17th Annual NECA Conference on Natural Gas and Fuels Issues

Northeast Fuel Market Overview

September 27, 2011

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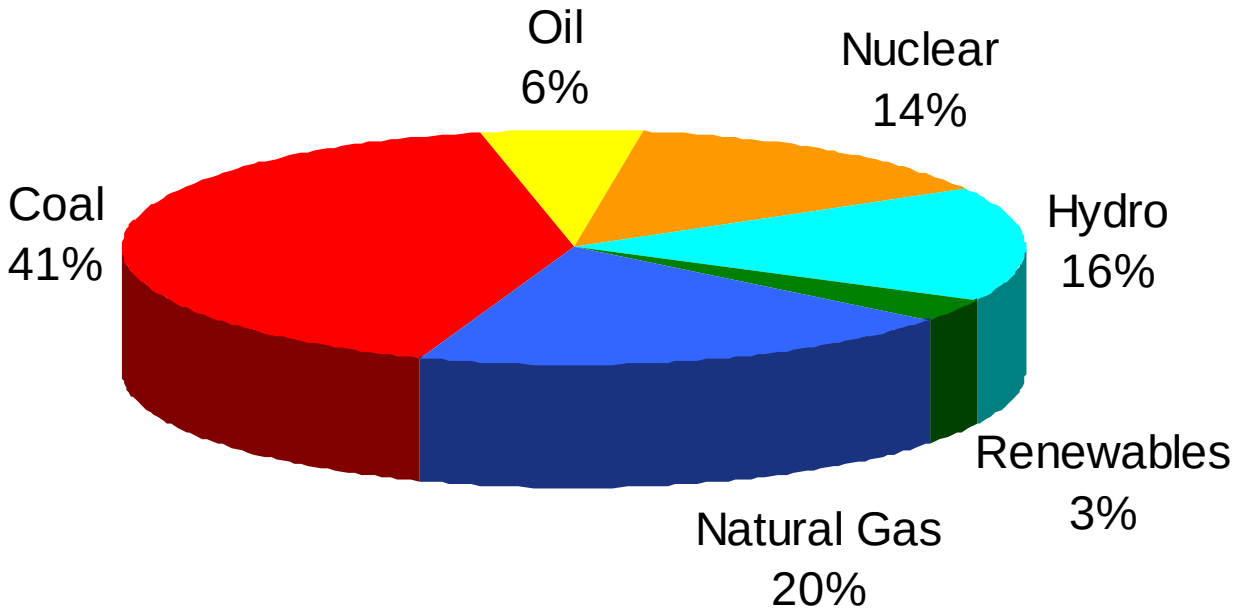
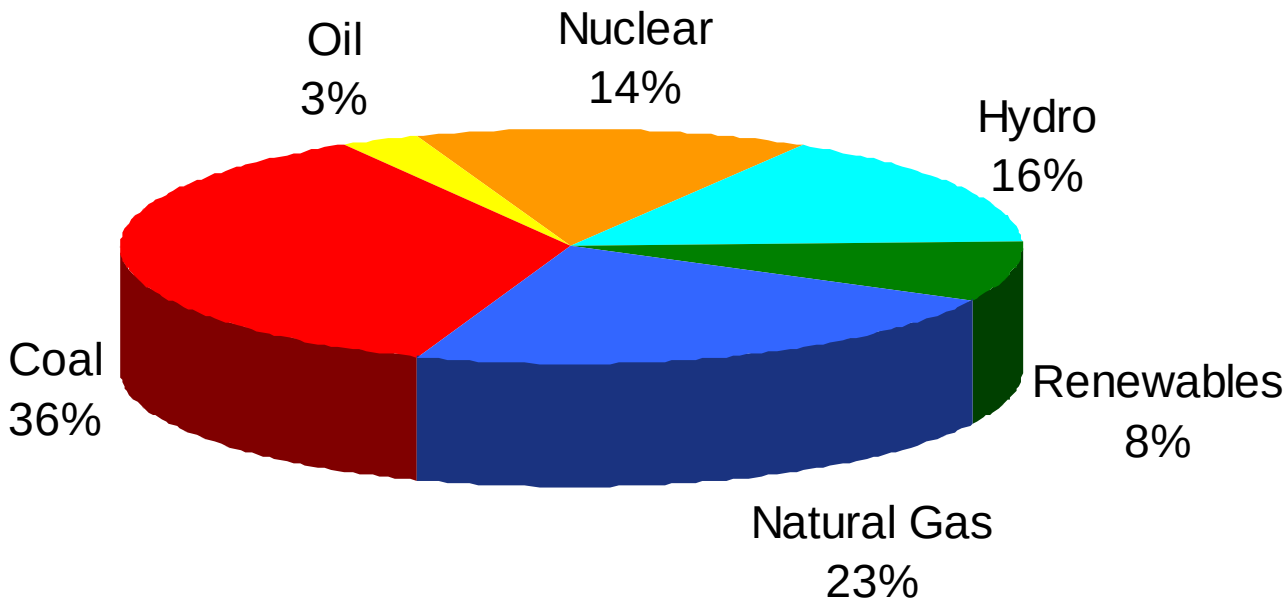
MARKET DESIGN, ECONOMICS AND POWER SYSTEMS

Global Electricity Generation by Fuel

Current



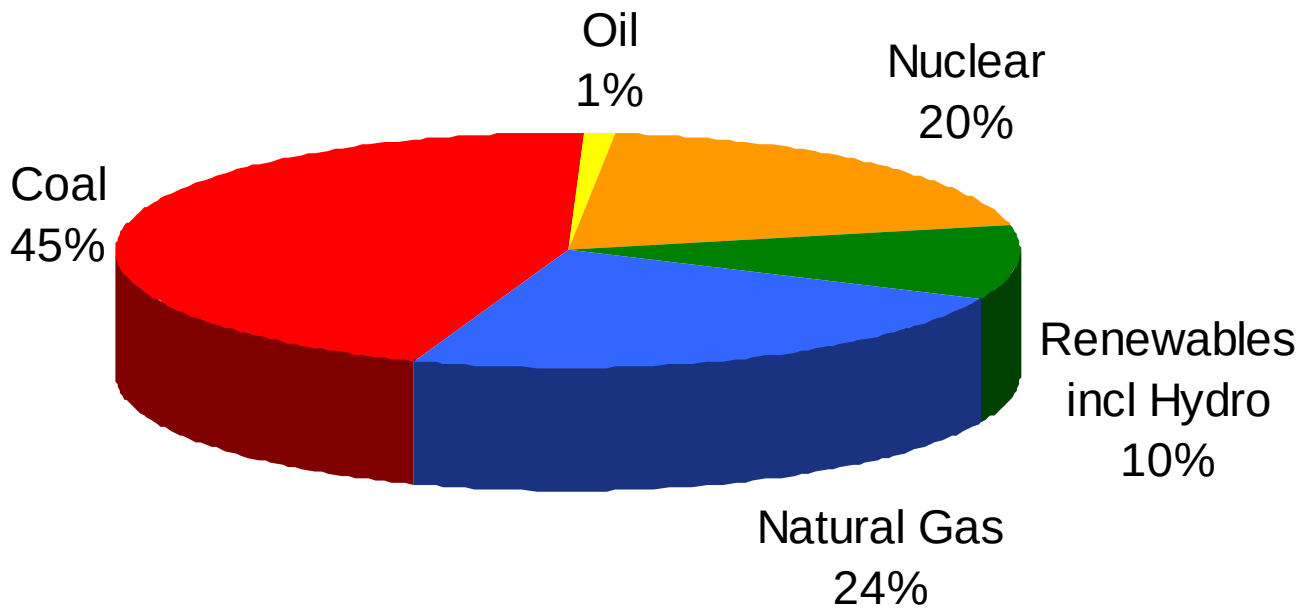
2030



Source: U.S. EIA IEO 2011

U.S. Electricity Generation by Fuel

Current



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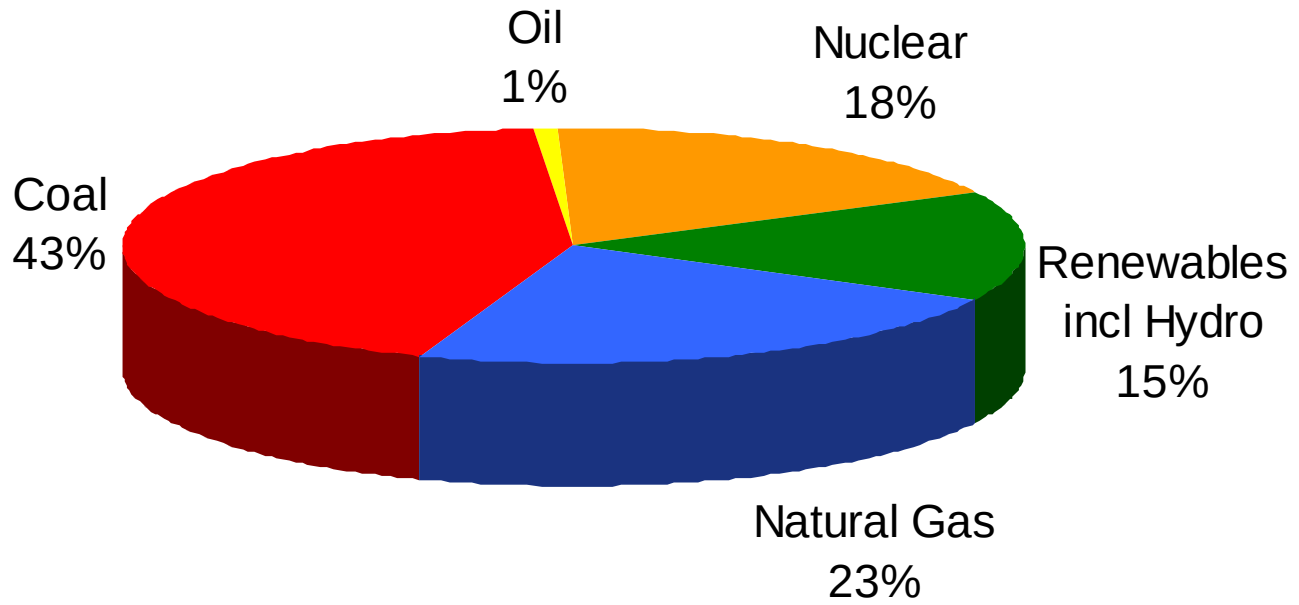
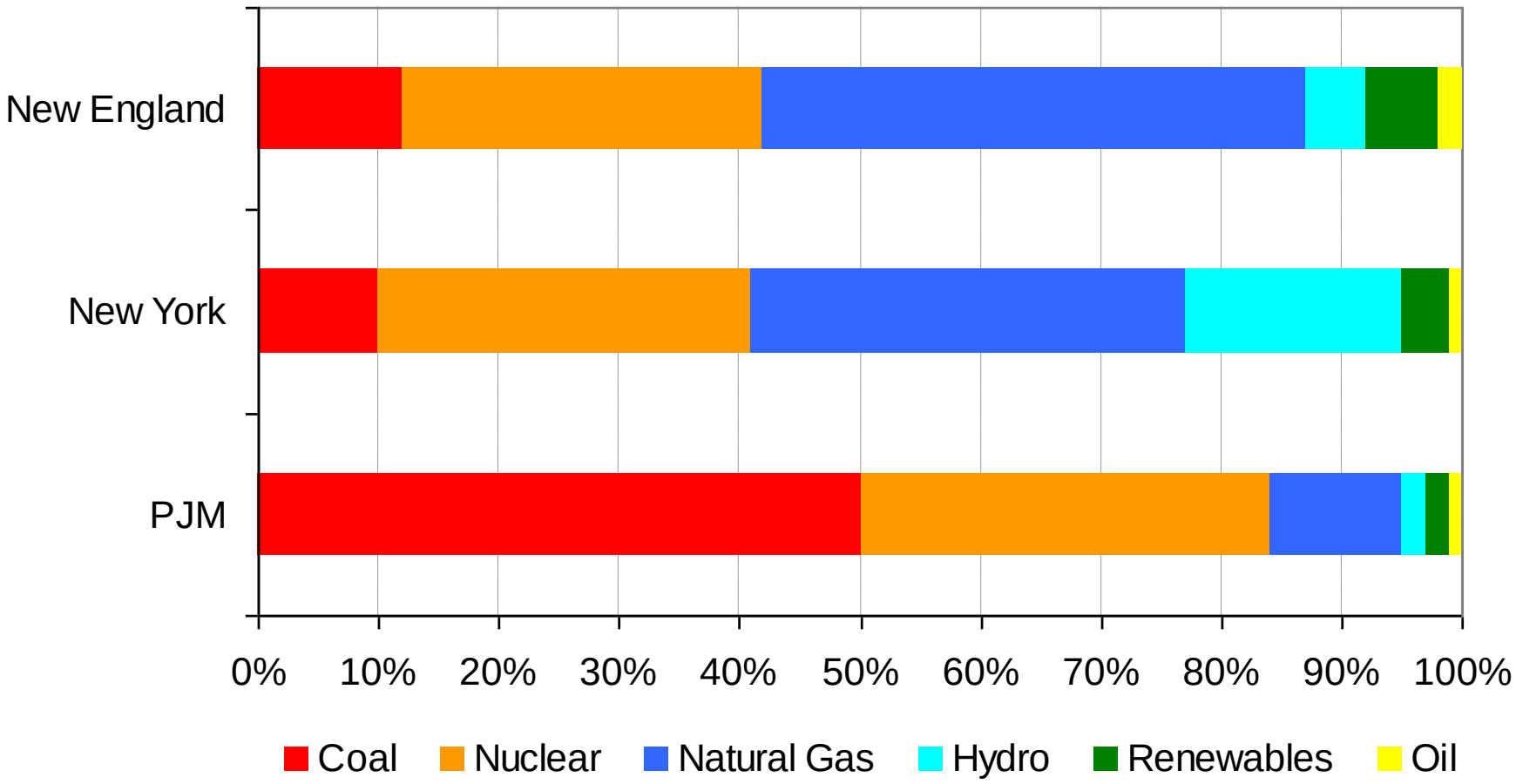


Source: U.S. EIA 2011 AEO

Northeast Electricity Generation by Fuel



Source: U.S. EIA

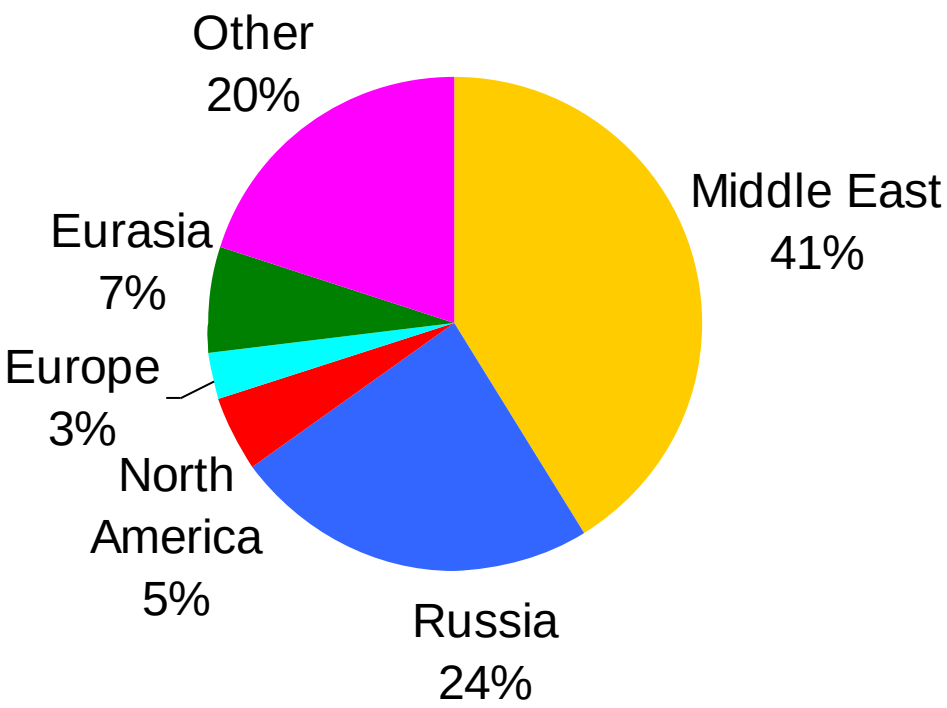
World Coal Reserves

	%	Billion Tonnes	Share of Global Production	Reserve / Production
US	28%	237	15%	241
Russian Federation	18%	157	4%	495
China	13%	115	48%	35
India	7%	61	6%	106
Australia	9%	76	6%	180
South Africa	4%	30	4%	119
Ukraine	4%	34	1%	462
All Others	17%	151	16%	
Total		861		118

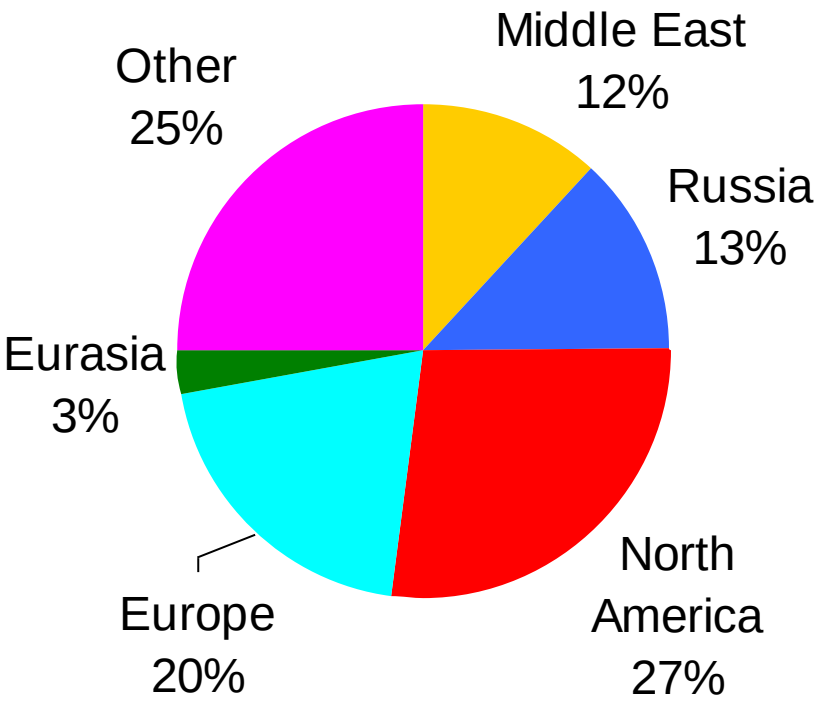
Source: *BP Statistical Review of World Energy*, June 2011

World Gas Reserves and Consumption

Total World Proved Gas Reserves
Year End 2010
6,607 trillion cubic feet

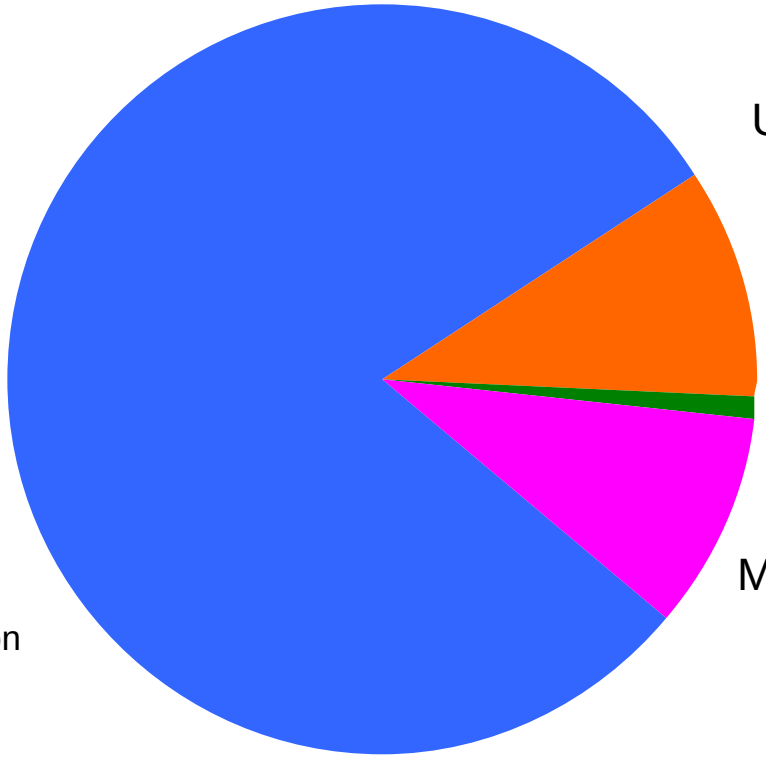


Total World Consumption
2010
307 Bcf/d



Source: *BP Statistical Review of World Energy*, June 2011

U.S. Gas Resources



[1] Potential Gas Committee, April 2011
[2] U.S. Energy Information Administration

Proved Reserves and Resources 12/31/09 (trillion cubic feet)

	Proved Resources	Estimated Resources	Years of Supply
U.S.	273	2,170	90
Total World	6,607	57,000 +	509

Sources:
BP Statistical Review of World Energy, June 2011
Potential Gas Committee, April 2011

World Uranium Resources and Consumption

Known Recoverable Resources	
World Total	5,404,000 tonnes U
	% of Total
Australia	31
Africa[1]	15
Kazakhstan	12
Canada	9
Russia	9
Brazil	5
USA	4
China	3
Other	12

Current Annual Production	
World Total	53,663 tonnes U

Current Annual Consumption	
World Total	68,971 tonnes U
	% of Total
Europe	33
USA	28
Japan	12
China	6
Russia	5
Other	16

Known Recoverable Reserves = 101 years of consumption

[1] S. Africa, Namibia, Niger

Data Source: NEI

Future of Uranium Market

- Nuclear power faces questions in light of Fukushima Daiichi problems
- Large number of aging plants in the U.S. and western Europe
- High capital costs for new plants
- Uranium supplies should be more than adequate but new mining and processing facilities are expensive
- What about the waste?

The Good News – Natural Gas Supply

- U.S. proved reserves increased 44% from 2003 to 2009
  - 189 Tcf as of 12/31/2003
  - 273 Tcf as of 12/31/2009

- More than half of the increase was due to increases in unconventional gas reserves (CBM and shale gas)
  - CBM and Shale Gas Proved Reserves were 22 Tcf at the end of 2003 and increased to 79 Tcf by the end of 2009
  - Shale gas reserves tripled from 2007 to 2009
  - Shale gas increased from about 1% of total U.S. production in 2003 to 20% by 2009

U.S. EIA

Northeast Overview

- Traditional Sources of Supply
  - Gulf Coast
  - Western Canada (WCSB)
  - Sable Island (Atlantic Canada)
  - LNG (Everett, MA)
  - Appalachian (conventional and CBM)
- Current Northeast Demand (2009)
  - Average
    - Industrial 0.5 Bcf/d
    - Commercial 1.2 Bcf/d
    - Residential 1.7 Bcf/d
    - Electric Generation 2.0Bcf/d

Sources: EIA

Expanded Northeast Supplies

- Bring new conventional wisdom regarding gas prices and availability for end-users
  - Old conventional wisdom
    - Expensive gas
    - Frequent winter basis blowouts
    - Peak demand delivery restrictions
  - New conventional wisdom
    - Moderate prices
    - Less volatility
    - Increased availability

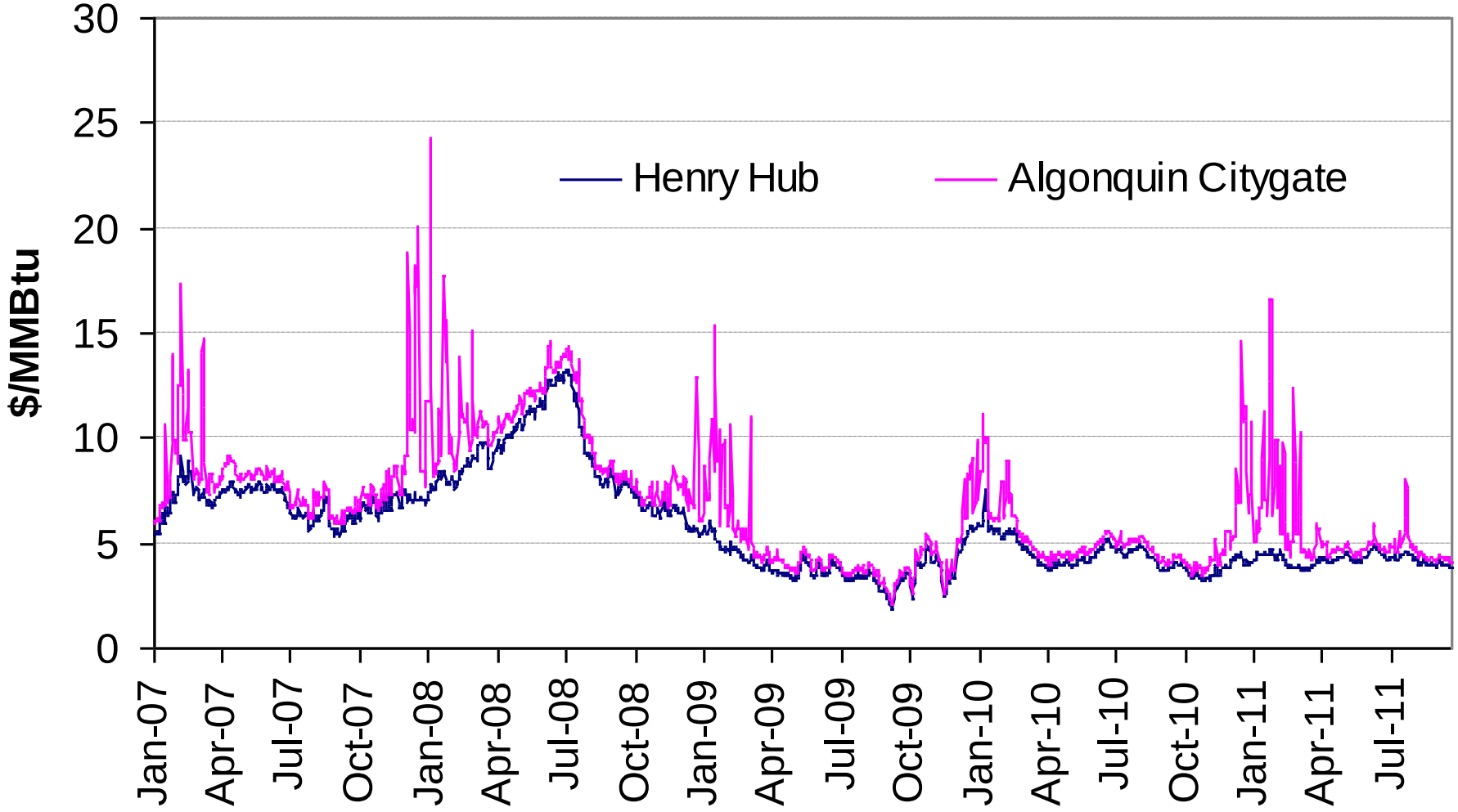
What's the new conventional wisdom and why the radical shift?

- A dramatic increase in the development and production of gas from unconventional resources, especially shale gas
- Changes in fracturing and horizontal drilling technology allow for less expensive and more rapid development
- Maturation of conventional producing fields will be more than offset by unconventional gas production
- Massive increase in worldwide liquefaction capability, LNG tankers, and U.S. regasification capability
- Critical reliance on LNG no longer required to ensure commodity balance

Is cheap natural gas a transient phenomenon or here to stay?

- Natural gas will remain volatile but moderately priced over the long run, i.e., $5.00 - $8.00 into-the-pipe
- "Basis" to New England will reflect increased commoditization of gas supplies across North America, in particular, growth of Marcellus shale
- Basis blowouts due to periodic deliverability constraints will be less frequent and short-lived

Natural Gas Daily Spot Price



Natural Gas Market – Trends & Implications

- There is a lot of natural gas in North America
  - Production from unconventional sources, particularly shales will continue to increase
  - Resulting in a dominant continental market for the next 8-10 years
- Global markets will have limited impact on the cost and availability of natural gas through LNG imports
  - LNG supplies determined by continental prices relative to global market price
  - North American LNG market of last resort
- Advantages of new gas-fired generation including lower capital costs, lower emissions, and relatively short lead-times offset high and volatile fuel prices

Coal Market – Trends & Implications

- Coal will continue to be a major fuel source for global electricity generation particularly in the U.S. and China
- Demand is unlikely to grow since new coal plants face:
  - Siting problems
  - High operating and capital costs
  - Emissions issues
- Over the long term, carbon emissions regulations are likely to pose a significant uncertainty for new coal-fired plants and could drastically impact the economics of older plants
- High capital costs for CO_2 capture and sequestration—could add 40% or more to the cost of coal-fired electricity
- Large reserves and resource base in North America
- Mining costs will drive prices, although the price of exportable coal (NAPP and CAPP) will be influenced by international steam and metallurgical markets

Oil Market – Trends & Implications

- North American Oil Supply Stable
  - Oil sands
  - Deepwater G.M. (Lower Tertiary, Wilcox Trend)
  - Bakken Shale and other developing shale plays
  - Bio-fuels
- Imports will retain significant share (>50%) of U.S. Supply
- Crude oil prices will be volatile
  - Upward long-term trend with significant short-term price excursions above and below the trend
- Peak oil scenario not likely in the foreseeable future (10 years)
- New supplies will be more costly to find and extract
- Return to global economic growth will bring growth in global oil demand and upward pressure on prices

Northeast: A Few Clouds for a Sunny Outlook

- Marcellus Production
  - Possible hydraulic fracturing restrictions
  - High water consumption
  - Long-term economics look good but it is early in the life of this gas resource play
- LNG capacity glut could disappear after 2015
  - Return to global economic growth will increase the demand for LNG supplies
- Ultimately U.S. carbon emissions regulations are likely to result in a significant shift from coal to gas-fired electricity generation