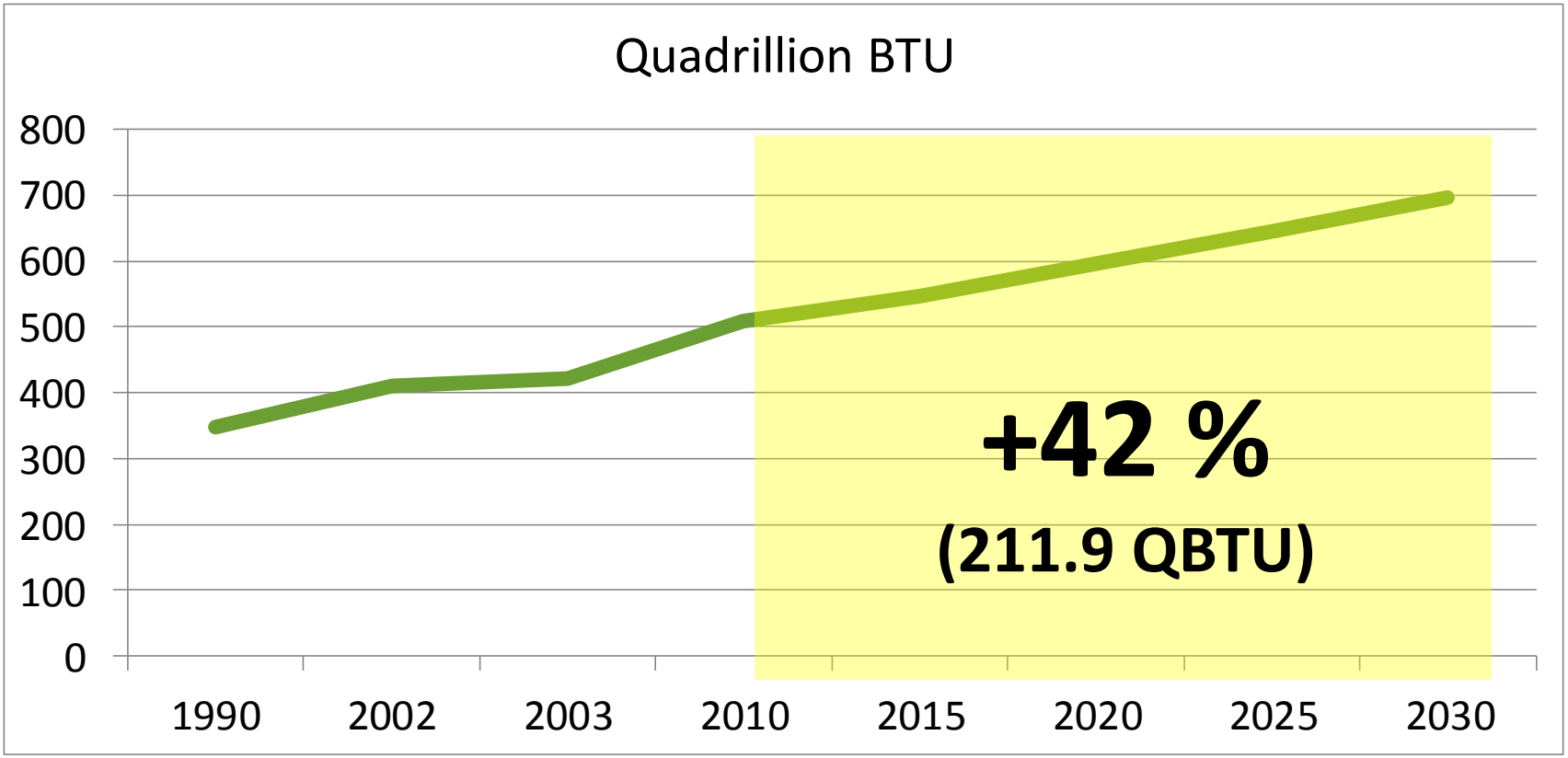
The Latest in Application, Use and Safety of Natural Gas as a Boiler Fuel

CIBO – Technical Focus Group, Energy & Environmental Committee Meetings

September 2015

ESC
Energy Solutions Center

World Energy Consumption Projections

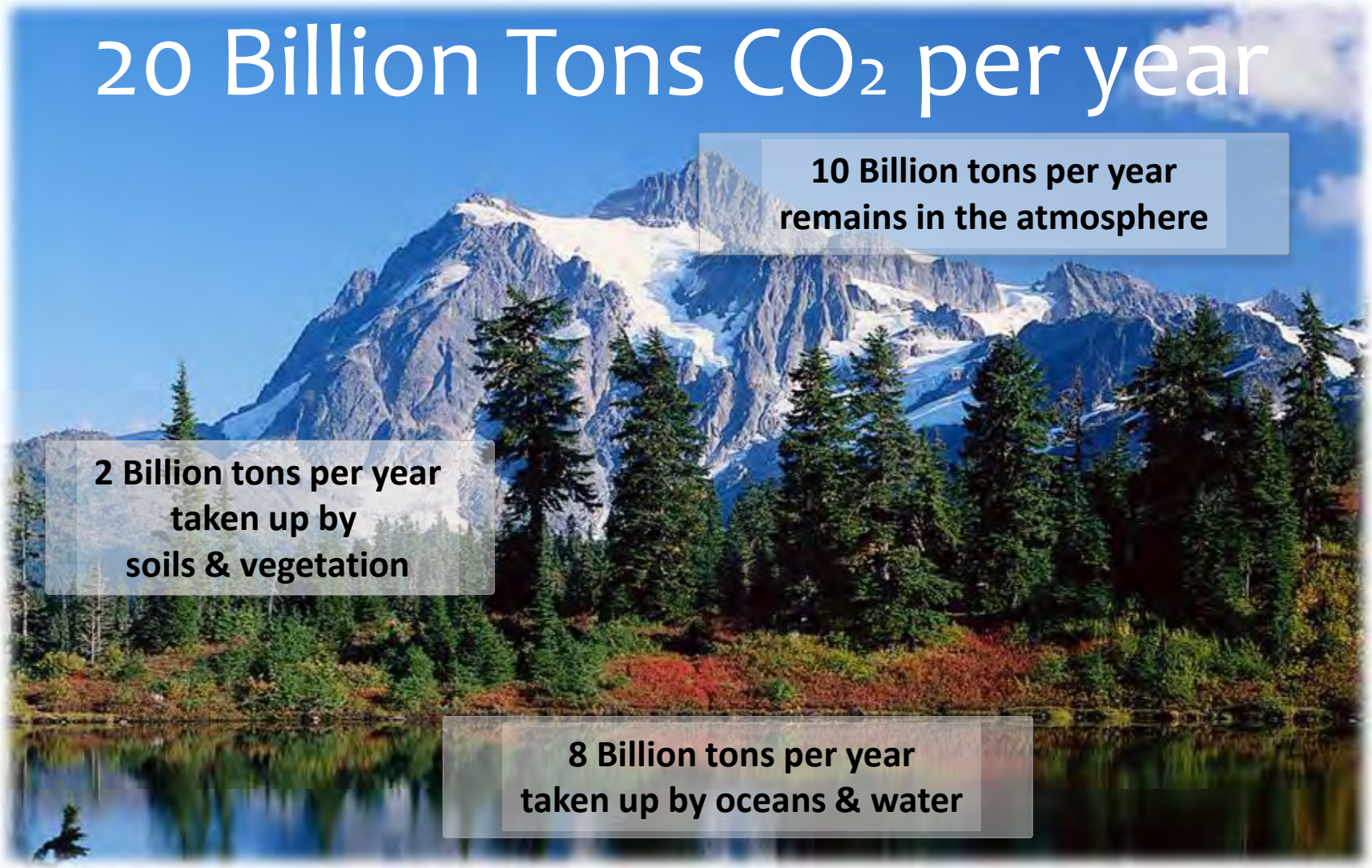


Source: Energy Information Administration - World Total Energy Consumption by Region, Reference Case, 1990-2030

Why Natural Gas?

- Emissions
- Fuel Cost
- Use of existing Equipment

20 Billion Tons CO_2 per year



Atmospheric CO_2 content rises 1.7 parts per million/year

Source: Fossil Fuel CO2 and the Angry Climate Beast, W.S. Broecker

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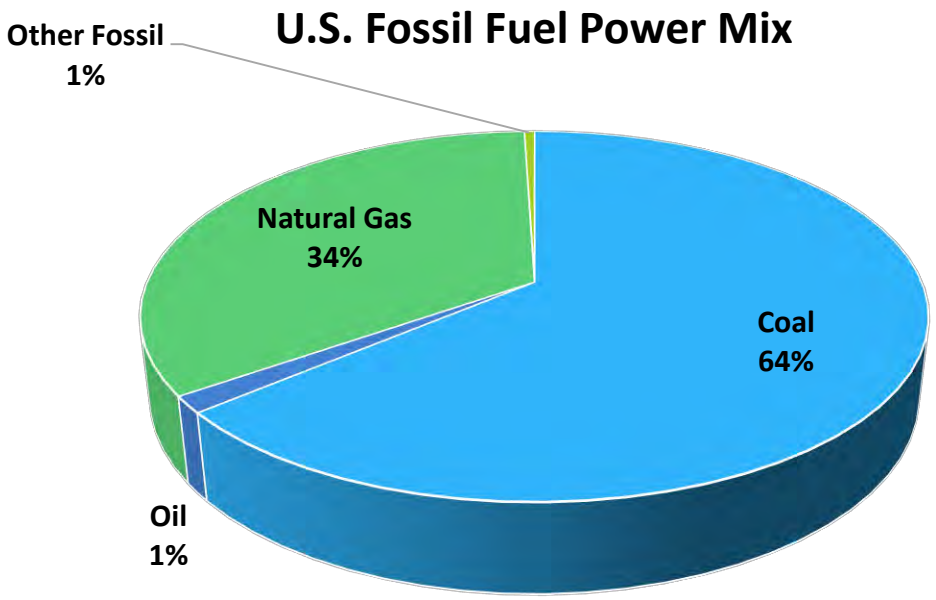
Fossil Fuel Power Mix



	# CO_2 / MWh
U.S. Average Annual All CO_2 Emissions	1,232
U.S. Average Annual Fossil Power CO_2 Emissions	1,745

Data taken from EGrid 2014

Fossil Fuels

Emission Levels

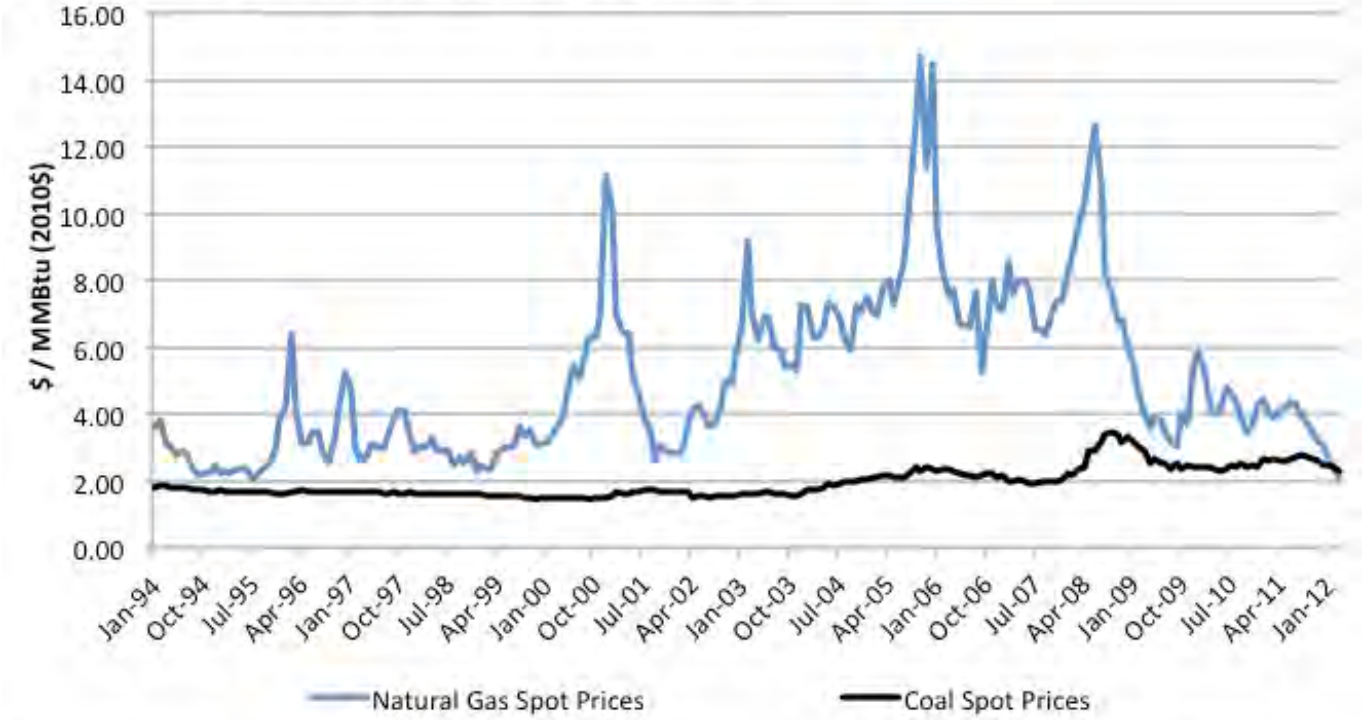
Pounds per Billion Btu's of Energy Input

Pollutant	Natural Gas	Oil	Coal
Carbon Dioxide	117,000	164,000	208,000
Carbon Monoxide	40	33	208
Nitrogen Oxides	92	448	457
Sulfur Dioxide	1	1,122	2,591
Particulates	7	84	2,744
Mercury	0.000	0.007	0.016

Source: EIA – Natural Gas Issues and Trends 1998

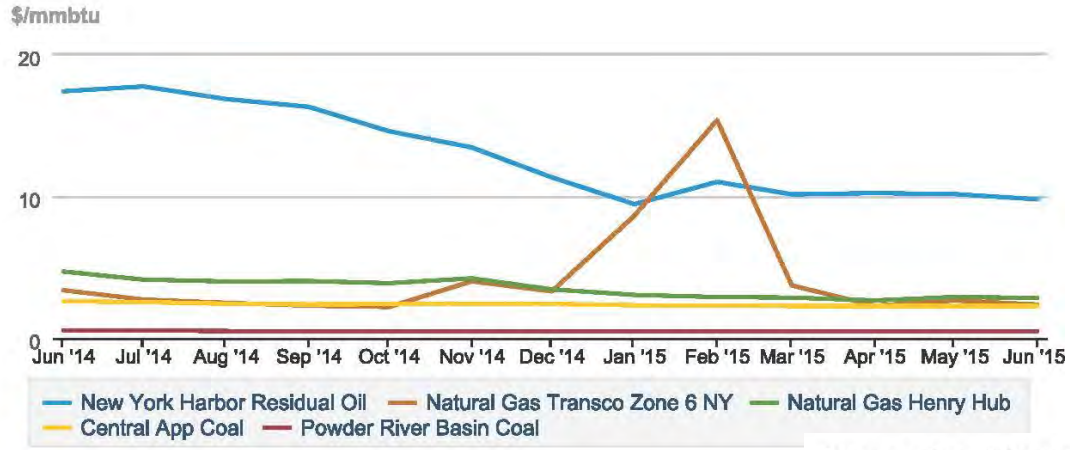
Fuel Cost

Figure 3: Coal & Natural Gas Spot Prices, in Real Terms[1]



Source: U.S. Energy Information Administration, NYMEX, Bureau of Labor Statistics, St. Louis Federal Reserve

Average fossil fuel spot prices ($/mmBtu), June 2014 – June 2015



eia Source: U.S. Energy Information Administration derived from Bloomberg Energy

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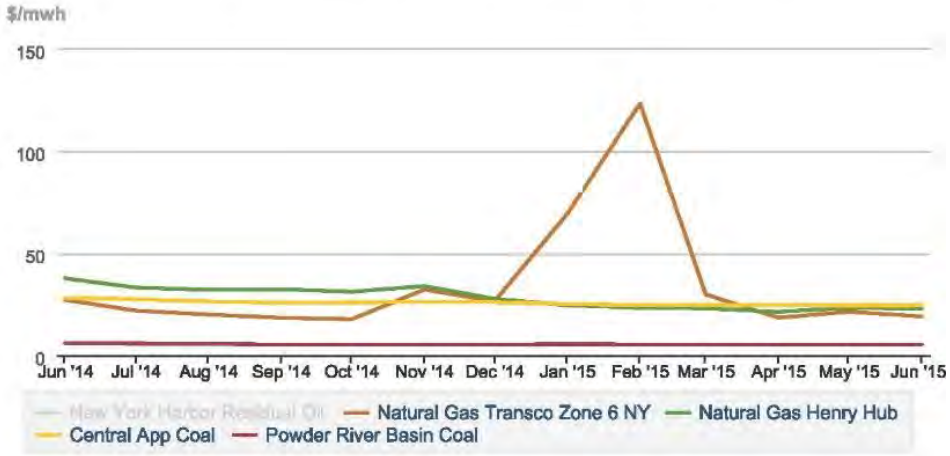

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Use of Existing Equipment

- Age of the plant
- Less Capital
- Shorter time schedule for project
- Use of existing asset

Advantages of Refueling

- Low capitol cost compared to replacing or repowering an existing coal-fired plant
- Minimal impact on the existing Firing system
- Fast implementation
- Fuel flexibility if the coal-firing option is retained

Impacts

- Boiler Gas Path
  - Forced draft and induced graft fans
  - Combustion air mix and requirements
- Steam side
  - Combustion product temperature, quantity and composition changes

Plant output profile

- Peaker plant
- Base plant