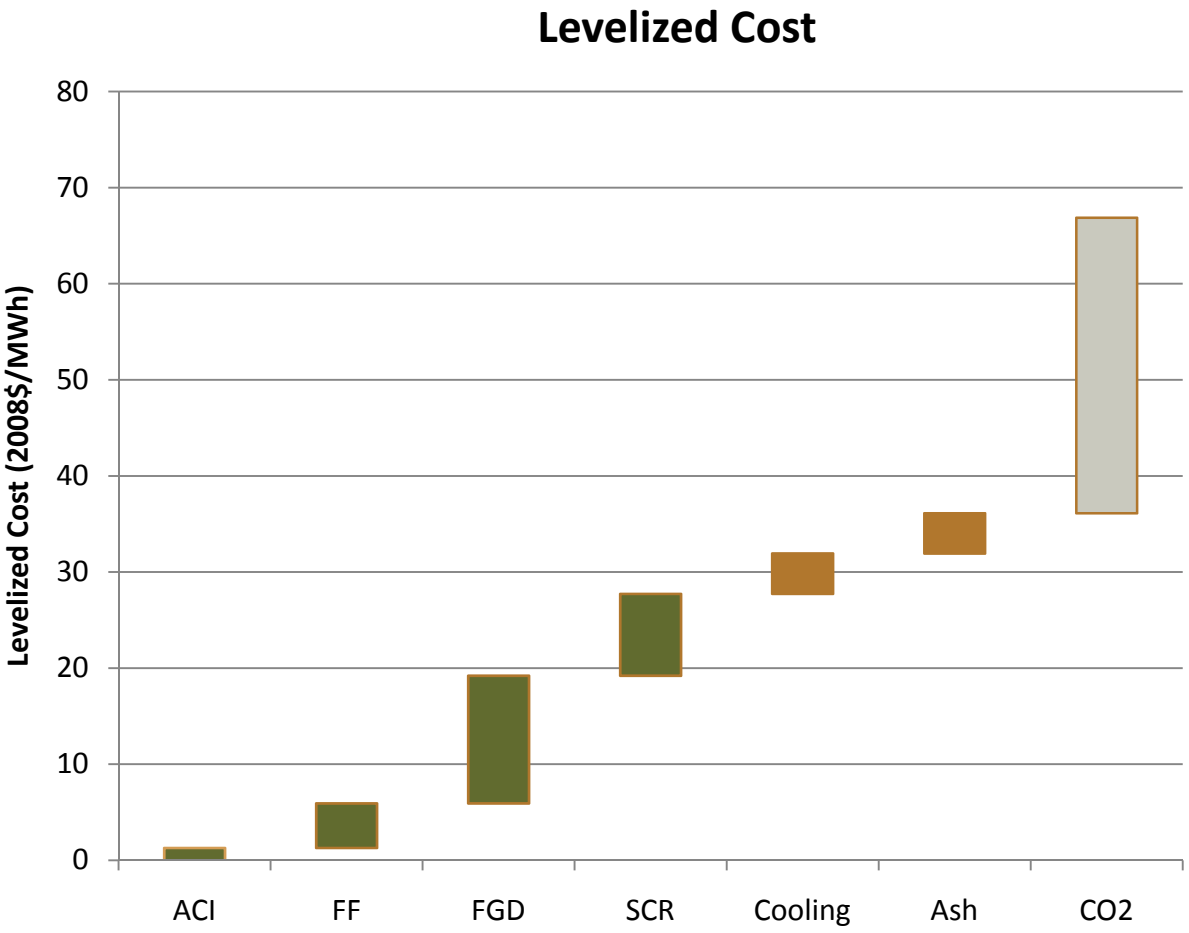
Levelized Regulated Coal Unit Compliance Costs



Key Assumptions:
- Capacity – 500 MW
- Heat Rate – 10,000 Btu/kWh
- CO_2 Price - $30/ton
- Regulated Unit

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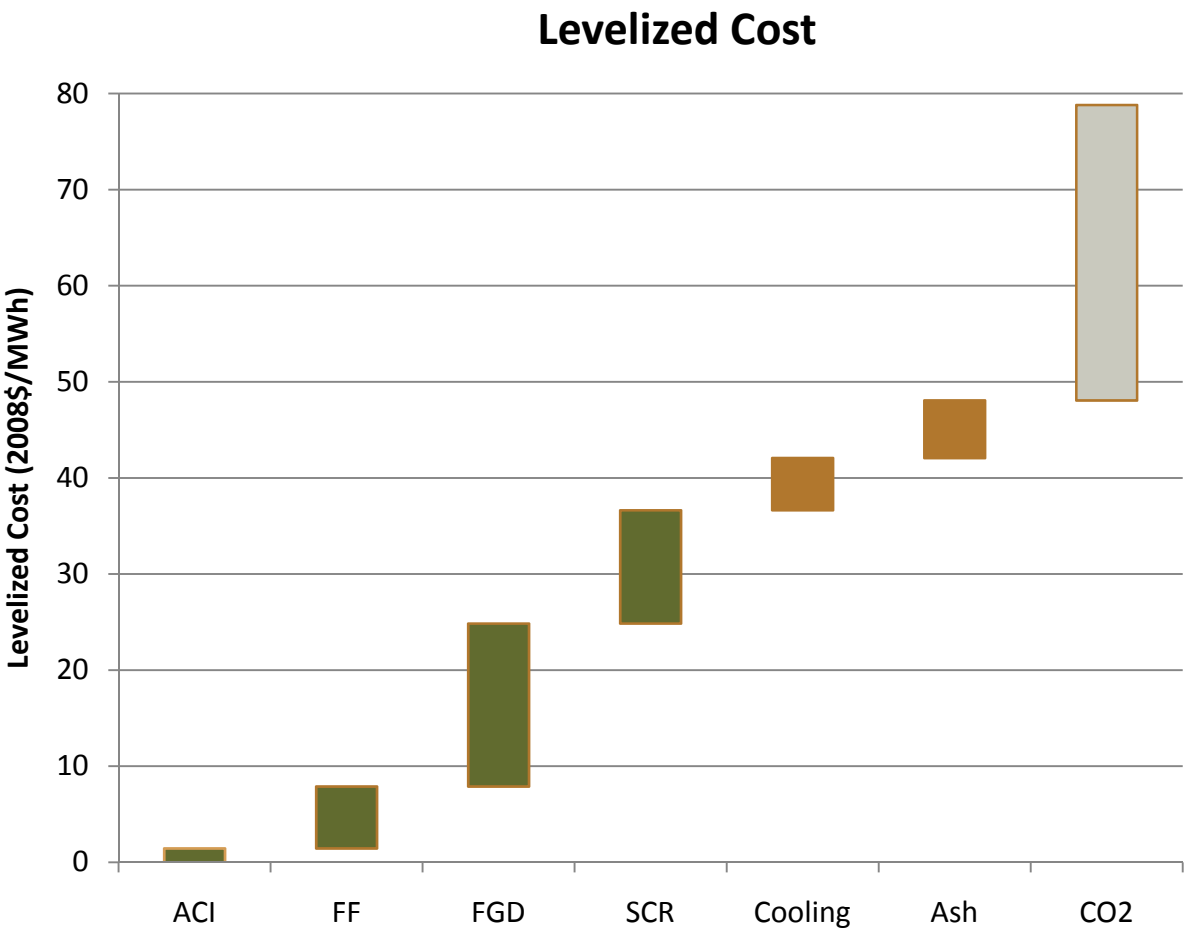
Levelized Merchant Coal Unit Compliance Costs



Key Assumptions:
- Capacity – 500 MW
- Heat Rate – 10,000 Btu/kWh
- CO_2 Price - $30/ton
- Merchant Unit

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Appendix

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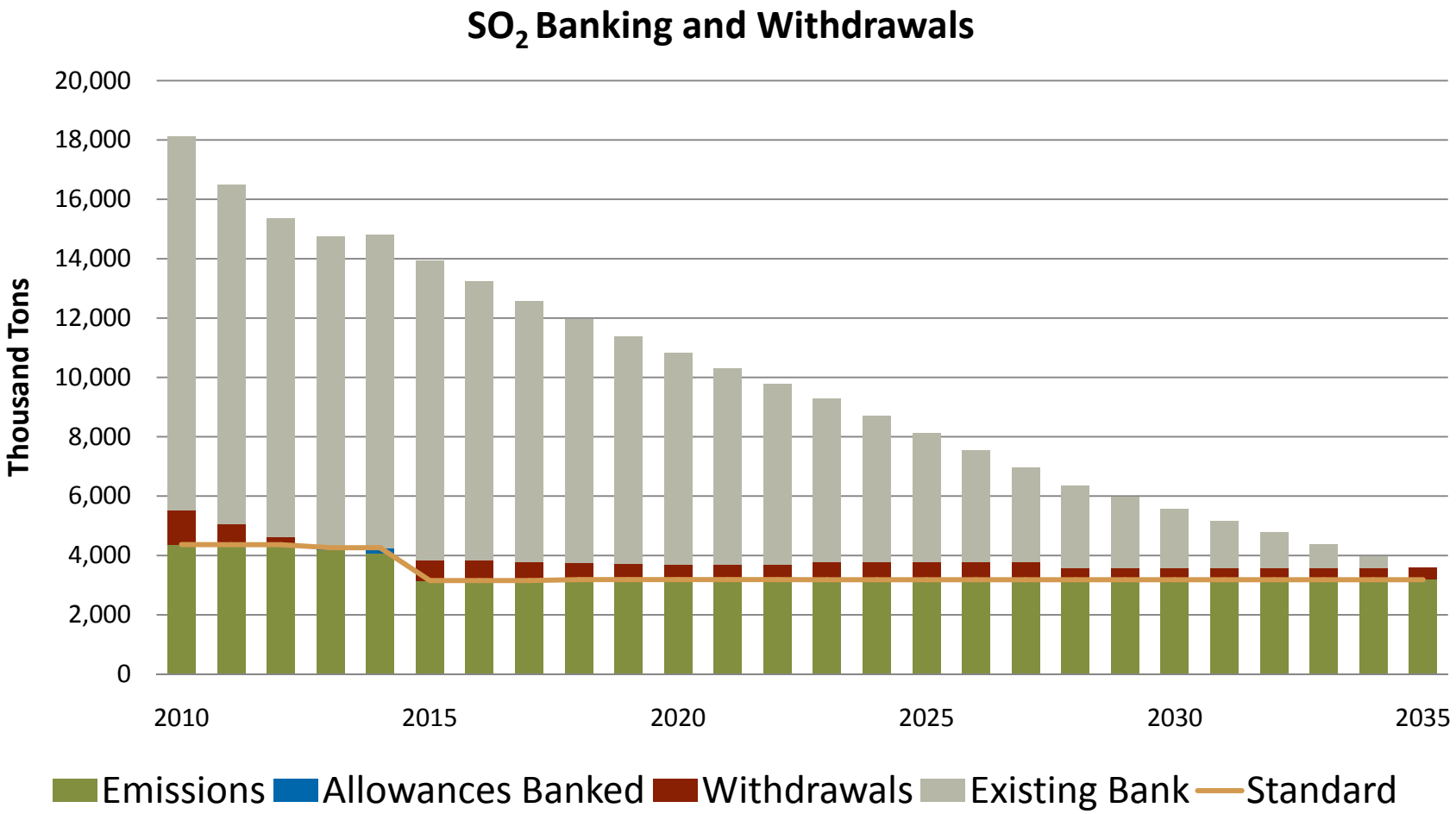
Reference Case SO_2 Banking and Withdrawals



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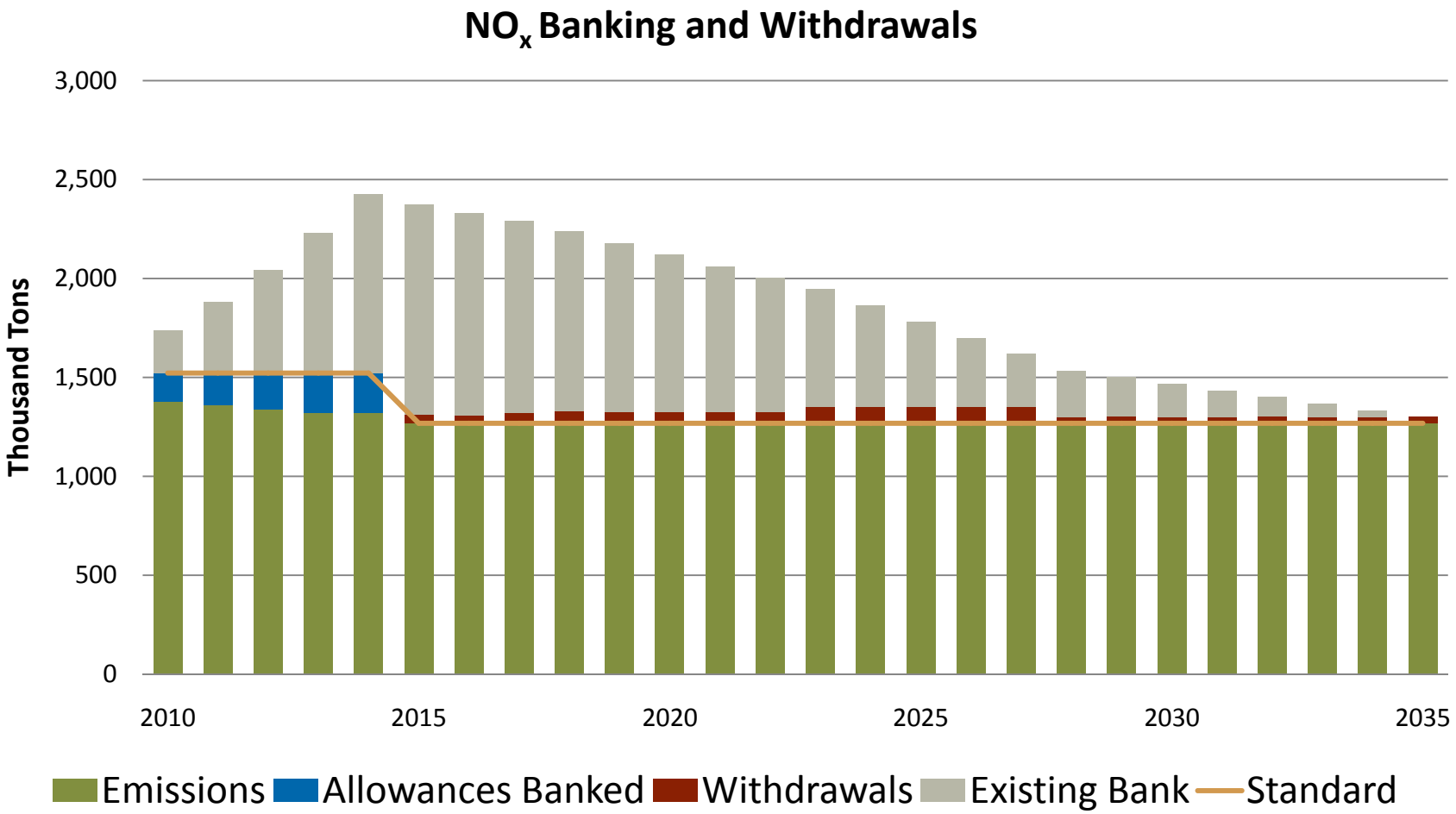
Reference Case NO_x Banking and Withdrawals



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