WORKING GROUP PRESENTATION FOR DISCUSSION PURPOSES
DO NOT QUOTE OR CITE AS RESULTS ARE SUBJECT TO CHANGE

Annual Energy Outlook 2014
2nd Coal Working Group

Coal and Uranium Analysis Team

September 26, 2013| Washington, D.C.

Topics for discussion

- Recap issues raised during previous meeting
- Preliminary Reference case run results
- Projected consumption (CTL), production, exports, and prices
- Changes in release cycles for EIA's AEO and IEO

Issues from Previous CWG Meeting

- 3% Carbon Adder for Coal Capacity
- Regional Haze
- Aging Coal Fleet Performance and Replacement
- Metallurgical Coal
- Side Cases
- Planned Capacity Additions
- Illinois Basin Coal Projections (vs. Northern Appalachia)

3% Carbon Adder for Coal Capacity

- Applicability to emission control retrofits
  - Applies only to non-CO_2 emission control retrofits
- How it affects the cost of capital
  - Direct adder, e.g., increases from 12% to 15%
- Basis for the adder
  - Approximates $15 per ton of CO_2 generally assumed by utilities in IRPs, etc.
- Impact on results
  - Refer to “No Greenhouse Gas Concern” case results in AEO2013
- Applicability in out-years once EPA New Source Performance Standards (NSPS) in place
  - EIA will follow up during AEO2015 review to reflect published EPA NSPS

Regional Haze

- Inclusion of any assumptions regarding implementation of western region BART/regional haze rules
  - Not explicitly covered
  - However, planned retrofits at affected plants included based on EIA survey responses

Aging Coal Fleet Performance and Replacement

- Question regarding retirement/replacement with the average age of coal fleet at approximately 60 years
  - No change in modeling assumptions, which include a $9/kW-Year ($2012) increase in annual, fixed operating and maintenance costs at 30 years of age
- Cycling with respect to competition with intermittent wind resources noted as a possible concern
  - EIA staff updated spinning reserve methodology to account for system cost of intermittent resources

Metallurgical Coal

- Question about role of exchange rates in the forecast
  - NEMS does not incorporate exchange rate modeling at this time
- Question about competitiveness with Australian met coal and impact on projections
  - Feedback on degree to which quality of U.S. met coal supports export trends sought by EIA

Side Cases

- EIA staff verified information at the last meeting
  - Pulverized coal with carbon capture technology are cheaper than IGCC
  - The $5,400/kW nuclear capital cost assumption is appropriate in the $25 carbon price case

Planned Capacity Additions

- Two Elk under construction for 10 years
  - Plant will no longer be included in planned additions
- Spiritwood capacity at 99 MW but EIA assumes 62 MW based on reported, contractual value as reported on the EIA-860
  - Modeled capacity to remain at EIA-860 reported amount of 62 MW
- Taylorville noted as being canceled
  - Plant is not included in planned additions; awaiting EIA-860 filing for 2013
- Medicine Bow uncertainty around capacity available to the grid
  - Plant is not included in planned additions; indications are that no electric power will be sold to the grid

Preliminary AEO2014: Coal-Fired Capacity Additions (megawatts)

FACILITY CODE	PLANT NAME	GENERATOR ID	STATE	PLANT TYPE	ENERGY SOURCE	START YEAR	START MONTH	SUMMER CAPABILITY
55856	Prairie State Generatng Station	PC1	IL	PC	BIT	2012	6	812
56808	Virginia City Hybrid Energy Center	1	VA	PC	BIT	2012	7	600
55856	Prairie State Generatng Station	PC2	IL	PC	BIT	2012	11	817
2721	Cliffside	6	NC	PC	BIT	2012	12	825
56564	John W Turk Jr Power Plant	1	AR	PC	SUB	2012	12	609
56611	Sandy Creek Energy Station	S01	TX	PC	SUB	2013	5	937
1004	Edwardsport	ST,CT1,CT2	IN	IGCC	BIT	2013	6	569
57037	Kemper County IGCC Project	1A,1B,1C	MS	IGCC	LIG	2014	5	593
7570	Spiritwood	1	ND	PC	LIG	2014	11	62
~~55360~~	~~Two Elk Generating Station~~	~~GEN1~~	~~WY~~	~~PC~~	~~WC~~	~~2016~~	~~12~~	~~275~~
Included as existing capacity for 2012 in AEO2014:								3,663
Included as planned capacity additions in AEO2014:								2,436

Source: U.S. Energy Information Administration, Form EIA-860 “Annual Electric Generator Report”

Illinois Basin Coal Projections

- Staff reviewed transportation rates and productivity assumptions for these two region in CMM
  - Review of productivity assumptions resulted in upward revision of trend leading to increased use of ILB coal in the revised Reference case
  - Staff also examined the impact of higher transportation rates assumed for new shipments between a coal type and a coal demand region

Key results for the AEO2014 Reference case

- Comparisons relative to AEO2013HR8 which included the impacts of the American Taxpayer Relief Act of 2012 passed on 1/1/2013.
- Coal is no longer the leading fuel for U.S. electricity generation in 2040. Coal's share of total generation decreases over time to 32% in 2040 from 37% in 2012 (compared to 35% in AEO2013HR8).
- Coal producers in the Interior region gain share while Appalachia loses share of total U.S. coal production. From 2012 to 2040, the Appalachian region's share of total coal production (on a Btu basis) falls from about 38% to 29%.
- Nearly all of the 44 GW of coal-fired capacity retirements (25 GW planned) occur by 2016 largely because of the combination of MATS, relatively low natural gas prices, and relatively low electricity demand.

Key results for the AEO2014 Reference case

- Expanding development of shale gas resources drives increased production and competitive prices for natural gas

- A short-term recovery for coal occurs followed by a decline in consumption in 2015 and 2016 as MATS takes effect, resulting in a net gain of 37 million tons for coal in 2016 compared to 2012. After 2016, coal consumption rises, peaking in 2027 with a small decline thereafter.

- 2.8 GW of additions (2.4 GW planned)

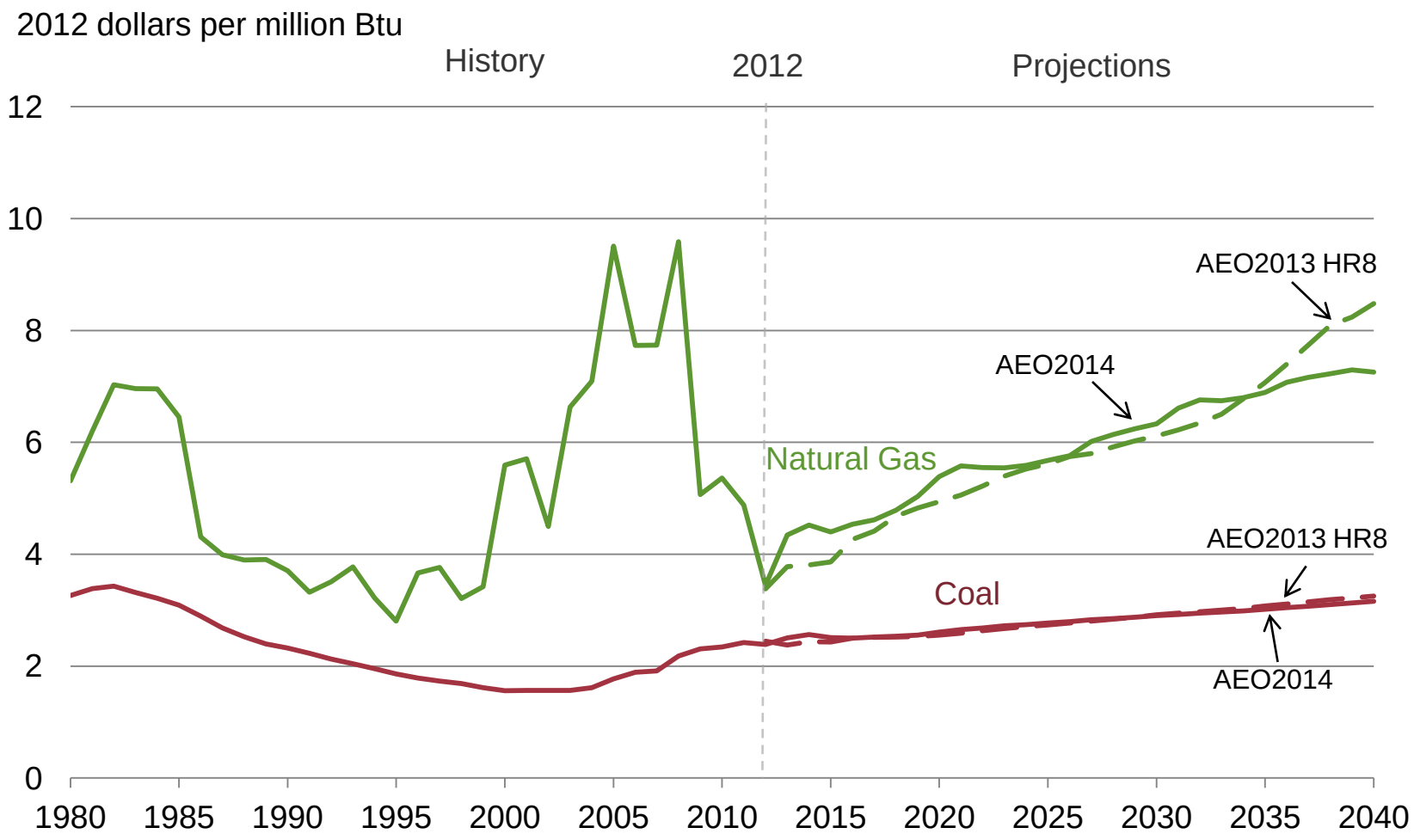
- Delivered coal prices increase gradually through 2040 at an average rate of 0.9% per year (on a per ton basis) due to declining coal mine productivity and increasing transportation costs

Legislation and regulation assumptions

- Current laws and regulations addressed in the AEO2014 Reference Case
  - Clean Air Interstate Rule (CAIR)
  - Mercury and Air Toxics Standards (MATS) by 2016
  - State Renewable Portfolio Standards (RPS)
  - California's cap-and-trade program and the Northeast's RGGI program
  - Uncertainty with respect to CO_2 policy addressed through a 3% higher cost of capital for new coal-fired power plants and capital investment projects at existing coal-fired power plants

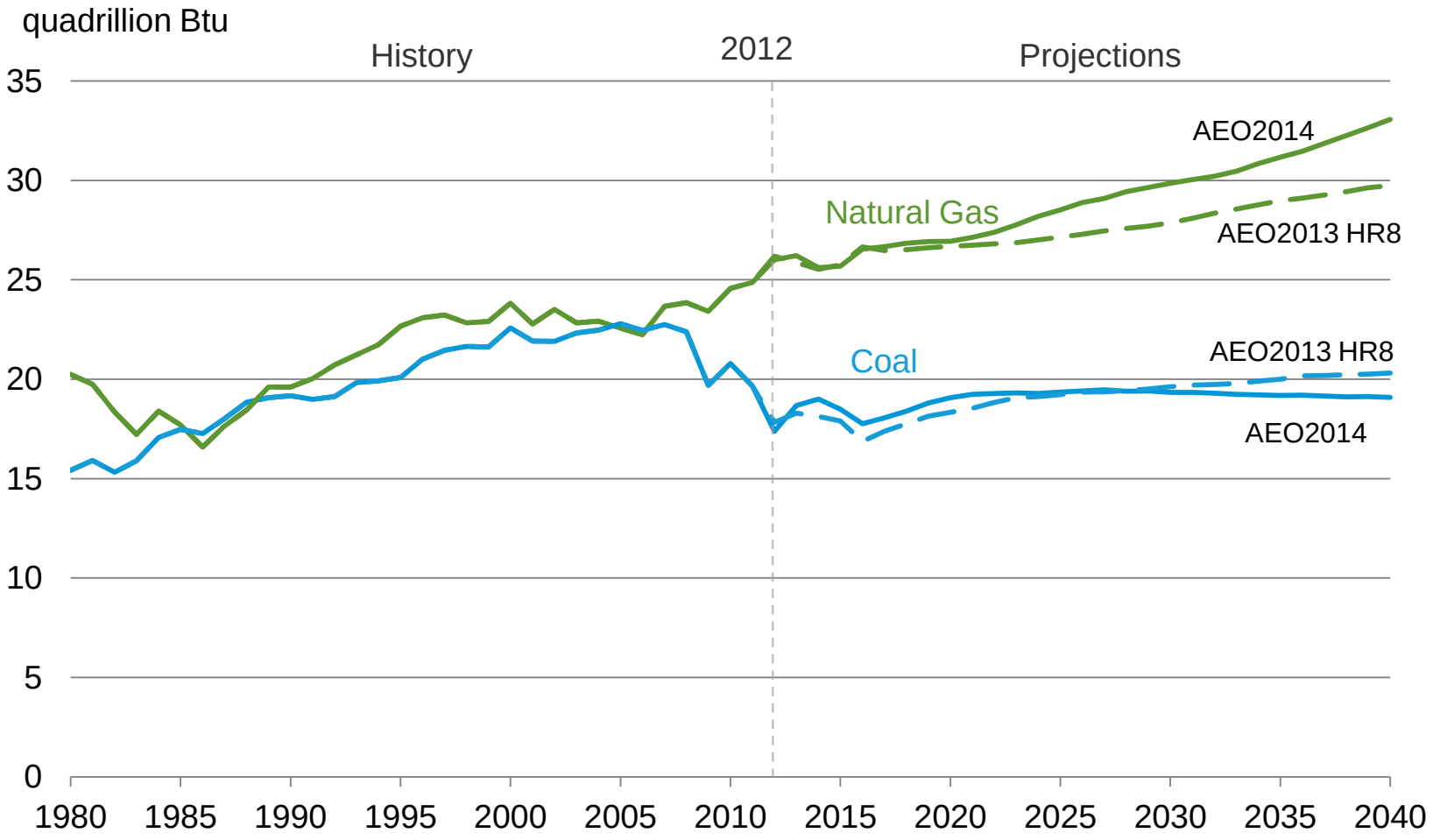
- Issues not addressed in the AEO2014 Reference Case
  - CO_2 New Source Performance Standards (NSPS)
  - Cooling water intake regulations per section 316(b) of the Clean Water Act
  - Regional haze
  - Coal combustion residuals

Natural gas and coal prices to the electric power sector, 1980-2040



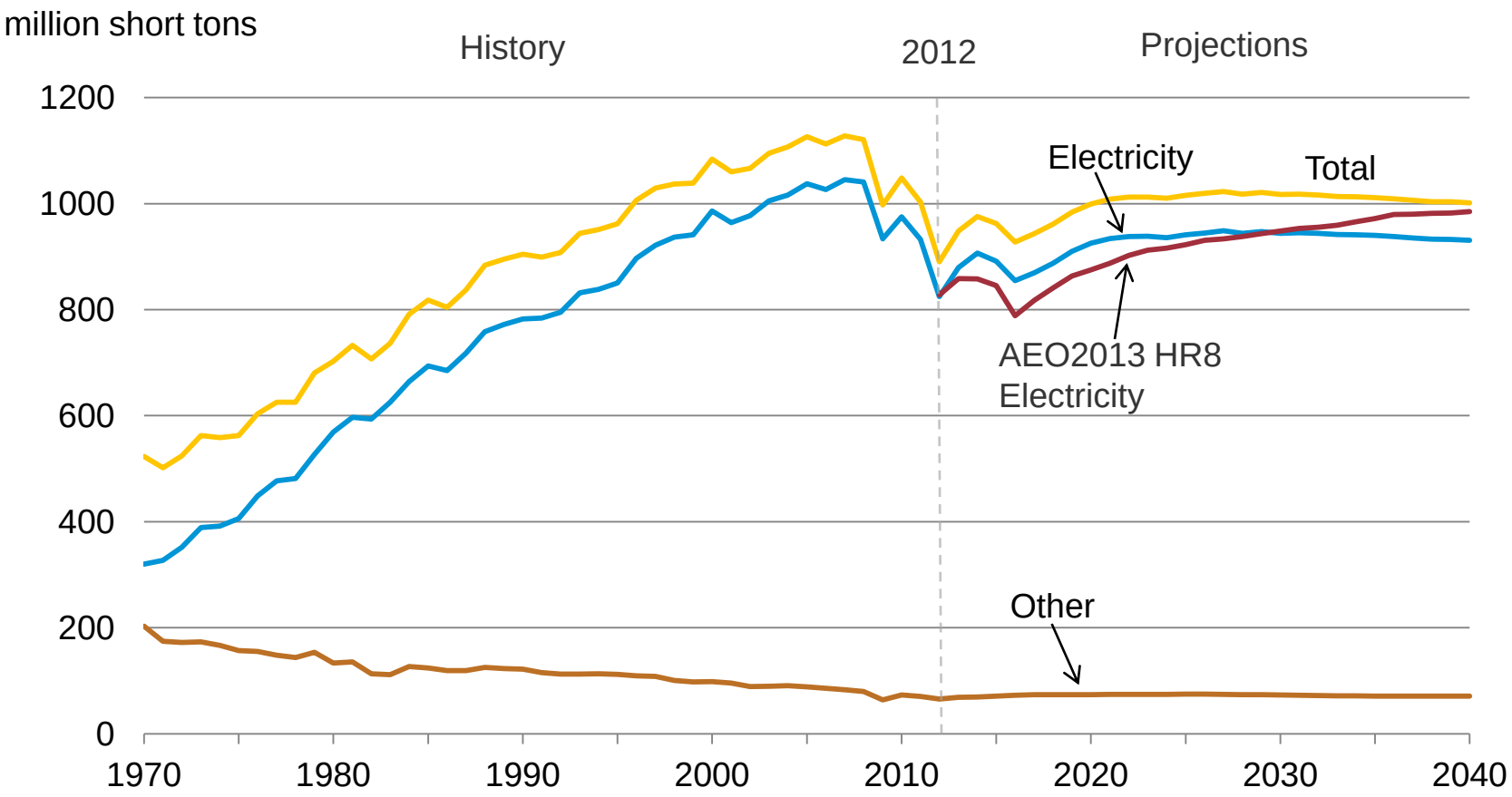
Source: Preliminary AEO2014 (NEMS run ref2014.d092413a); and AEO2013 HR8.

Natural gas and coal consumption, 1980-2040



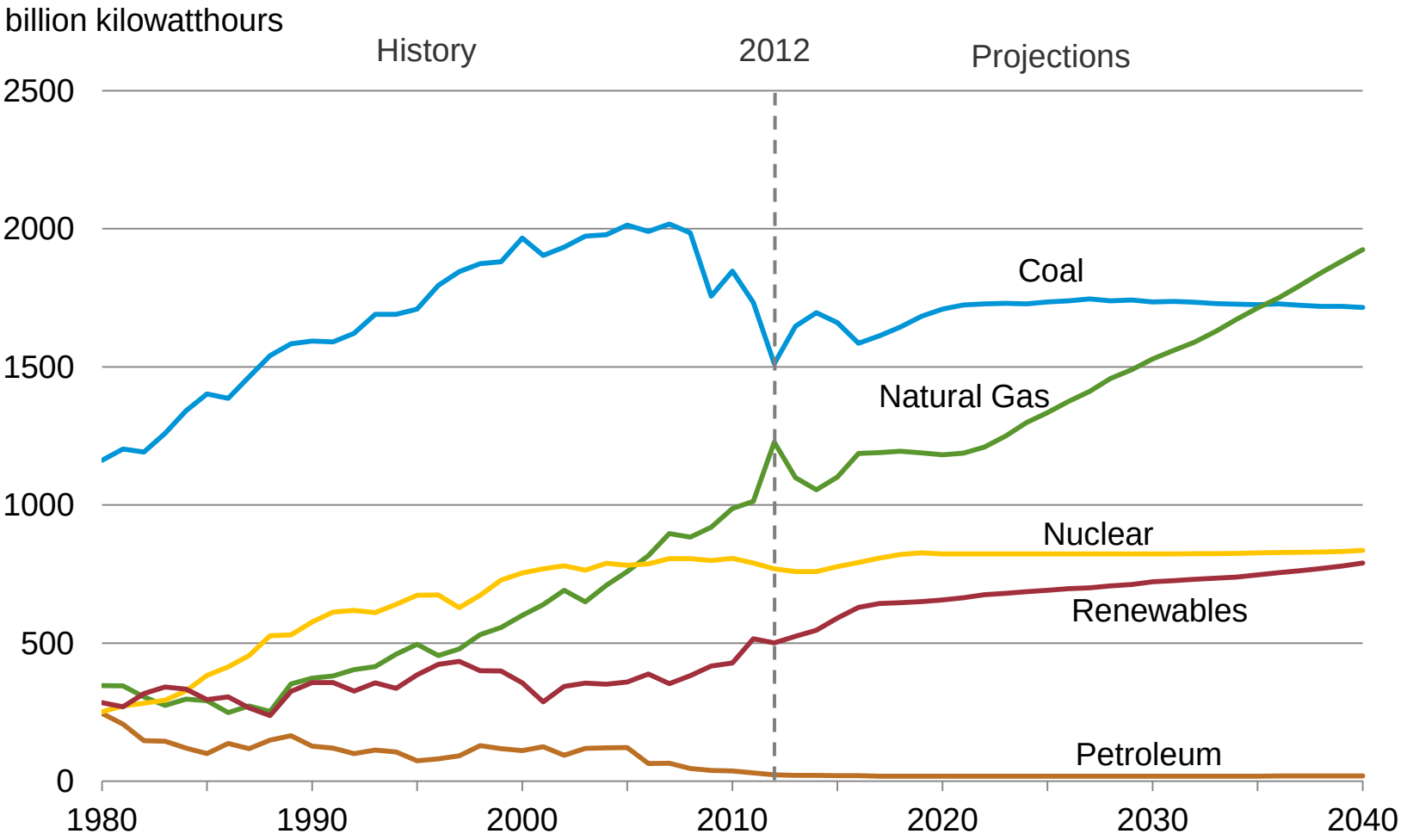
Source: Preliminary AEO2014 (NEMS run ref2014.d092413a); and AEO2013 HR8.

Coal consumption by sector, 1970-2040



Source: Preliminary AEO2014 (NEMS run ref2014.d092413a); and AEO2013 HR8.

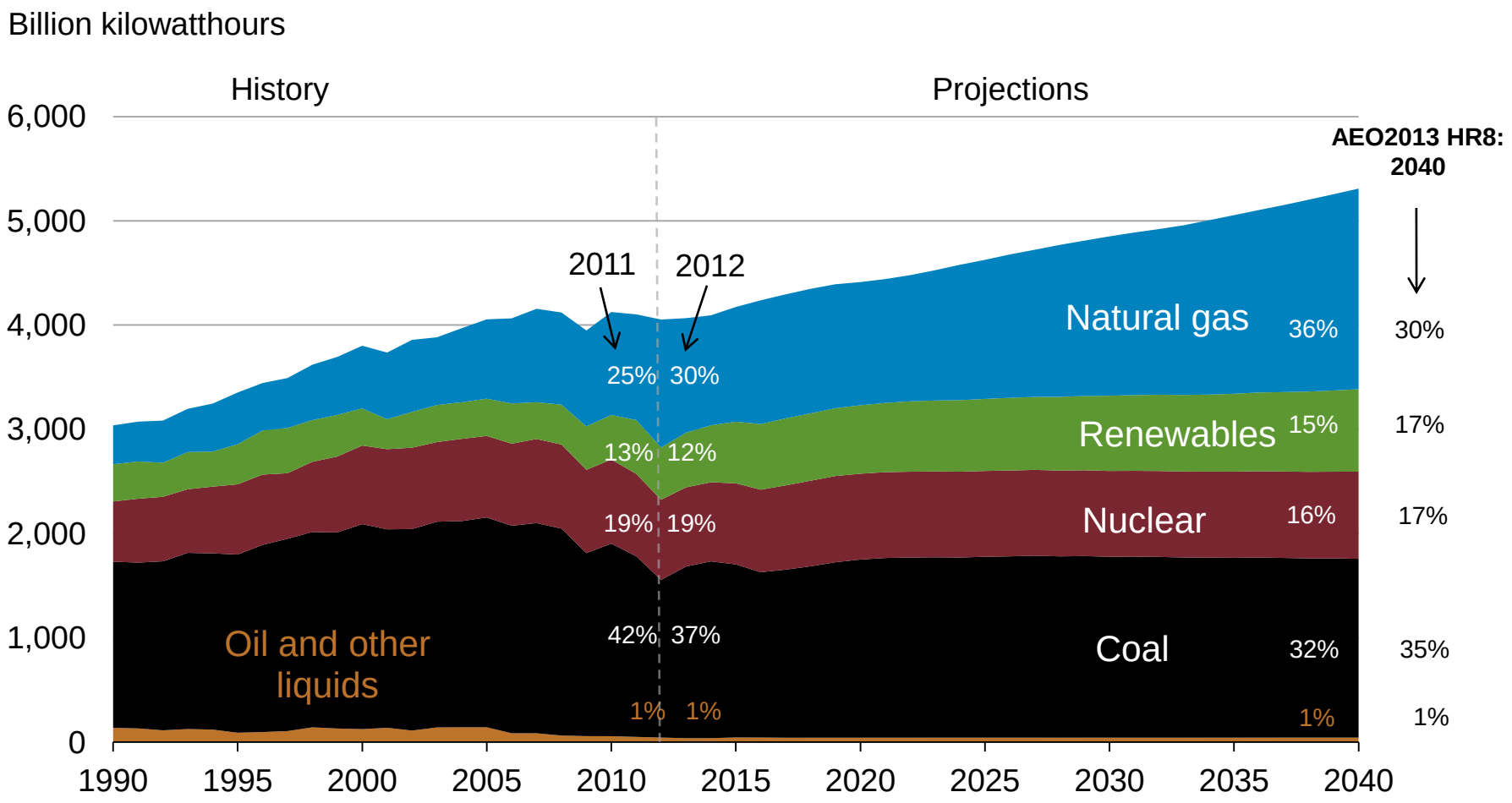
Electricity Generation by Fuel, 1980-2040



Note: Includes generation from plants in both the electric power and end-use sectors.

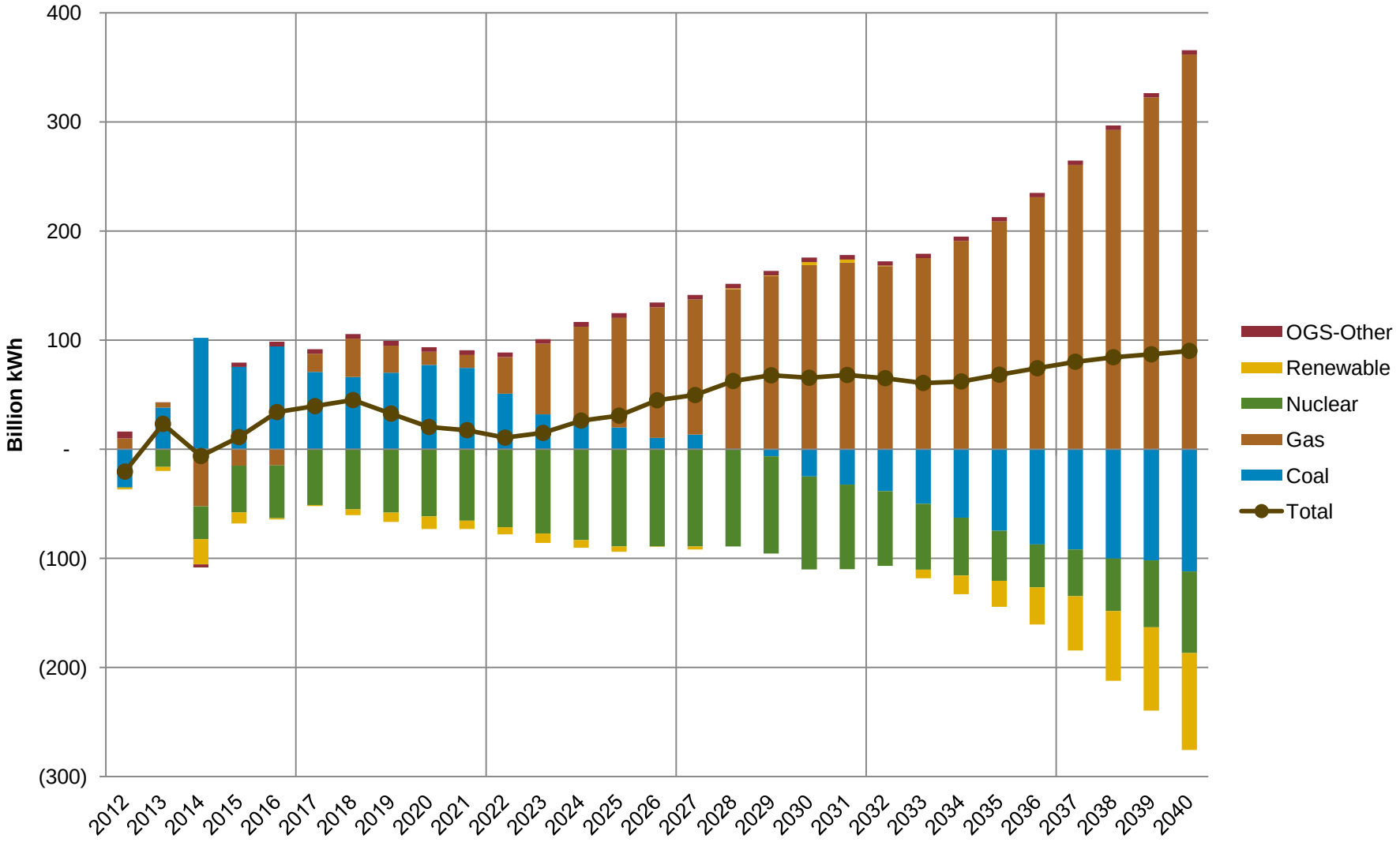
Source: **History:** U.S. Energy Information Administration (EIA), *Annual Energy Review;*
Projections: Preliminary AEO2014 (NEMS run ref2014.d092413a).

Electricity generation by fuel, 1990-2040



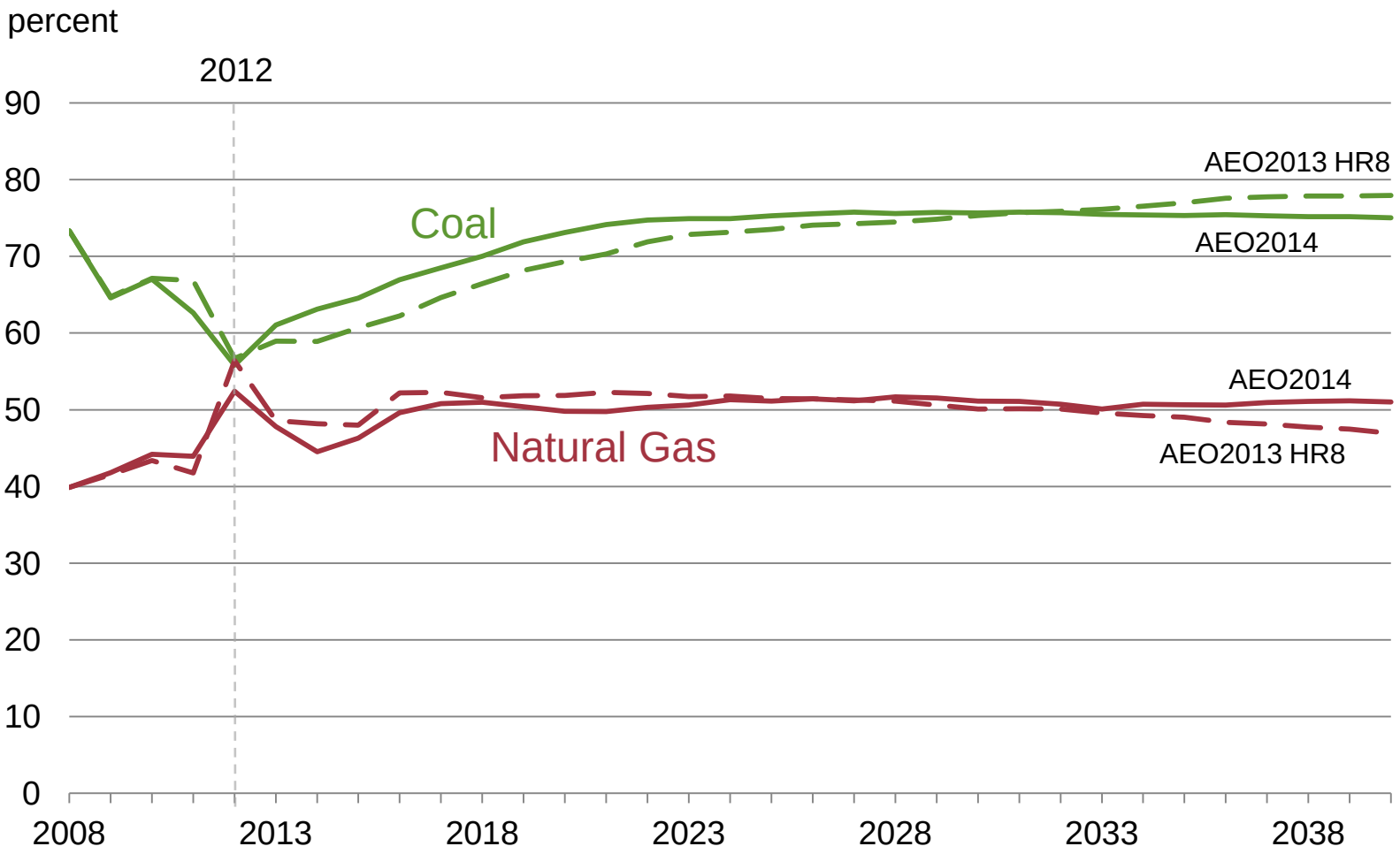
Source: Preliminary AEO2014 (NEMS run ref2014.d092413a); and AEO2013 HR8.

Comparison of electric generation to AEO2013



- **Source:** Preliminary AEO2014 (NEMS run ref2014.d092413a); and AEO2013 HR8.

Average capacity utilization of natural gas combined cycle and coal generating capacity, 2008-2040



Source: Preliminary AEO2014 (NEMS run ref2014.d092413a); and AEO2013 HR8.

Electric Net Summer Generating Capacity by Fuel, 2008-2040 (gigawatts)

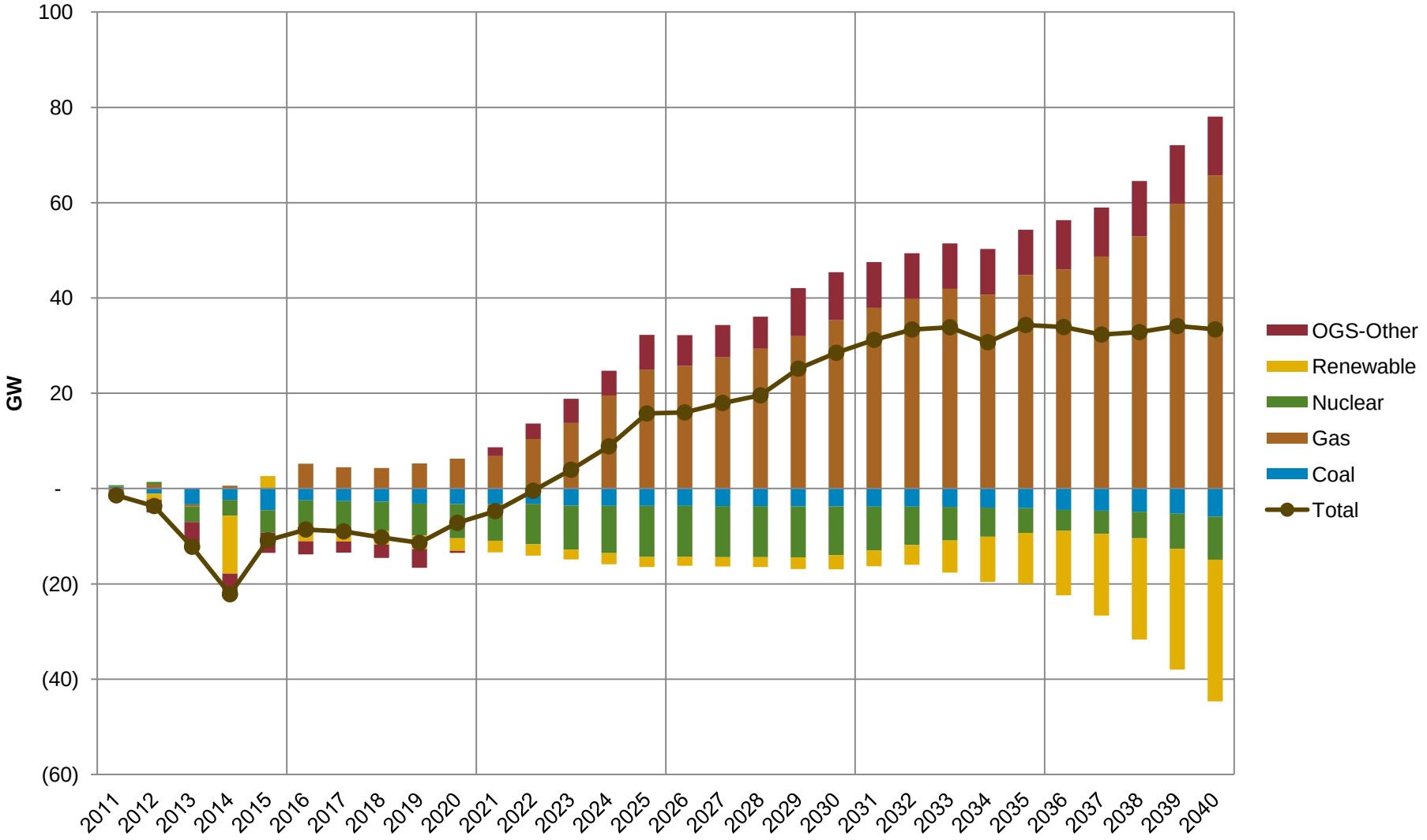
AEO2013

Fuel	2008	2011	2012	2015	2016*	2020	2030	2040	2040
Coal	311	318	312	296	274	272	271	271	277
Electric Power Sector	308	315	309	293	271	269	268	268	272
End-Use Sectors	4	4	3	3	3	3	3	3	4
Natural Gas	335	358	367	381	389	399	508	637	572
Petroleum	115	103	99	94	94	87	79	75	63
Nuclear Power	101	101	102	100	101	103	103	105	114
Renewable Sources	117	142	158	188	191	193	201	221	251
Other (includes pumped storage)	25	25	25	26	26	26	26	26	25
Total	1004	1047	1064	1085	1073	1080	1188	1335	1302

Source: Preliminary AEO2014 (NEMS run ref2014.d092413a); and AEO2013 HR8.

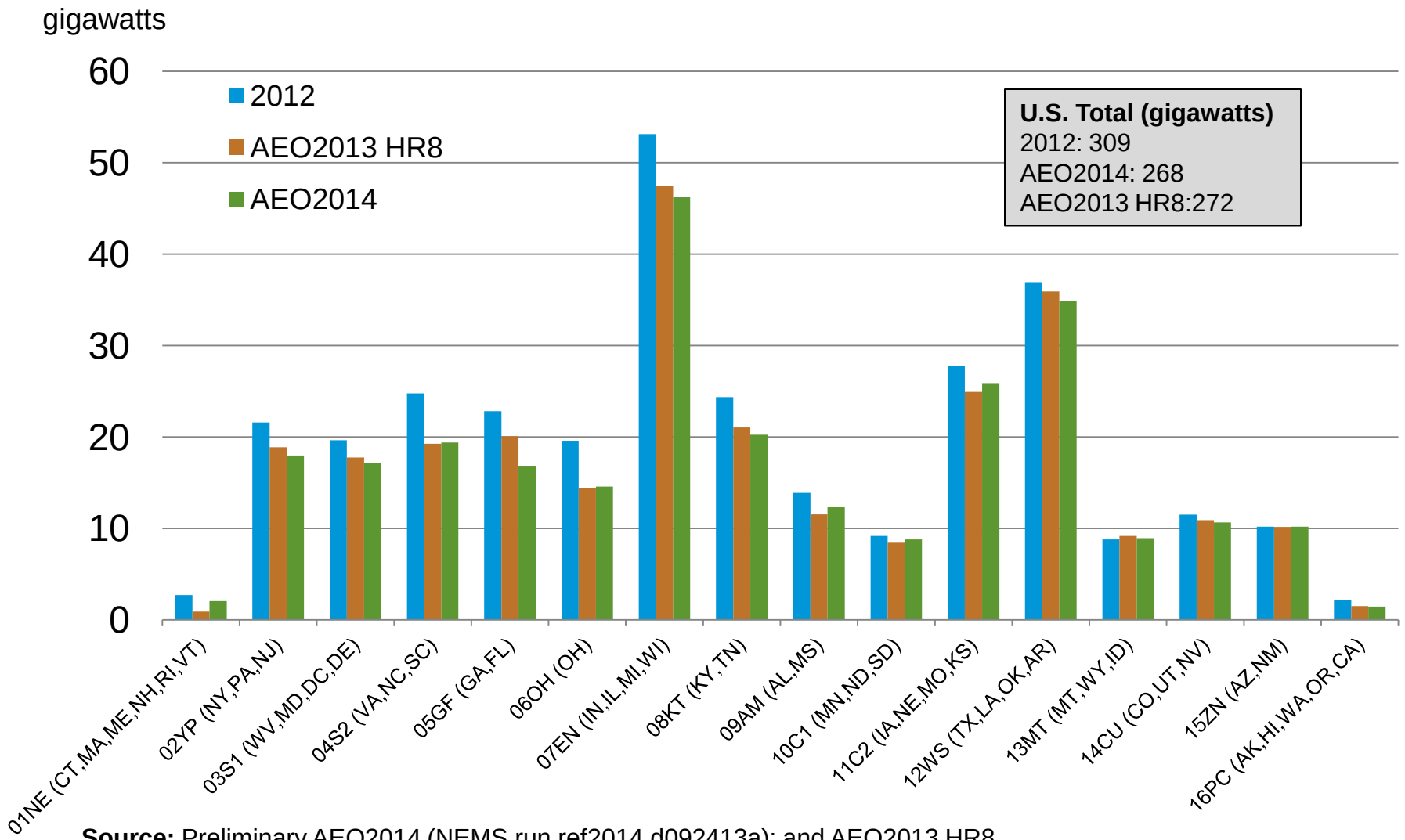
**MATS compliance assumed to begin*

Comparison of electric capacity to AEO2013



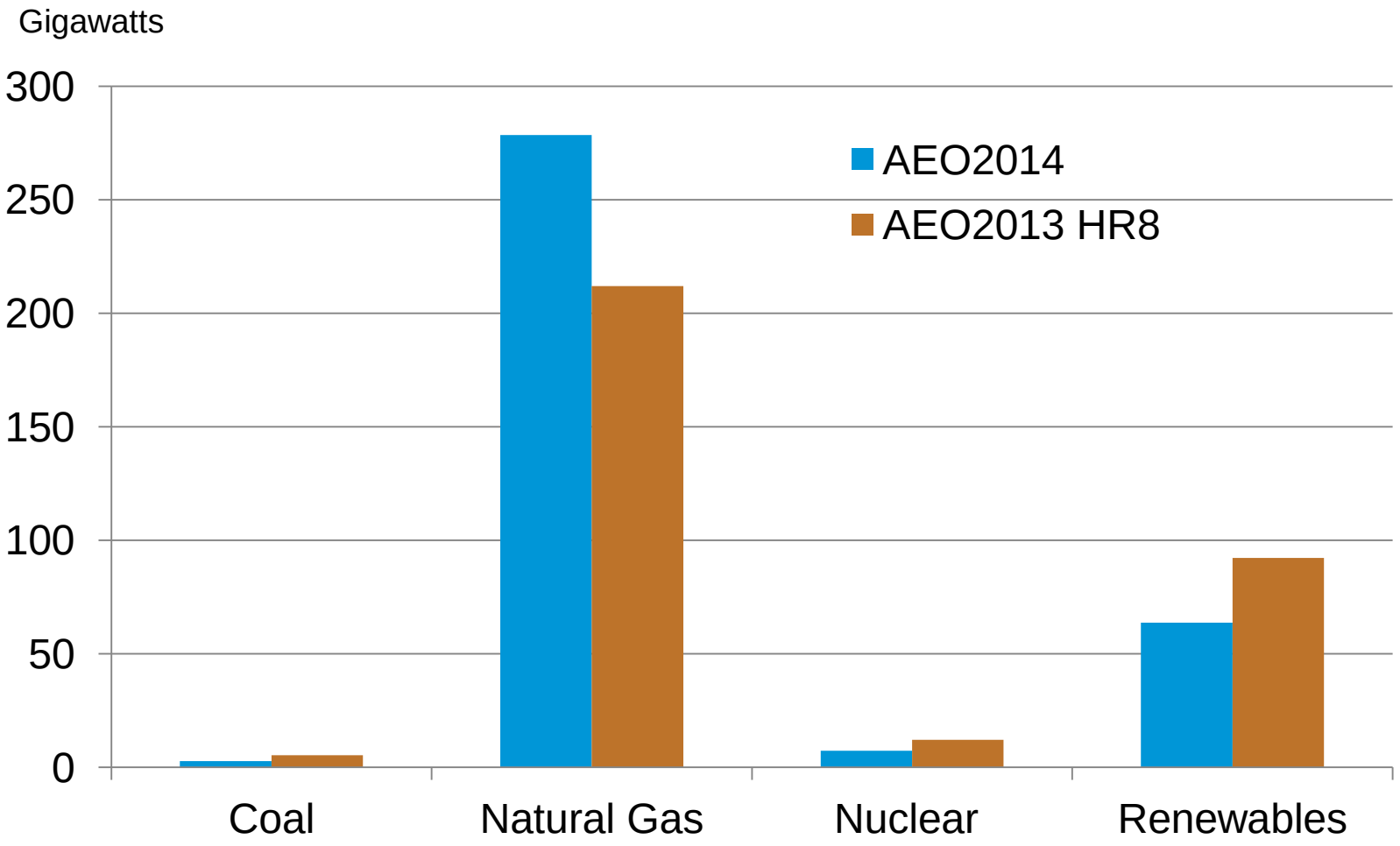
- **Source:** Preliminary AEO2014 (NEMS run ref2014.d092413a); and AEO2013 HR8.

Net summer coal-fired generating capacity in the electric power sector by coal demand region, 2012 and 2040



Source: Preliminary AEO2014 (NEMS run ref2014.d092413a); and AEO2013 HR8.

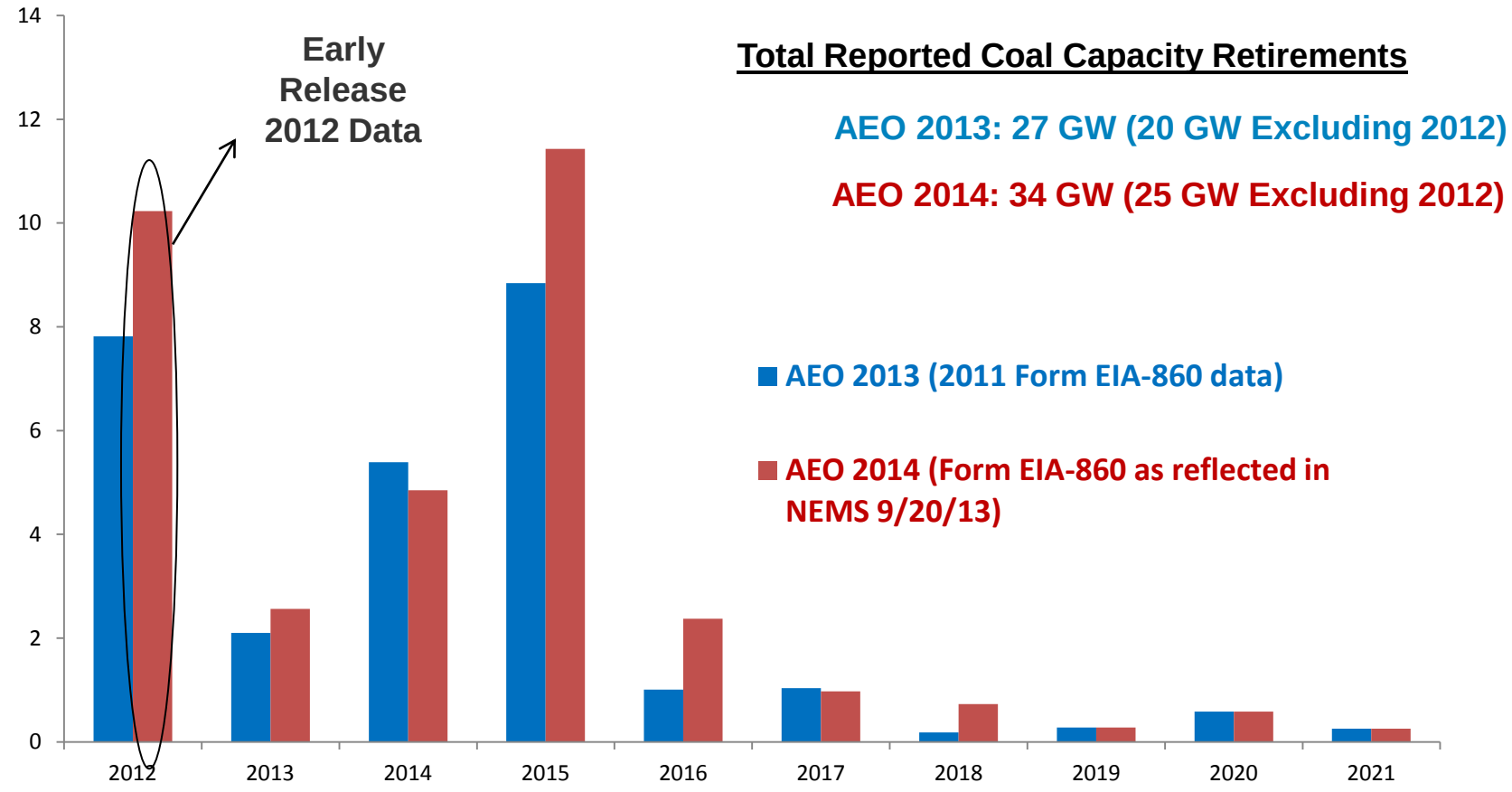
Cumulative Capacity Additions, 2013-2040



Source: Preliminary AEO2014 (NEMS run ref2014.d092413a); and AEO2013 HR8.

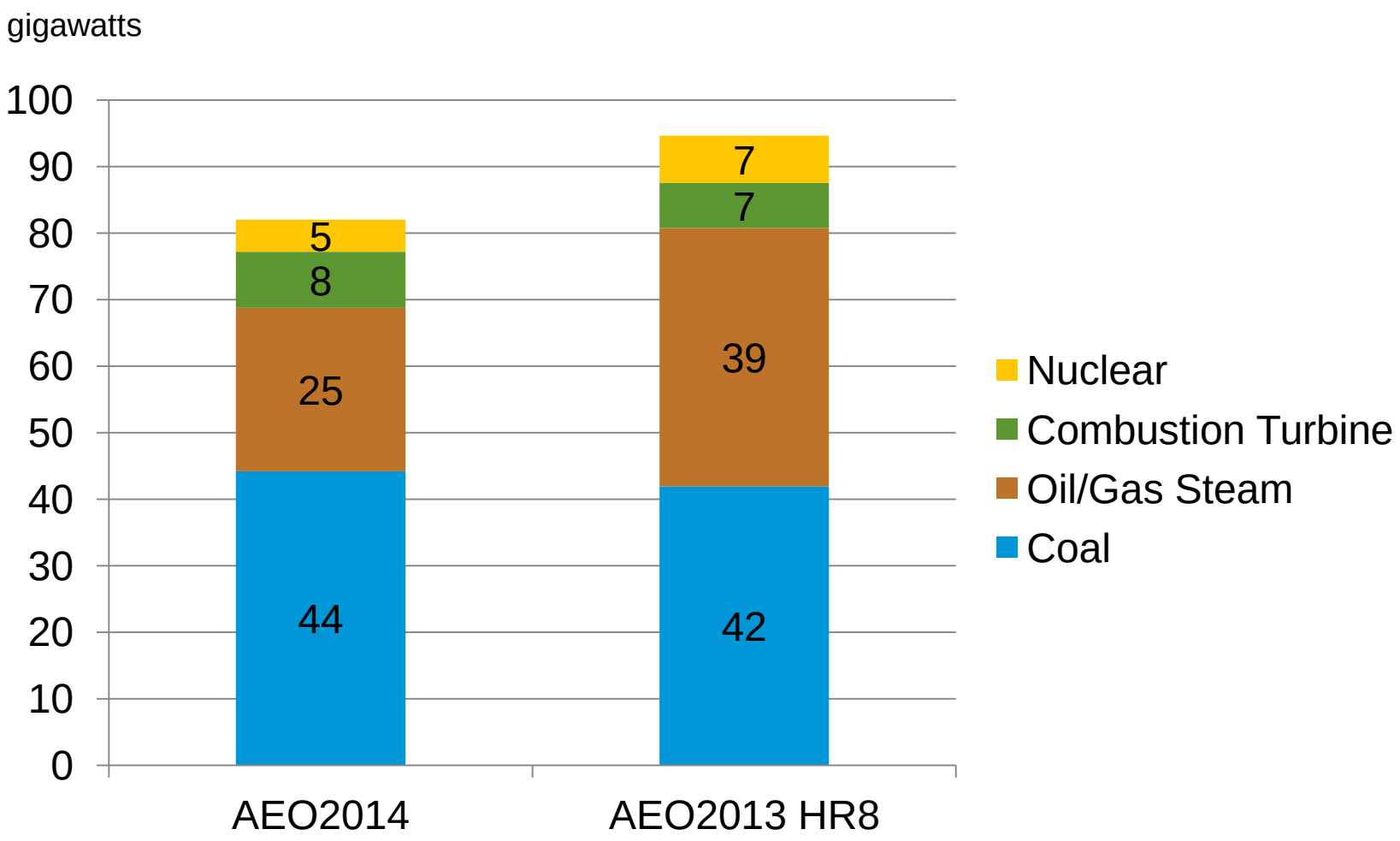
Reported Coal Retirements By Year

Gigawatts



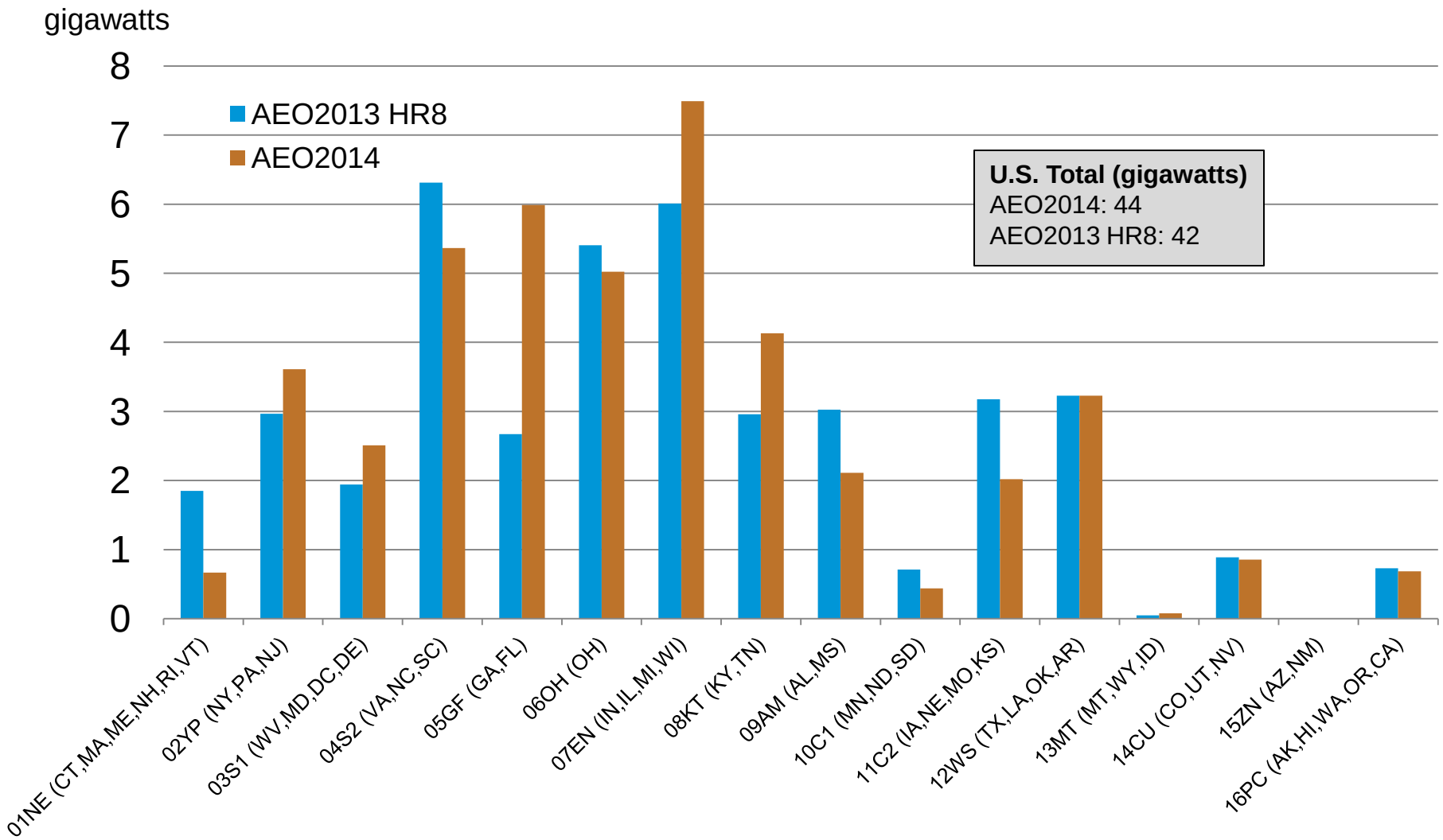
Source: Preliminary AEO2014 (NEMS run ref2014.d092413a); and AEO2013 HR8.

Cumulative Plant Retirements, 2013-2040



Source: Preliminary AEO2014 (NEMS run ref2014.d092413a); and AEO2013 HR8.

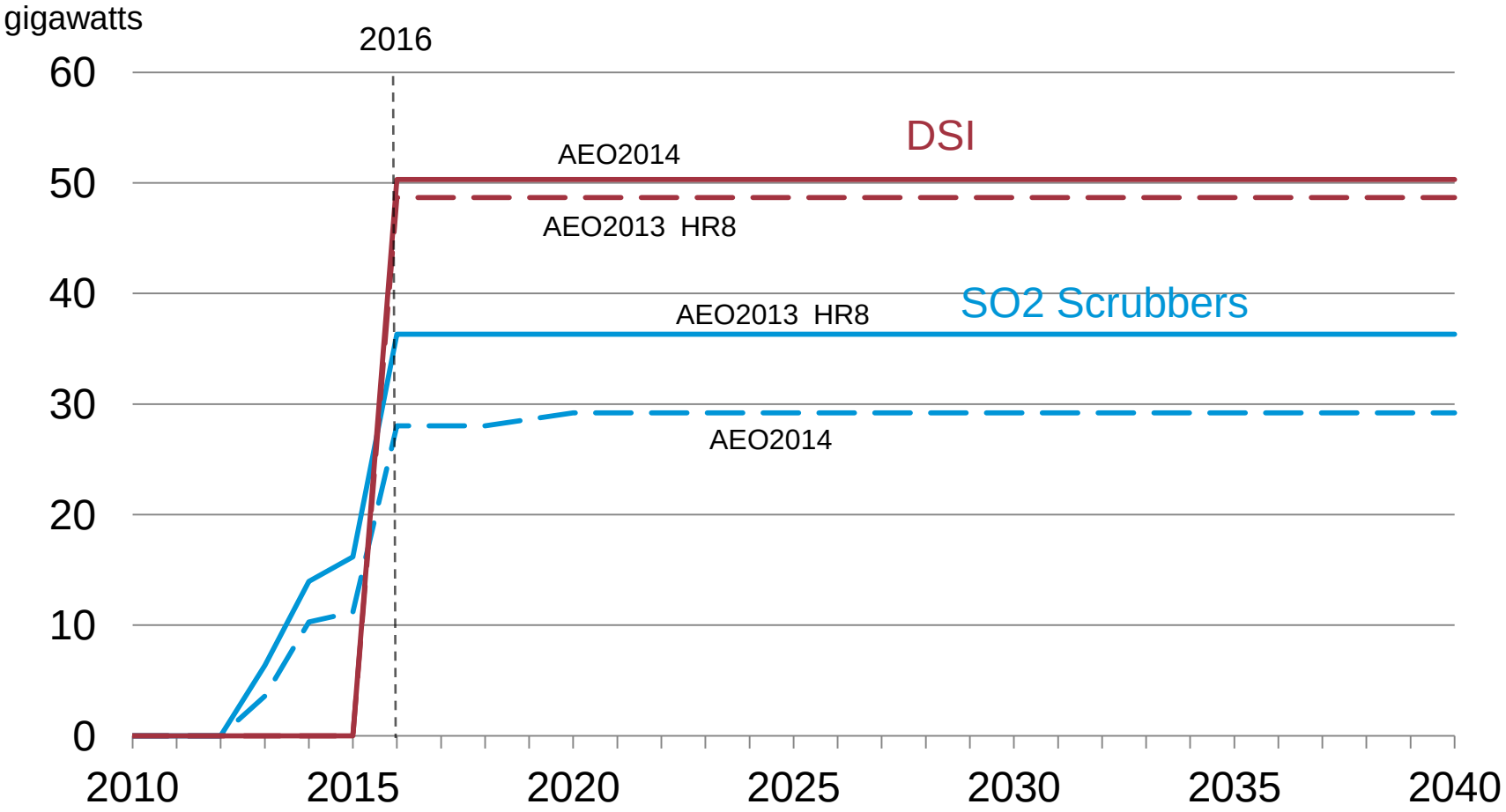
Cumulative coal-fired capacity retirements by coal demand region, 2013-2040



Source: Preliminary AEO2014 (NEMS run ref2014.d092413a); and AEO2013 HR8.

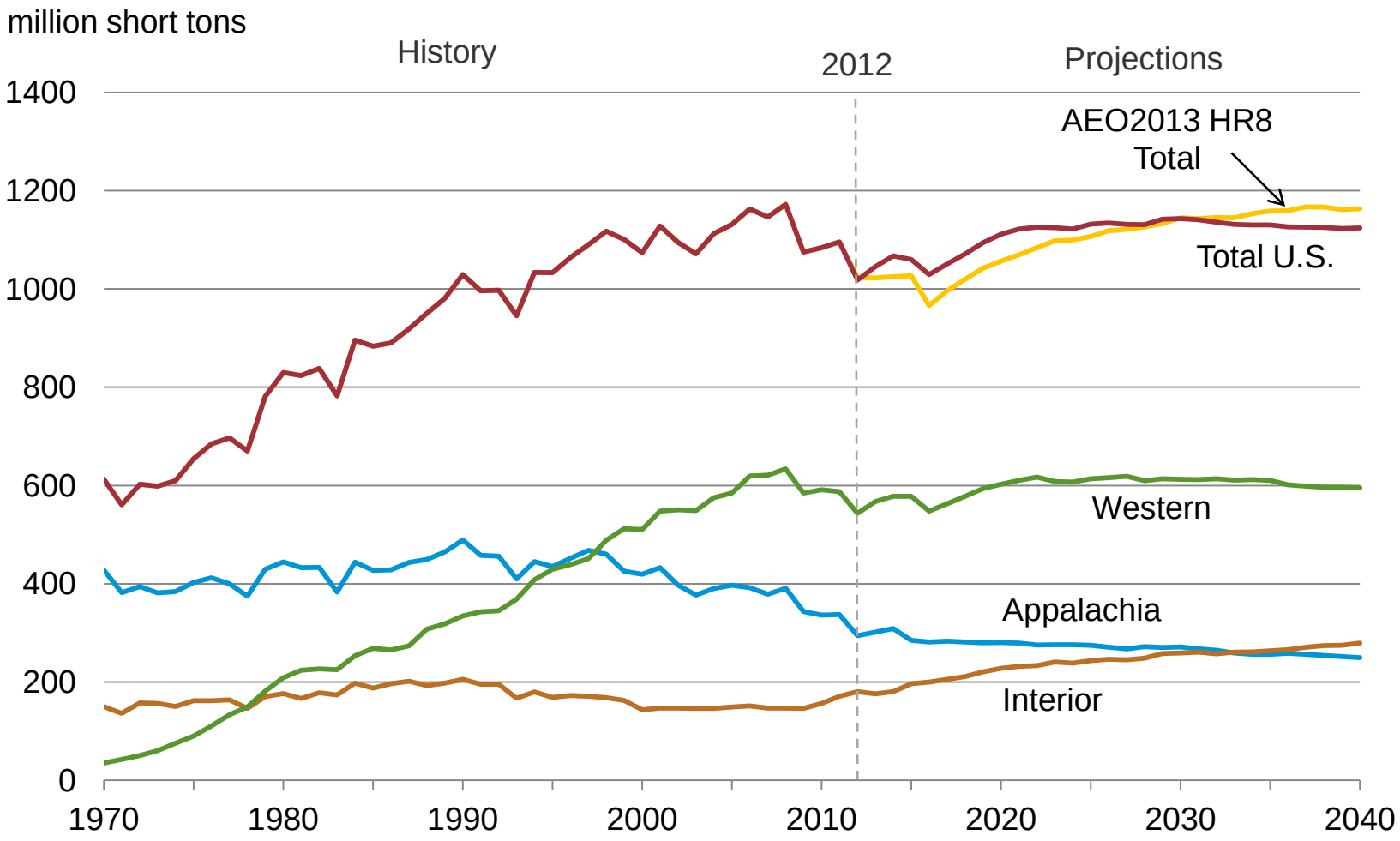
Cumulative SO2 scrubber and DSI retrofits, 2013-2040

- AEO2014 allows ESP upgrades for certain eligible plants.
- DSI and fabric filter costs were updated.



Source: Preliminary AEO2014 (NEMS run ref2014.d092413a); and AEO2013 HR8.

Coal production by region, 1970-2040



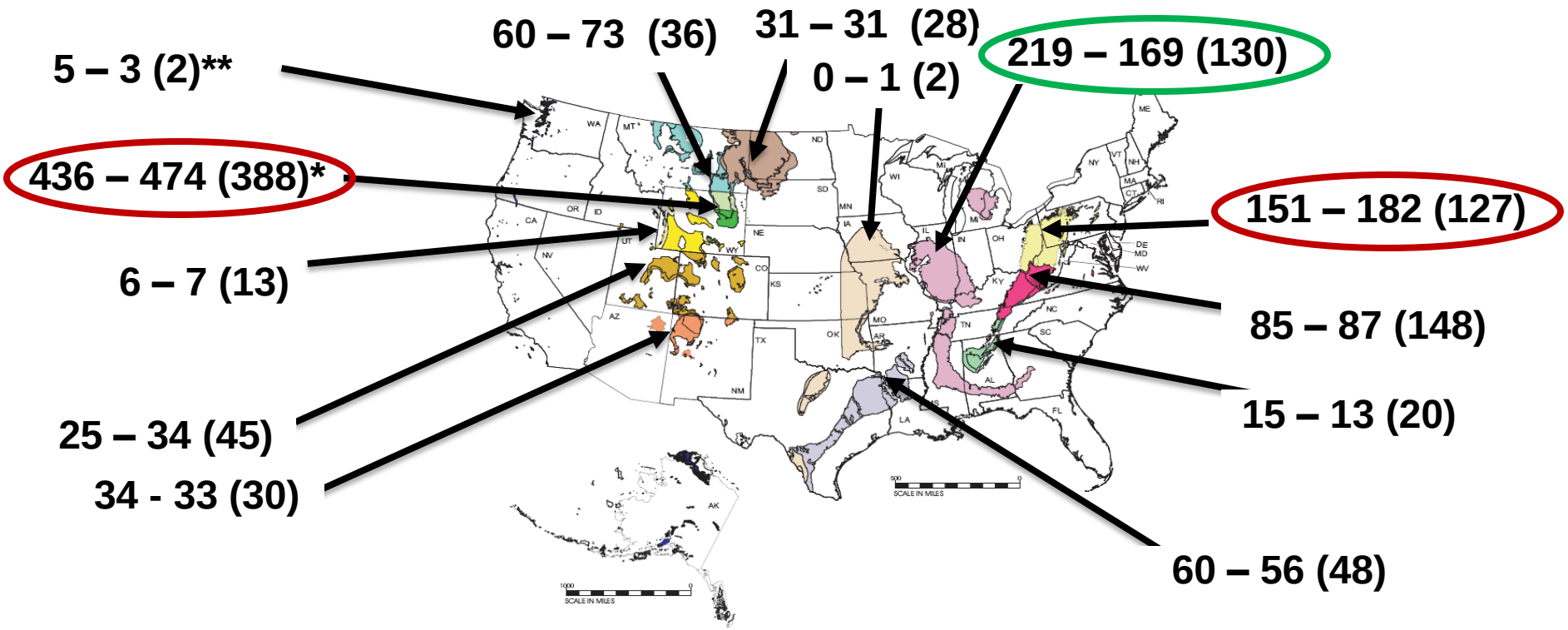
Source: Preliminary AEO2014 (NEMS run ref2014.d092413a); and AEO2013 HR8.

Average annual growth in coal mining labor productivity for selected supply regions (percent)

Coal Supply Region	1980-1990	1990-2000	2001-2011	2006-2011	2011-2012	AEO2014 2011-2040	AEO2013 2011-2040
Northern Appalachia	5.4	5.5	-2.5	-4.2	-3.6	-1.3	-1.2
Central Appalachia	7.3	4.4	-5.9	-6.3	-3.8	-3.2	-3.6
Eastern Interior	4.8	3.7	-1.6	-0.6	5.8	0.1	-0.6
Gulf Lignite	2.6	2.4	-2.0	-5.7	-4.2	-1.0	-2.3
Dakota Lignite	6.0	1.0	-3.4	-6.5	-4.5	-1.7	-0.9
Western Montana	4.6	2.0	-3.6	-5.7	-11.7	-1.7	-1.7
WY, Northern Powder River Basin	7.5	3.2	-3.8	-4.2	-5.8	-1.6	-1.7
WY, Southern Powder River Basin	7.2	4.9	-3.2	-3.4	-6.6	-1.6	-1.7
Rocky Mountain	7.8	5.5	-4.8	-5.5	2.9	-2.6	-1.9
U.S. Average	7.1	6.2	-2.7	-3.7	0.1	-1.1	-1.4

Source: **History:** U.S. Energy Information Administration (EIA), *Annual Coal Report*; and Mine Safety and Health Administration, Form 7000-2, "Quarterly Mine and Employment and Coal Production Report;"
Projections: Preliminary AEO2014 (NEMS run ref2014.d092413a); and AEO2013 Reference case.

Coal production, AEO2014 vs. AEO 2013 in 2040 (and 2012) (million short tons)



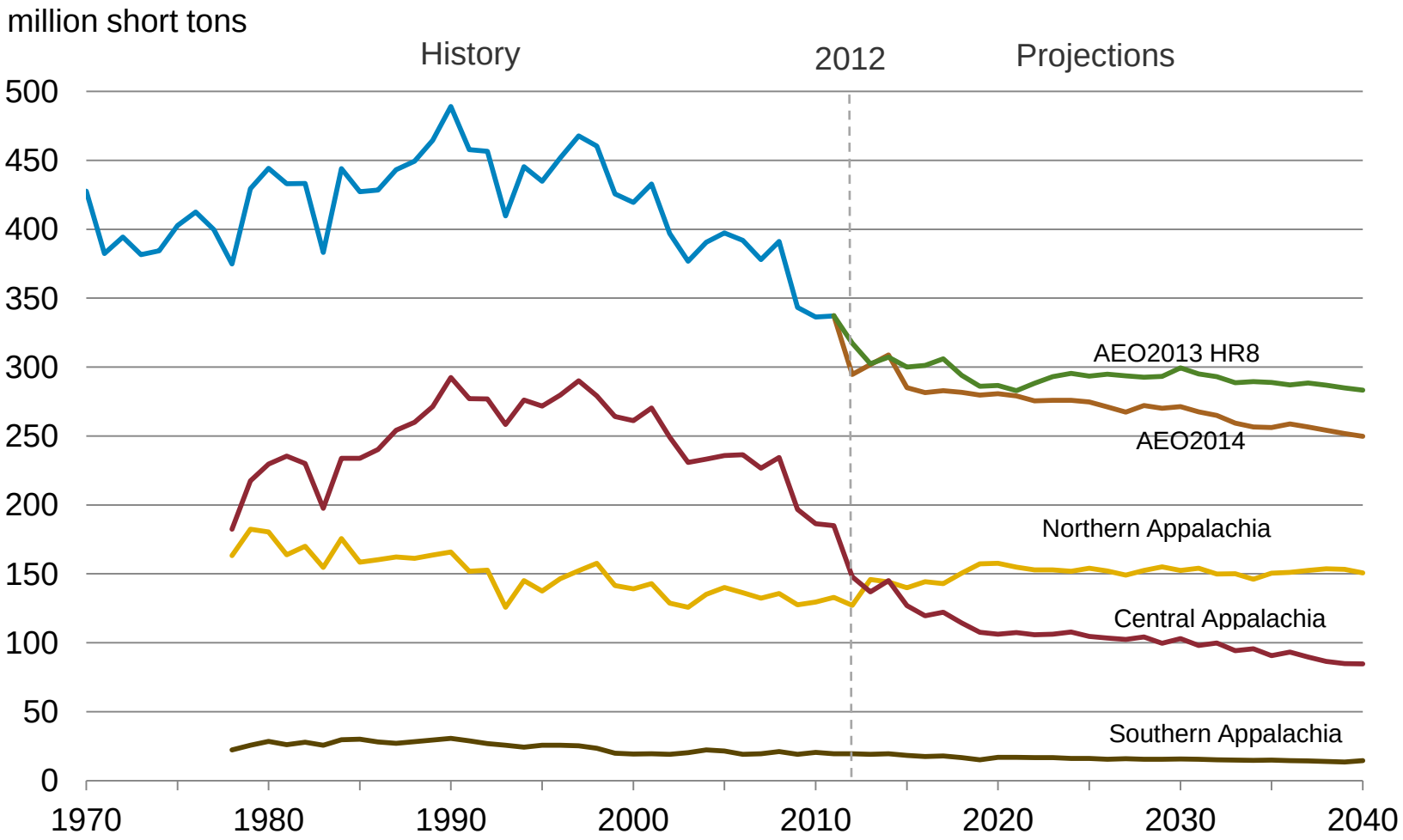
U.S. Total:
1,124 – 1,163 (1,016)

* Includes production from all mines in Wyoming's Powder River Basin.

** Includes production from mines in both Alaska and Washington.

Source: 2012: Mine Safety and Health Administration, Form 7000-2, "Quarterly Mine and Employment and Coal Production Report;" **2040:** Preliminary AEO2014 (NEMS run ref2014.d092413a); and AEO2013 HR8.

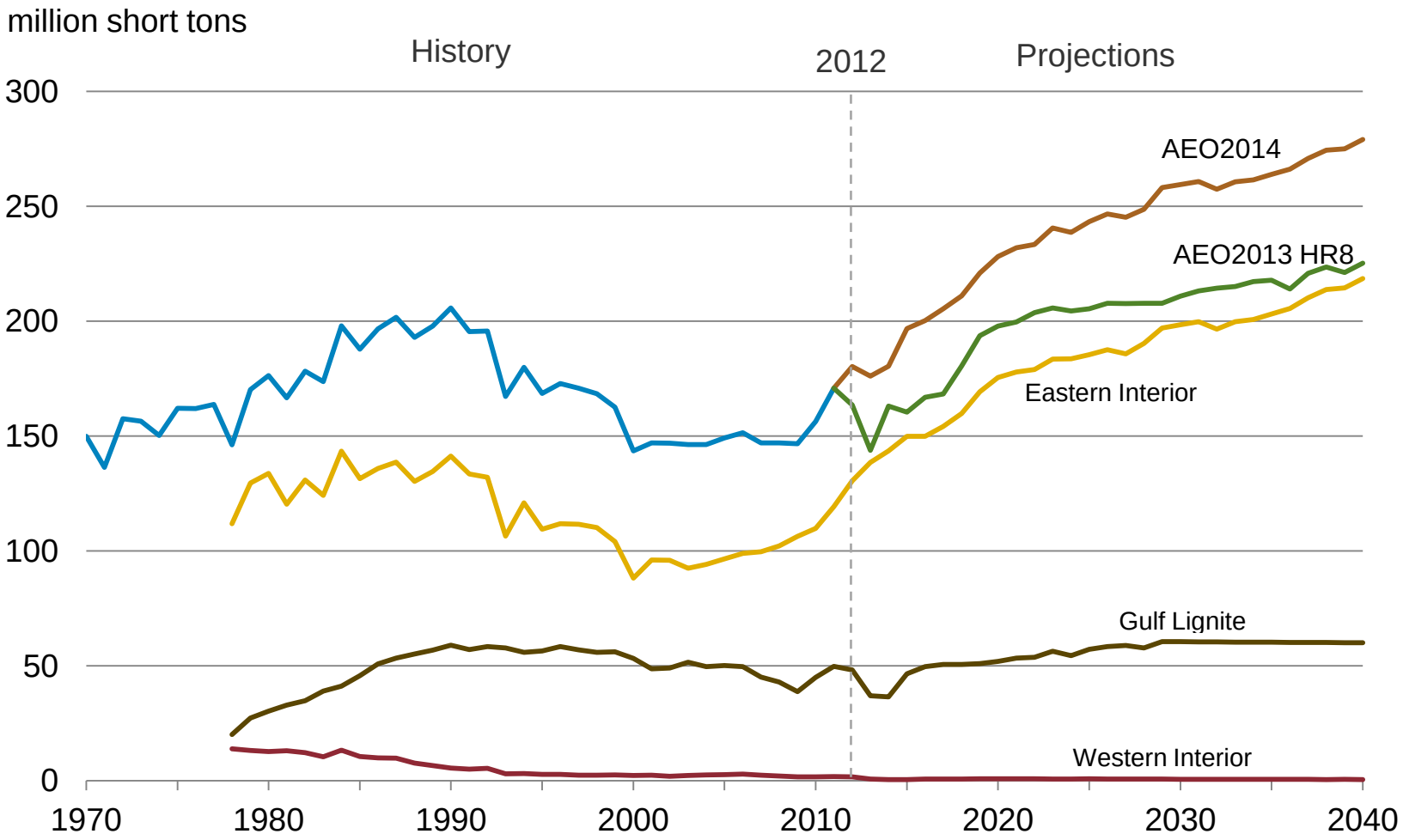
Appalachian coal production, 1970-2040



Source: Preliminary AEO2014 (NEMS run ref2014.d092413a); and AEO2013 HR8.

Except for Appalachian total, data for 1978-1985 exclude production from small (<10,000 short tons) coal mines

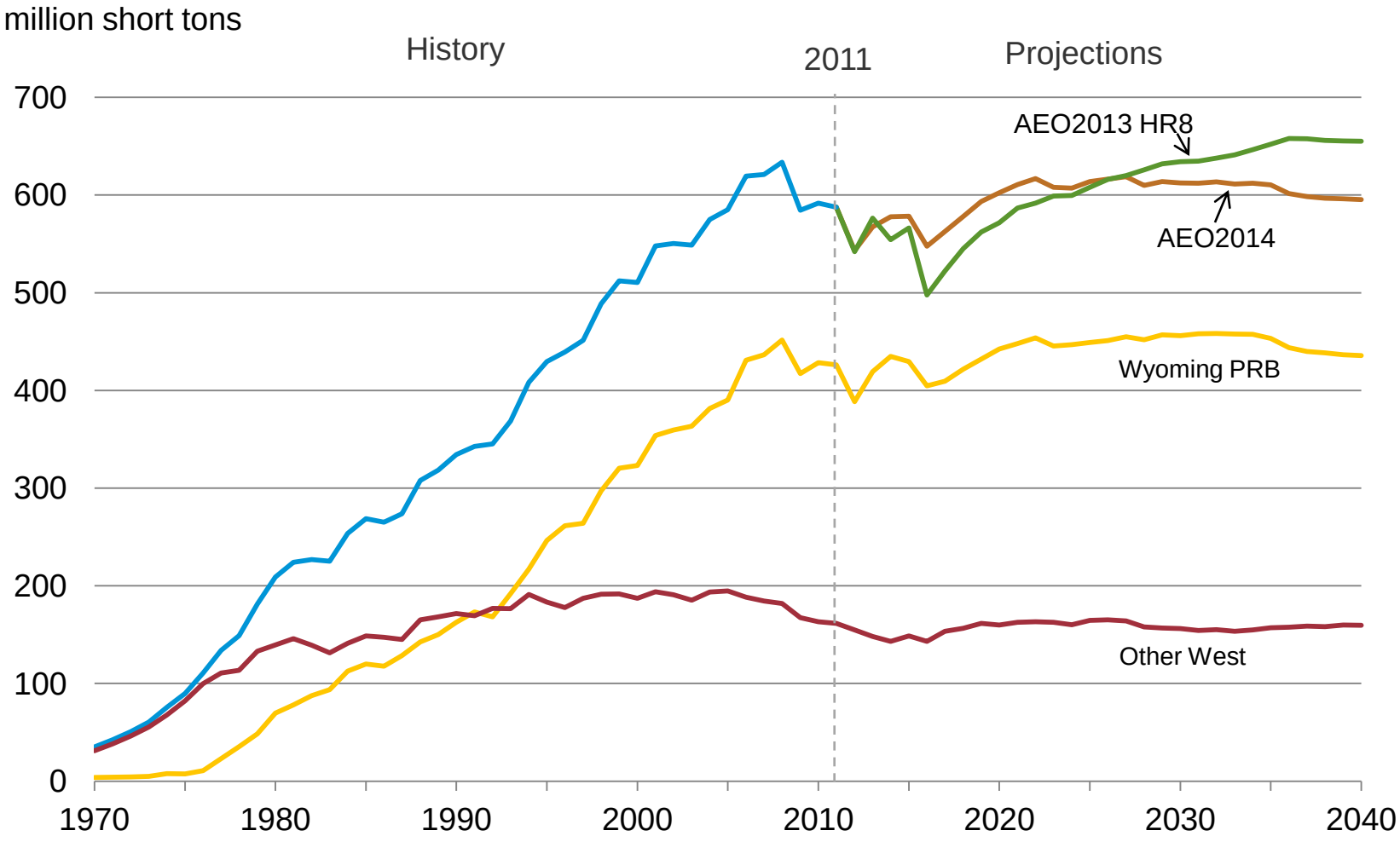
Interior coal production, 1970-2040



Source: Preliminary AEO2014 (NEMS run ref2014.d092413a); and AEO2013 HR8.

Except for Interior total, data for 1978-1985 exclude production from small (<10,000 short tons) coal mines

Western coal production, 1970-2040

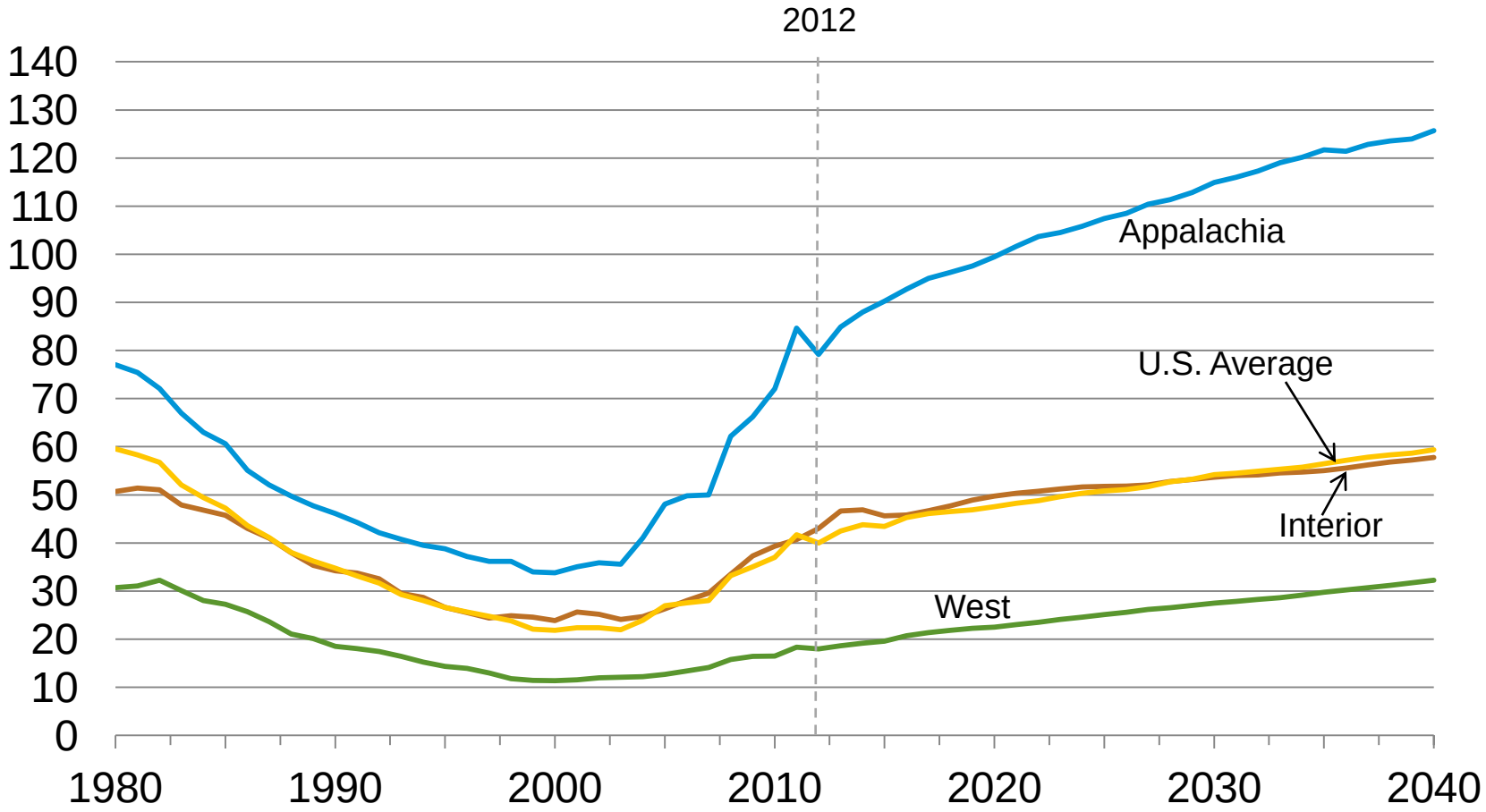


Source: Preliminary AEO2014 (NEMS run ref2014.d092413a); and AEO2013 HR8.

Except for Western total, data for 1978-1985 exclude production from small (<10,000 short tons) coal mines

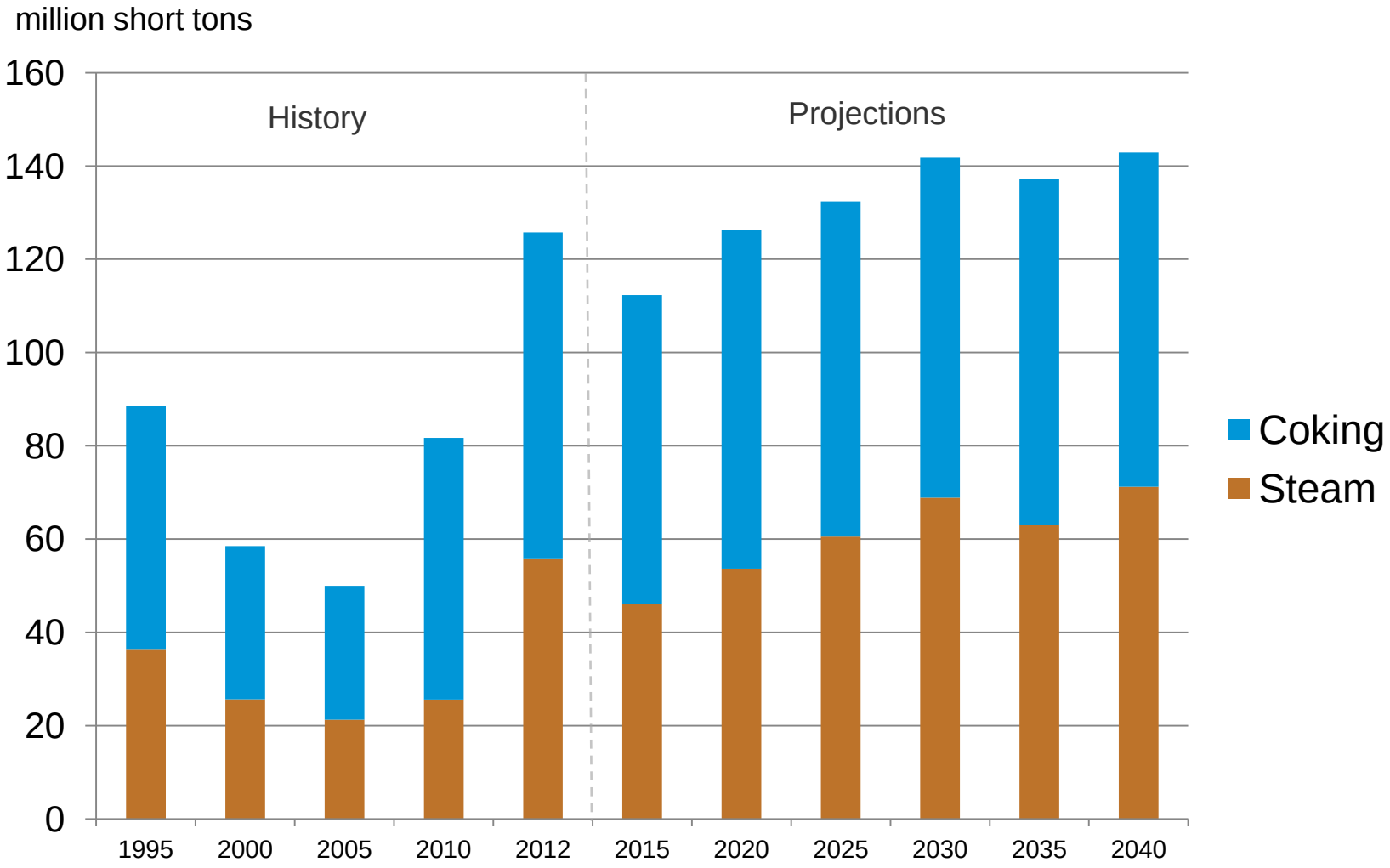
Average minemouth coal prices by region, 1980-2040

2012 dollars per short ton



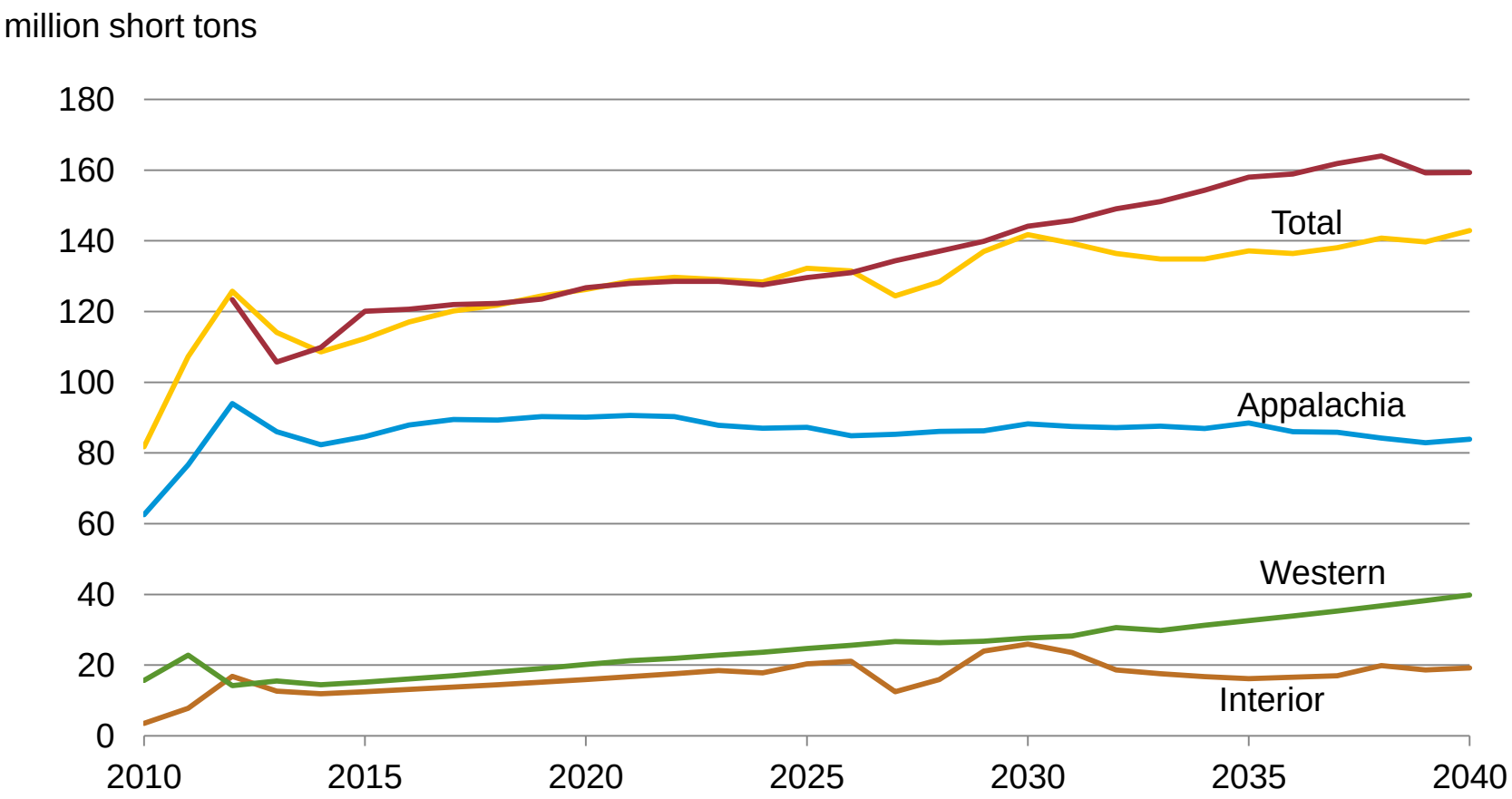
Source: Preliminary AEO2014 (NEMS run ref2014.d092413a)

U.S. Coal Exports, 1995-2040



Source: History: U.S. Energy Information Administration (EIA), *Quarterly Coal Report;*
Projections: Preliminary AEO2014 (NEMS run ref2014.d092413a); and AEO2013 HR8.

Coal exports by major supply region, 2010-2040



Source: 2010-2011: U.S. Energy Information Administration (EIA), Annual Coal Distribution Report;
2012-2040: Preliminary AEO2014 (NEMS run ref2014.d092413a); and AEO2013 HR8.

Changes in release cycles for EIA's AEO and IEO

- To focus more resources on rapidly changing energy markets and how they might evolve over the next few years, the U.S. Energy Information Administration is revising the schedule and approach for production of the *International Energy Outlook* (*IEO*) and the *Annual Energy Outlook* (*AEO*).
- Starting with *IEO2013*, which was released in July, 2013, EIA adopted a two-year production cycle for both the *IEO* and *AEO*.
- Under this approach, a full edition of the *IEO* and *AEO* will be produced in alternating years and an interim, shorter edition of each will completed in the "off" years.

	2014	2015
International Energy Outlook	**Interim Edition will be released in mid 2014**, focusing on the liquids projection, which is used as part of the *AEO2014*. Summary tables and a short analysis will be included.	**Full Edition will be released in the spring 2015**
Annual Energy Outlook	**Full Edition will be released in spring 2014**, including analysis of energy issues and many alternative scenarios.	**Interim Edition will be released in late 2014 or early 2015** and will only include the Reference, Low and High Economic Growth, and Low and High Oil Price cases. The shorter version will include tables for these cases and short discussions.

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