The Electricity Capacity Challenge: A View from The Energy Information Administration

for
POWERING THE NEXT DECADE:
KEY ISSUES FOR THE INCOMING ADMINISTRATION
Technology Policy Institute
The National Press Club

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September 26, 2008

Energy Information Administration
Official Energy Statistics from the U.S. Government

Outline

1. WHERE WE ARE TODAY, AND HOW WE GOT THERE

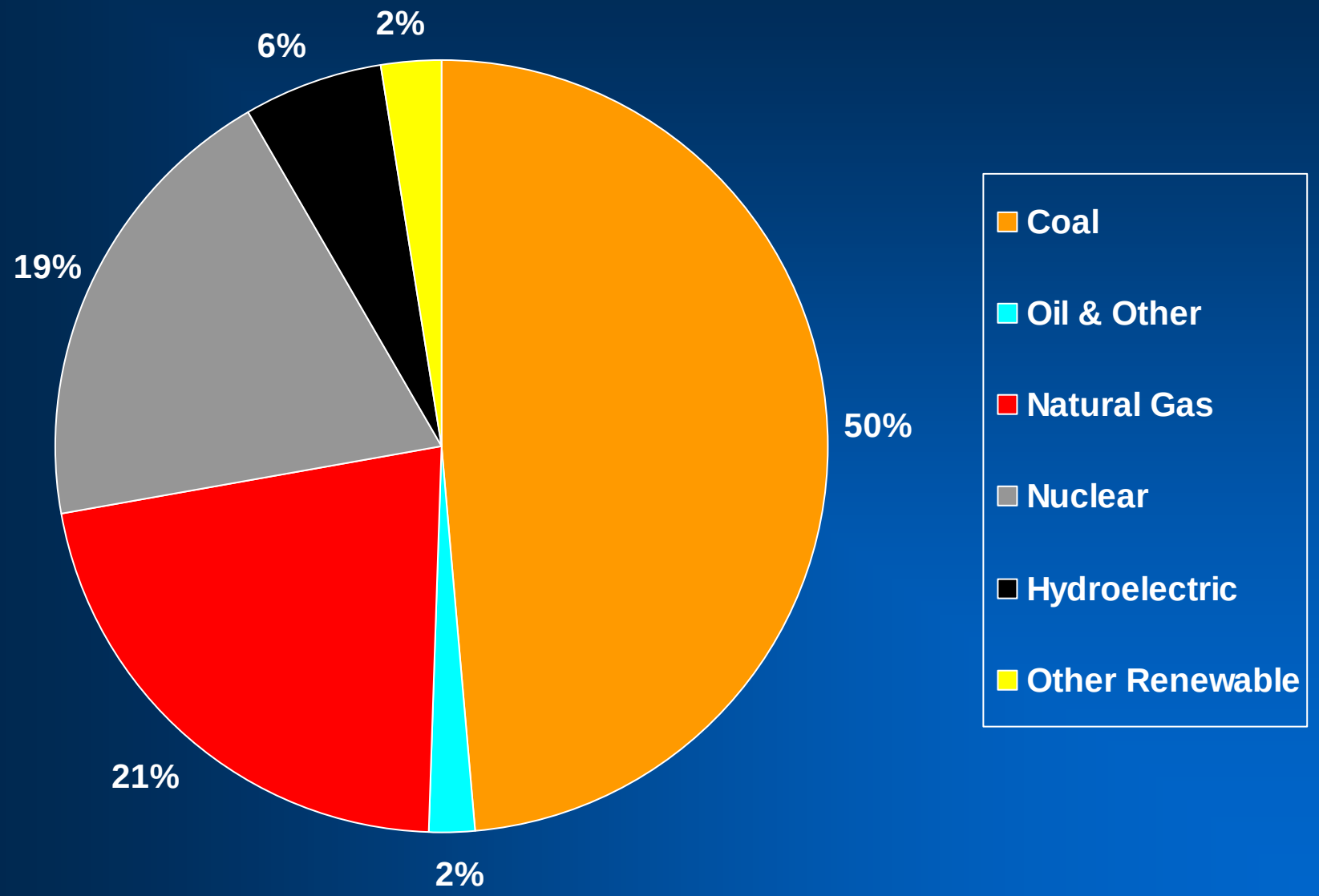
- Review of the Electricity Supply Mix
- Past and Projected Demand Trends

2. KEY FACTORS AFFECTING CAPACITY CHOICES

- Capital Costs
- Fuel Costs
- Climate Policy (and/or expectations thereof)

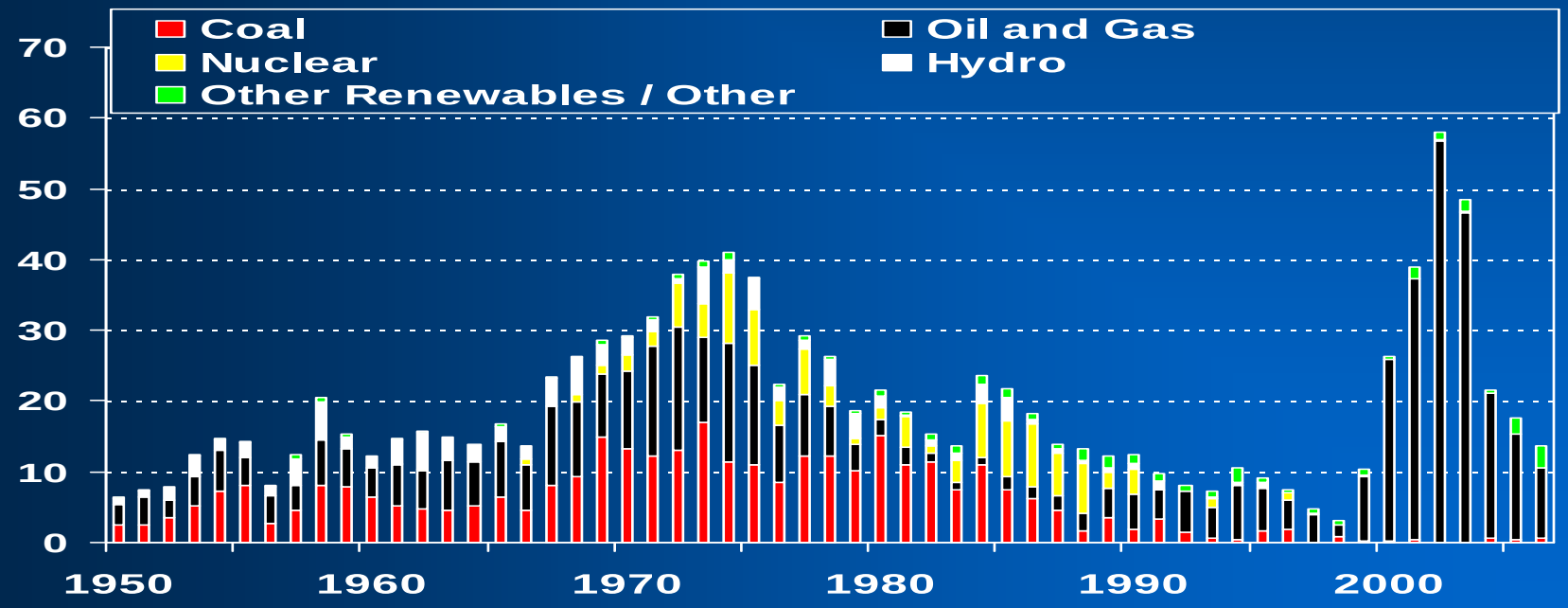
3. ALTERNATIVE FUTURES to 2030

Coal Continued to Dominate the U.S. Generation Mix in 2007

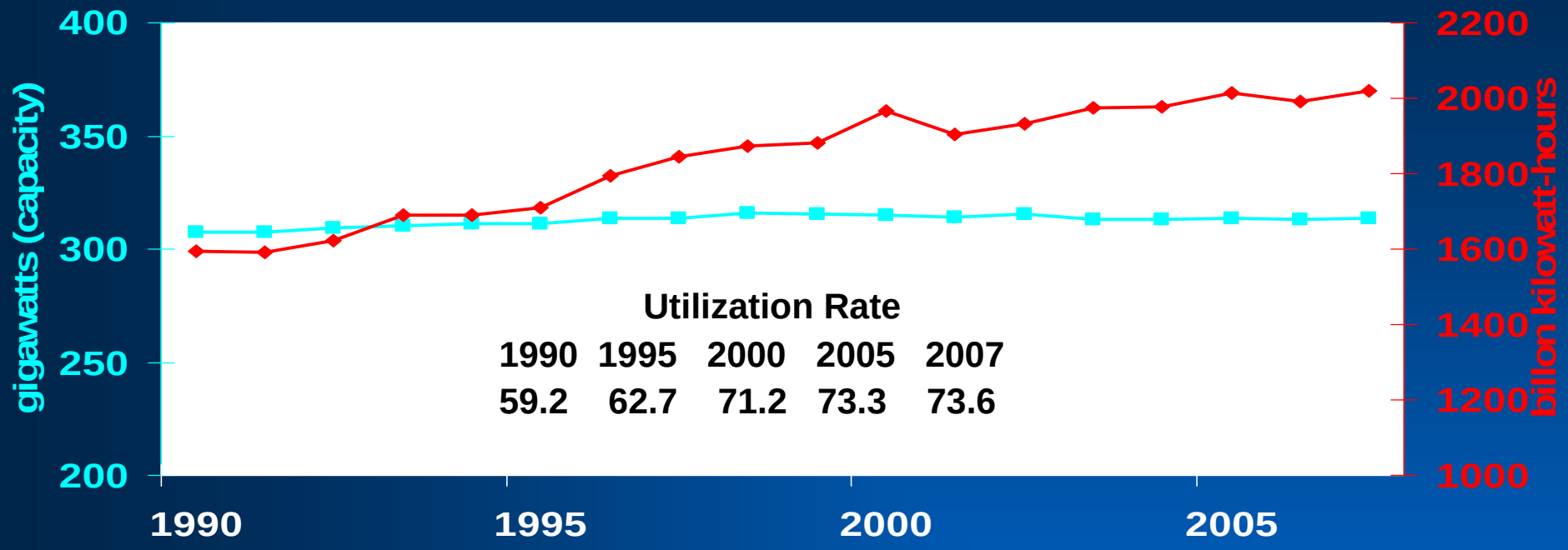


Electric Generating Capacity Additions, 1950-2006 (gigawatts)

- Significant amounts of coal and nuclear capacity, which have relatively low operating costs, were added in the 1980s.
- Large amounts of natural gas-fired generating capacity have been added since 1999. The rise in natural gas prices has made it more expensive to operate these plants.



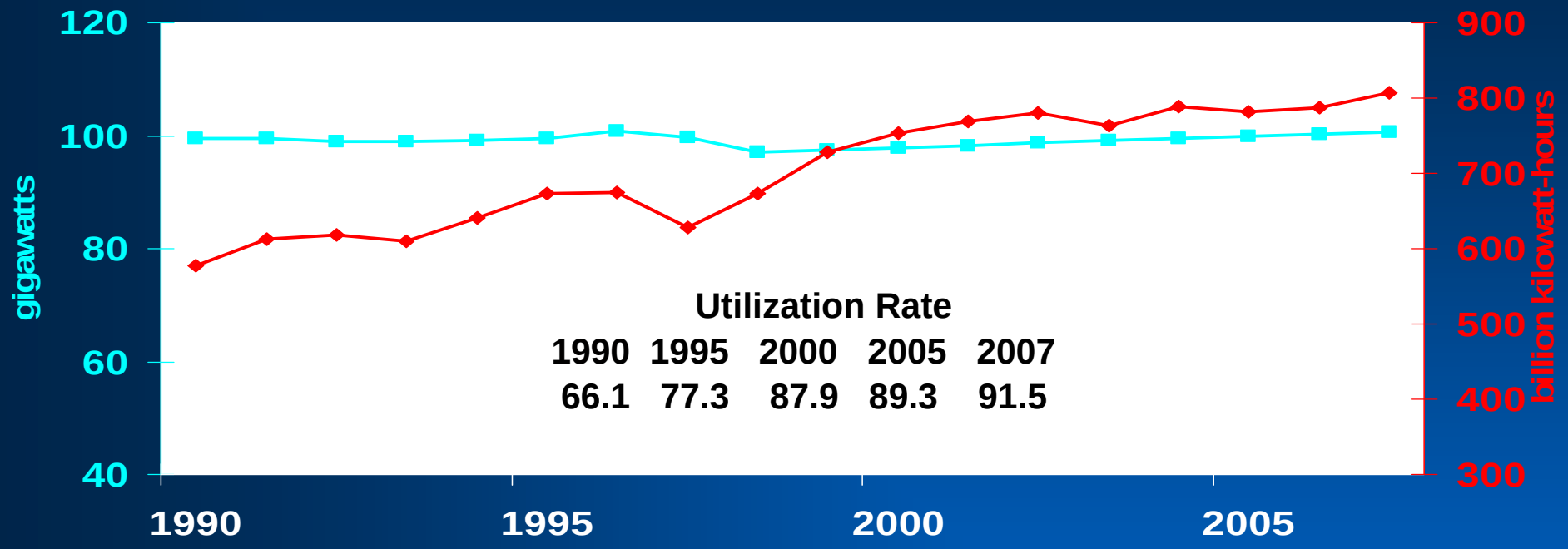
Coal Capacity and Generation



- Although coal-fired generation capacity hasn't grown significantly since 1990, coal-fired generation has increased dramatically due to higher utilization rates.

- There is some opportunity for further increases in utilization if baseload demand grows.

Nuclear Capacity and Generation



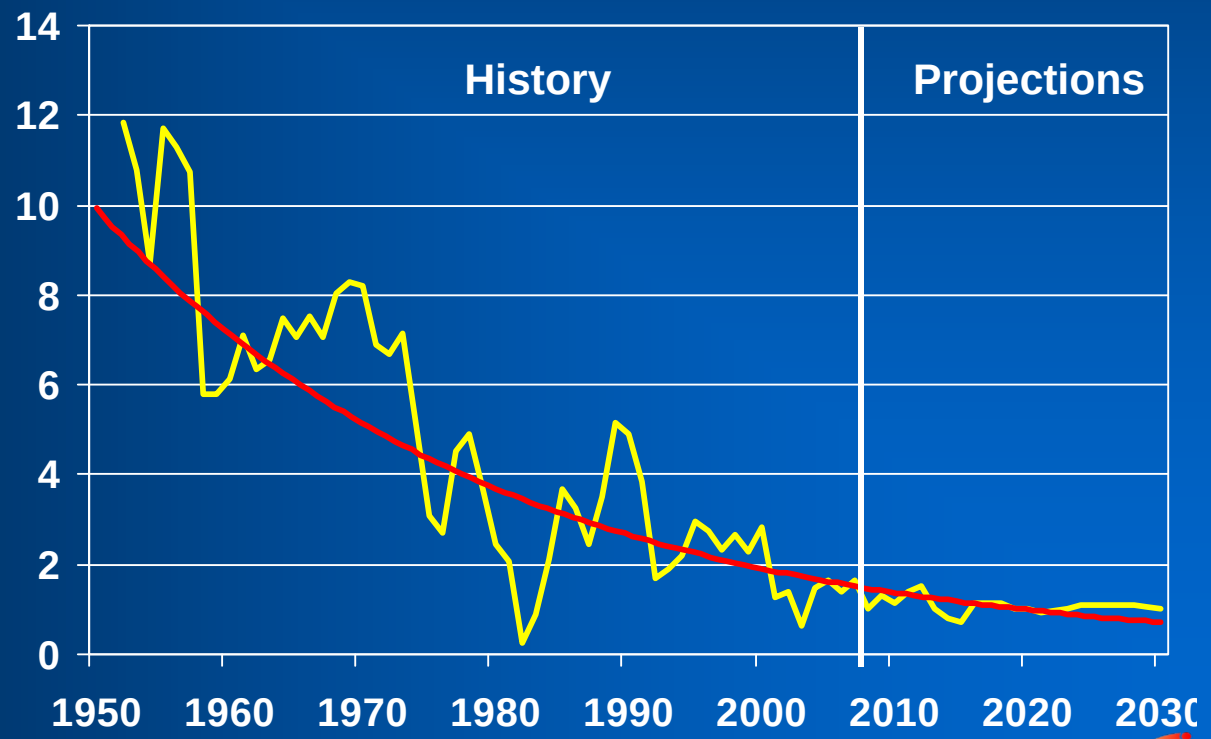
- Increases in nuclear generation since 1990 have also been driven by higher utilization rates rather than capacity additions.
- Current utilization rates are very high, limiting prospects for further improvements.

Electricity Demand Growth Continues to Slow

(3-year rolling average percent growth)

- Electricity demand growth has slowed over time.
- However, electricity demand is still expected to grow more than 25% above today's level by 2030.

Period	Annual Average Growth
1950s	9.0
1960s	7.3
1970s	4.2
1980s	3.1
1990s	2.4
2000-2006	1.2
2006-2030	1.1



3 Competitive Arenas and
4 Key Factors Driving Capacity Choices

Three Competitive Arenas

Vs.

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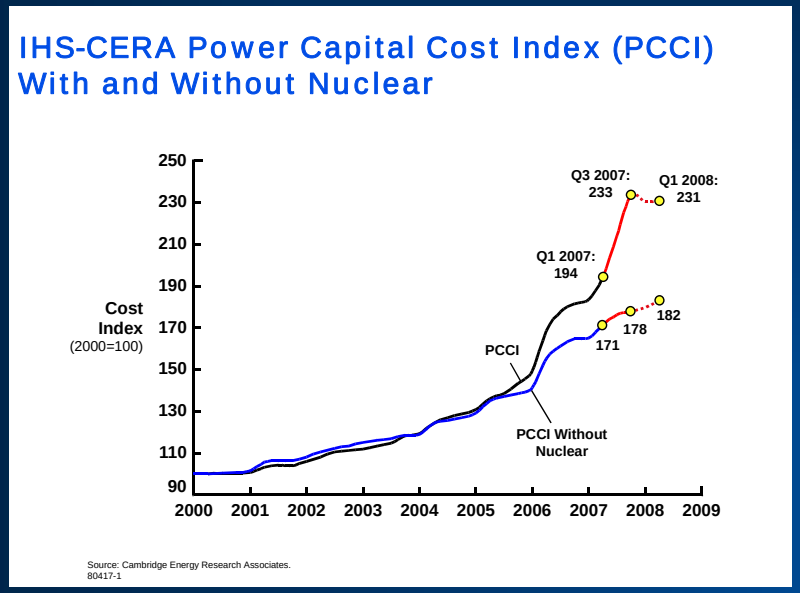
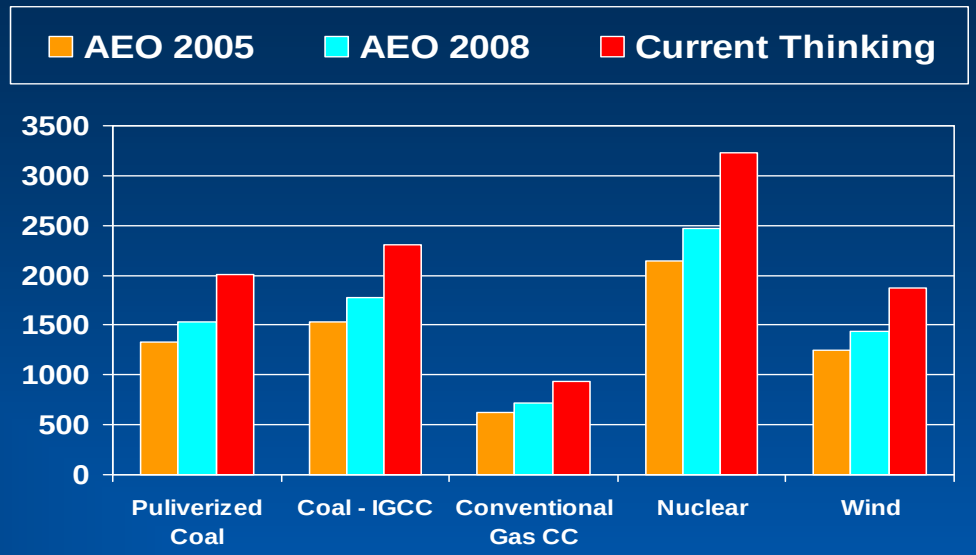
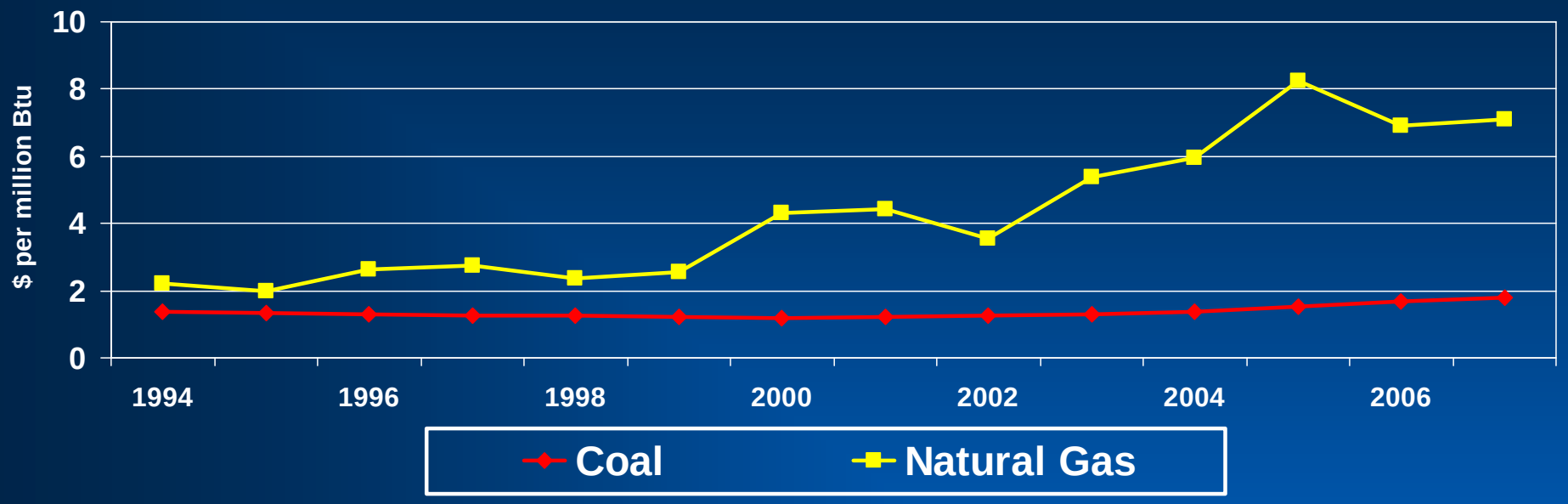
Capital Costs of New Plants: New vs. Old/New





- The "overnight" capital cost of major energy projects has risen dramatically in recent years
- New coal plant and nuclear plant costs which have the biggest proportion of capital costs "on-site" have risen especially fast
- KEY QUESTION: Is it a bubble or permanent shift?
- HIGHER NEW PLANT CAPITAL COSTS FAVOR
  - Existing Plants
  - Less capital-intensive technologies

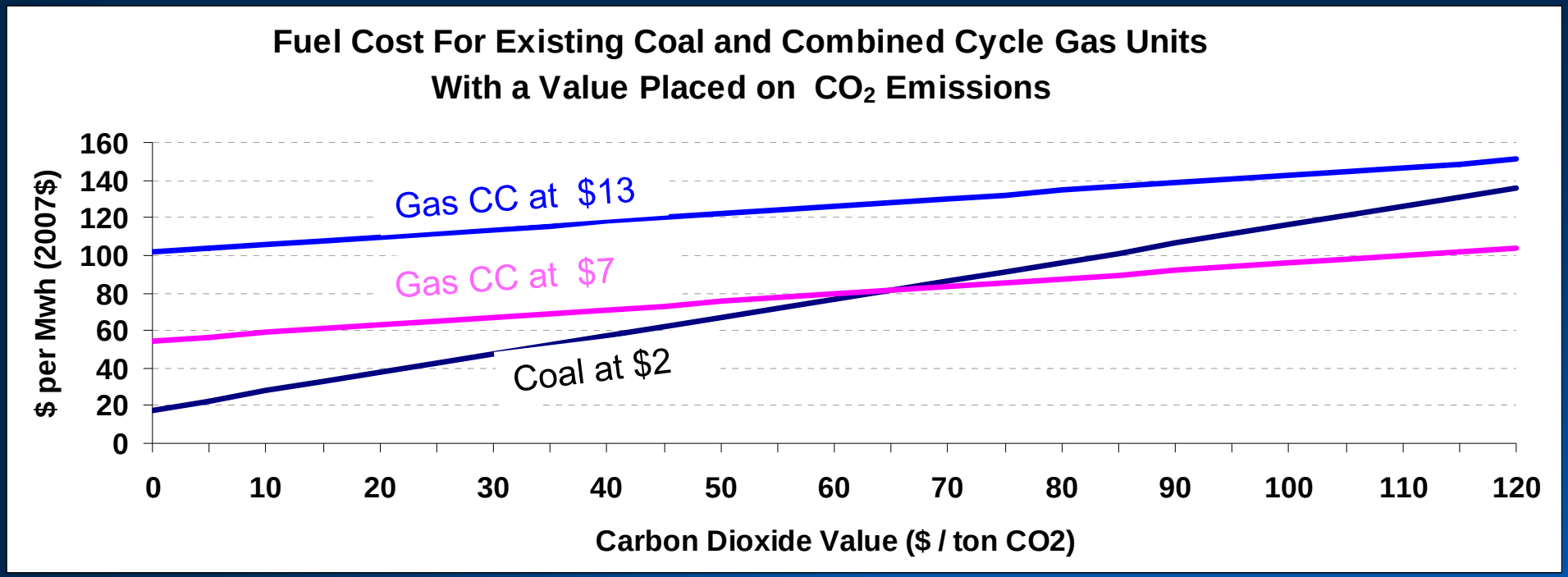
Fuel Costs Affect All Areas of Competition



- Natural gas prices have risen dramatically since 2000.
- Coal prices have also risen, but to a much lesser extent
- The relative increase in NG prices has made other generation sources, including coal, nuclear, and renewables more economically attractive

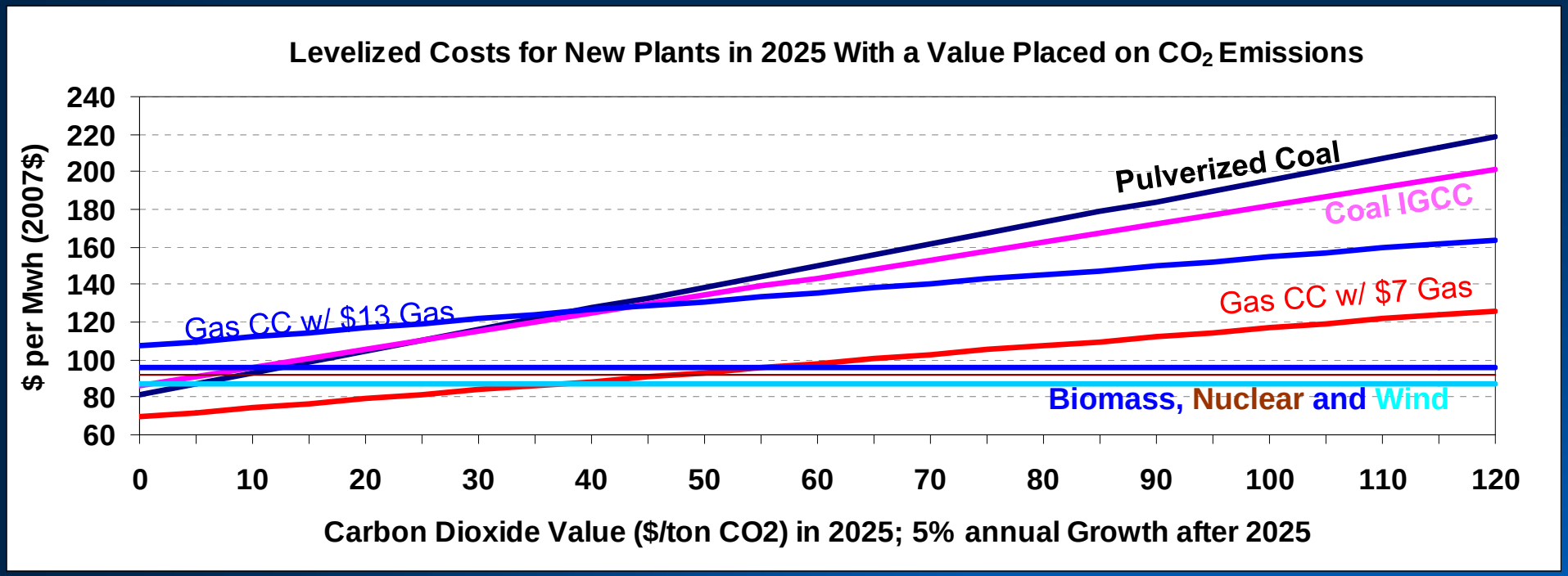
BUT …….

Climate Policy Impact on Operating Costs: OLD vs. OLD



- Climate policies affect the operating costs of both coal-fired and gas-fired power plants
- OLD vs. OLD: The "crossover point" for least-cost dispatch of coal and gas capacity depends on both fuel prices and the carbon value. As gas prices increase, the "crossover" occurs at a higher carbon value.
- NEW (not shown) vs. OLD: Carbon values may eventually get high enough to make the capital+operating costs of new no-carbon generation cheaper than the operating only costs of an existing generation unit. At that point, operators will want to retire the existing unit.

Climate Policy Impact on Levelized Cost: NEW vs.OLD/ NEW



- Levelized cost, which considers both capital and operating costs, is a useful metric for new plants.
- The crossing points for tradeoffs among technologies in "NEW vs. NEW" capacity decisions generally occur at lower carbon dioxide values than the crossing points for "OLD vs. OLD" dispatch decisions.

Demand is Also Uncertain

- EIA's reference electricity demand projection is sensitive to:
  - the projected rate of economic growth and its mix: faster growth and more growth in energy intensive sectors would raise demand
  - the pace of efficiency improvements, both mandated and price-induced
  - residential fuel switching towards electricity and the growth of "other" plug load

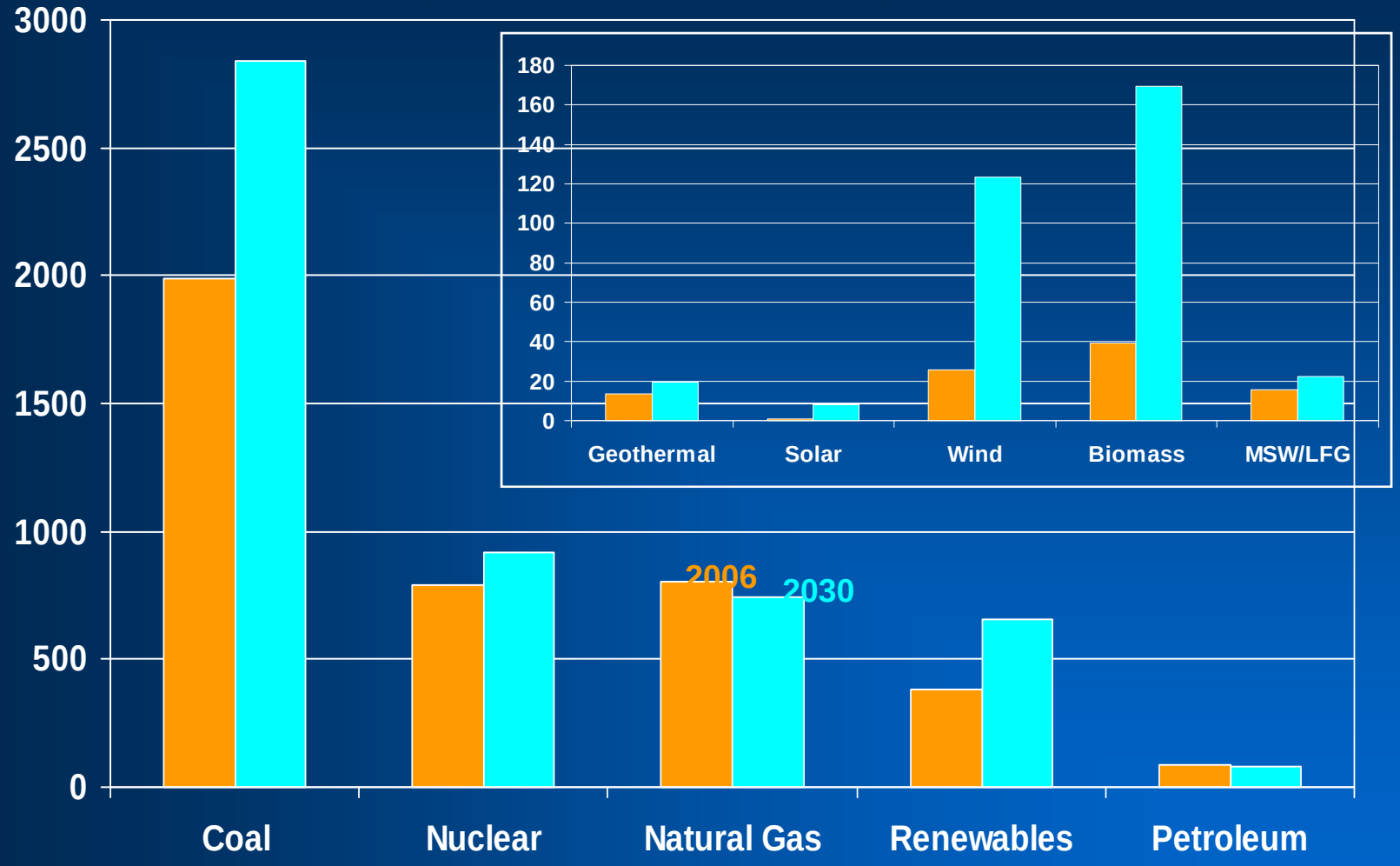
- Transportation fuel switching (i.e. plug-in hybrids) is not a major source of demand uncertainty over the next decade
  - One million Plug-in Hybrids with a 40-mile range on grid power (PHEV-40) would raise projected electricity demand in 2020 by only about 5 billion kilowatt hours, or one-tenth of 1 percent.

Wild Cards

- Production Tax Credits (PTC)
  - Qualifying technologies that enter service by the end of 2008 receive the PTC. Wind receives 2.0 cents per kilowatt hour with adjustment for inflation, for 10 years. The PTC has repeatedly been extended.
- Loan Guarantees
  - Program initiated by Energy Policy Act of 2005. Could be very important for highly capital intensive projects, including nuclear.
- State (and Federal?) Renewable Portfolio Standards
- The impact of the climate issue (not actual policy measures taken to address it) on capacity decisions.
  - Uncertainty regarding future policy changes may lead decision makers to "punt" by avoiding large investments until the fog of policymaking clears.

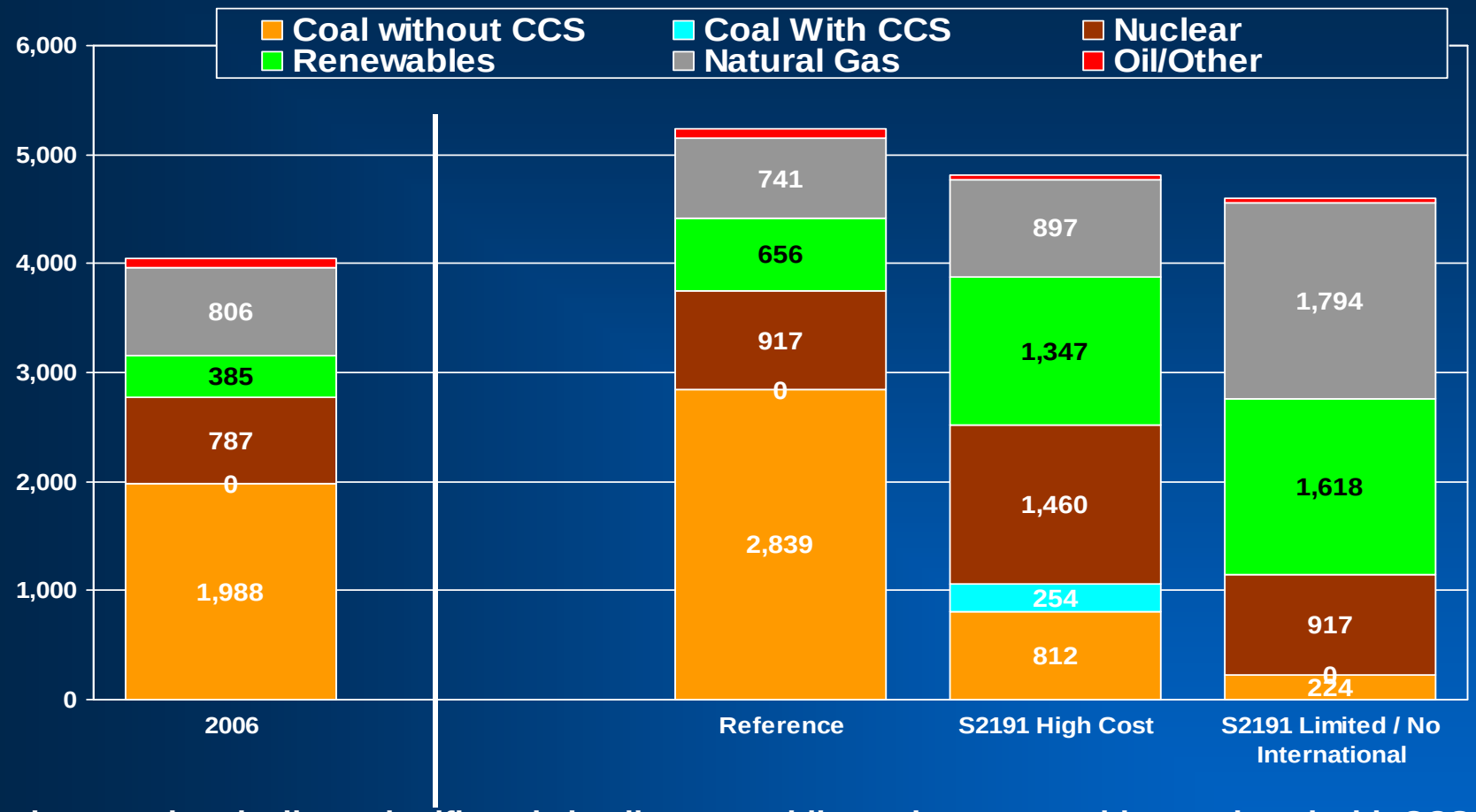
Electricity Generation Mix in 2006 and 2030, Assuming No Policies to Limit Greenhouse Gas Emissions

(billion kilowatthours)



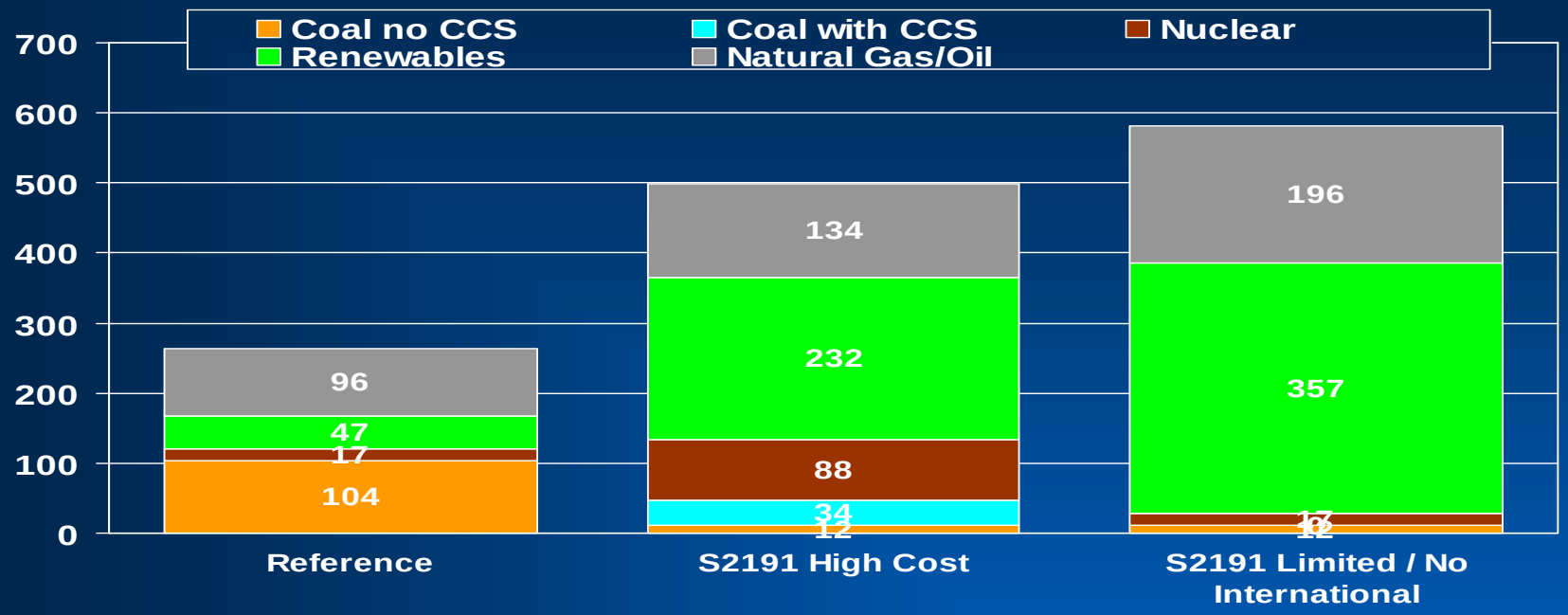
Actions to limit energy-related greenhouse gas emissions could significantly change the outlook for generation in 2030.

Projected Impacts of L-W Climate Policy on Electricity Generation by Fuel in 2030 (billion kilowatthours)



- Coal generation declines significantly in all cases, while nuclear, renewables, and coal with CCS grows.
- Major emissions reductions in electricity generation require existing (OLD) coal capacity to be retired in favor of NEW generation capacity
- Natural gas generation more than doubles if nuclear, renewables and coal with CCS are limited.

Projected Impacts of L-W Climate Policy on Cumulative Electric Capacity Additions,2007-2030 (Gigawatts)



- Additions of coal plants without CCS are virtually eliminated in the S. 2191 cases.
- When nuclear and coal with CCS are available, they are used for new capacity and to replace existing conventional coal plants. When they are not available, more natural gas plants are added.
- Regardless of technology assumptions, an aggressive policy to reduce greenhouse gas emissions increases the requirement for total NEW capacity additions in order to make up for the retirement of OLD existing coal capacity

Summing up

- The rate of demand growth, fuel costs, capital costs, and climate change policies are key drivers of the capacity decisions.
  - KEY FUEL COST ISSUE: The natural gas supply and demand balance.
  - KEY CAPITAL COST ISSUE: The extent to which recent increases in new plant costs are permanent or a bubble.
  - KEY CLIMATE POLICY ISSUE: Significant action to limit GHG emissions would likely to trigger retirements of existing coal plants that provide about half of total generation, increasing (perhaps significantly) the total amount of new capacity required. In addition to fuel and capital costs, policy design will affect behavior and the mix of new generation.

- The climate issue can affect capacity expansion decisions even before a climate policy is implemented.

- A number of wild cards, including policy decisions about subsidies and mandates for targeted technologies, can also have a big impact.

Thank You

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