

Worldwide Pollution Control Association

Gulf Power Coal to Gas Seminar
May 30-31, 2012

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W
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A



COAL TO GAS CONVERSION

A FEW ISSUES

SCOTT EVANS, CLEAN AIR ENGINEERING

A few good
resources...

**OVERVIEW OF NATURAL GAS CONVERSION
OPTIONS TO MEET EMISSION REQUIREMENTS
ON COAL-FIRED ELECTRIC GENERATING UNITS**

Prepared for
**Utility Air Regulatory Group
Control Technologies Committee**

Prepared by
**Lowell L. Smith
Consultant to UARG**

March 2011

**A few good
resources...**

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resources...

White Paper

MS-14

*Natural Gas Conversions of Existing
Coal-Fired Boilers*

Authors:

F.J. Binkiewicz Jr., P.E.

R.J. Kleisley

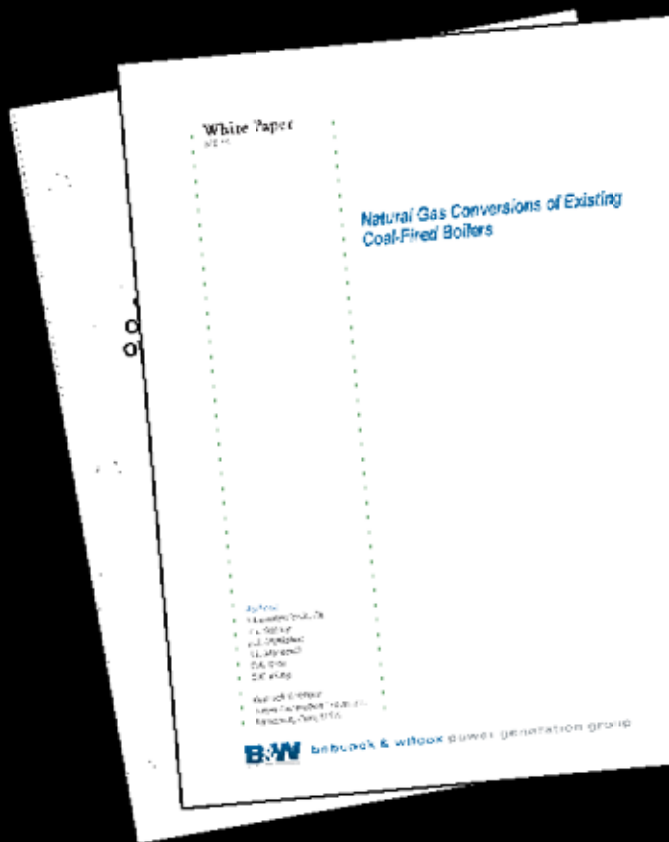
B.E. McMahon

J.E. Monacelli

D.A. Roth

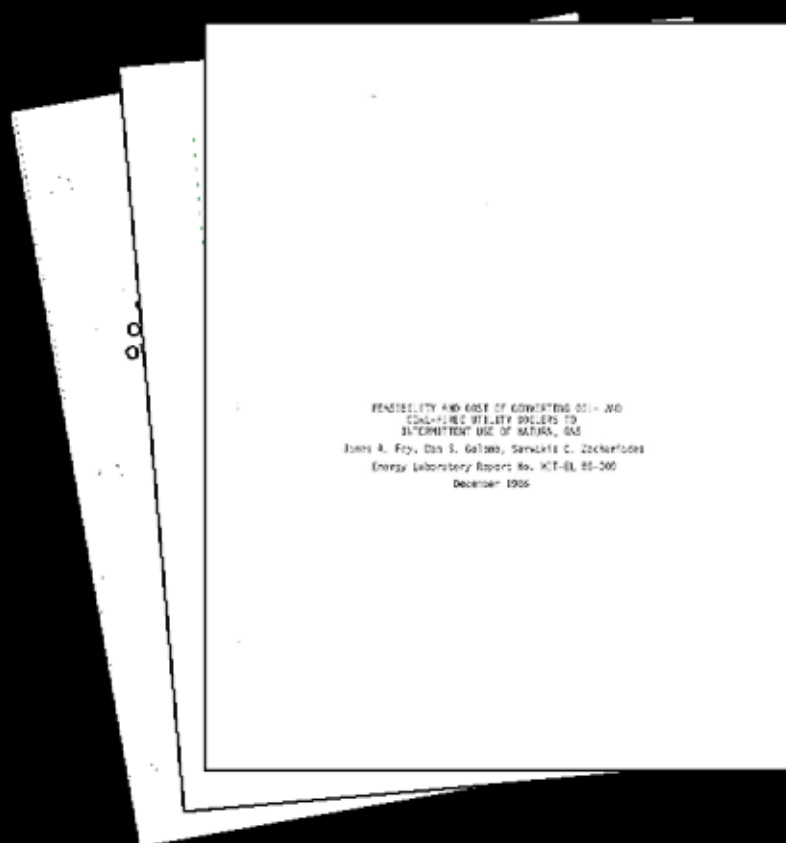
D.K. Wong

*Babcock & Wilcox
Power Generation Group, Inc.
Barberton, Ohio, U.S.A.*



FEASIBILITY AND COST OF CONVERTING OIL- AND
COAL-FIRED UTILITY BOILERS TO
INTERMITTENT USE OF NATURAL GAS
James A. Fay, Dan S. Golomb, Savvakis C. Zachariades
Energy Laboratory Report No. MIT-EL 86-009
December 1986

A few good
resources...



FEASIBILITY AND COST OF CONVERTING COAL-FIRED UTILITY BOILERS TO ALTERNATIVE USE OF NATURAL GAS
James A. Foy, Dan S. Galbraith, Saravkshi C. Zocheropoulos
Energy Laboratory Report No. EEL-08-005
December 2008

A few good
resources...

B
BERNSTEINRESEARCH

U.S. Utilities: Coal-Fired Generation Is Squeezed in the Vice of EPA Regulation; Who Wins and Who Loses?

OCTOBER 2010

EPA emissions regulations will speed coal plant retirements, raise prices – and benefit survivors

Under a court order to regulate hazardous air pollutants from coal-fired power plants by November 2011, EPA is readying tough new emissions standards for mercury and acid gases; the Clean Air Act requires that all coal plants comply by November 2014.

To control hazardous air pollutants, the Clean Air Act requires “maximum achievable control technology,” a costly combination of emissions controls; for many older, smaller coal plants, the cost of these retrofits will be prohibitive, forcing widespread retirements by 2015.

We calculate that plants supplying 15% of U.S. coal-fired generation will cease operation; net of new coal plants coming on line, coal-fired generation could fall by 9% by 2015; utility demand for coal will drop commensurately; gas-fired generation, and utility demand for gas, will rise.

This loss of coal-fired capacity will raise prices for energy and capacity, benefiting competitive generators whose nuclear or EPA-compliant coal plants are unaffected: FirstEnergy (FE), Exelon (EXC), Constellation (CEG), Mirant (MIR), PPL (PPL), PSEG (PEG), and Allegheny (AYE).

SEE DISCLOSURE APPENDIX OF THIS REPORT FOR IMPORTANT DISCLOSURES AND ANALYST CERTIFICATIONS

POTENTIAL GAS COMMITTEE REPORTS UNPRECEDENTED INCREASE IN MAGNITUDE OF U.S. NATURAL GAS RESOURCE BASE

POTENTIAL GAS COMMITTEE REPORTS UNPRECEDENTED INCREASE IN MAGNITUDE OF U.S. NATURAL GAS RESOURCE BASE

GOLDEN, Colo., June 18, 2009 – The Potential Gas Committee (PGC) today released the results of its latest biennial assessment of the nation's natural gas resources, which indicates that the United States possesses a total resource base of 1,836 trillion cubic feet (Tcf). This is the highest resource evaluation in the Committee's 44-year history. Most of the increase from the previous assessment arose from reevaluation of shale-gas plays in the Appalachian basin and in the Mid-Continent, Gulf Coast and Rocky Mountain areas.

"The PGC's year-end 2008 assessment reaffirms the Committee's conviction that abundant, recoverable natural gas resources exist within our borders, both onshore and offshore, in all types of reservoirs," said Dr. John B. Curtis, Professor of Geology and Geological Engineering at the Colorado School of Mines and Director of the Potential Gas Agency there, which provides guidance and technical assistance to the Potential Gas Committee.

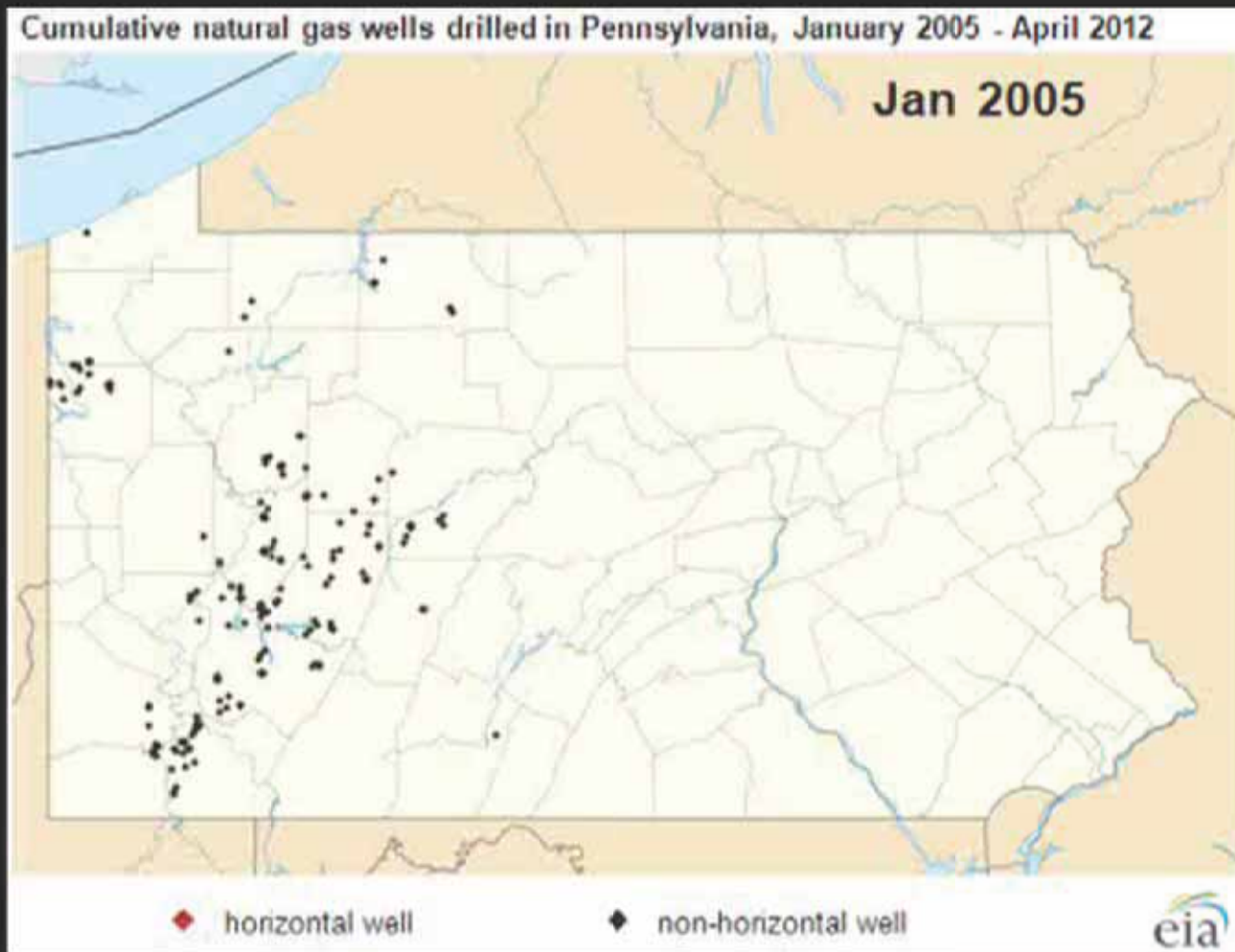
Dr. Curtis cautioned, however, that the current assessment assumes neither a time schedule nor a specific market price for the discovery and production of future gas supply. "Estimates of the Potential Gas Committee are 'base-line estimates' in that they attempt to provide a reasonable appraisal of what we consider to be the 'technically recoverable' gas resource potential of the United States," he explained.

The Committee's year-end 2008 assessment of 1,836 Tcf (statistically aggregated mean value) consists of 1,673 Tcf of gas attributable to traditional reservoirs and 163 Tcf in coalbed reservoirs. Compared to year-end 2006, traditional resources increased by nearly 519 Tcf (45%), while coalbed gas resources decreased by 3 Tcf (1.9%), resulting in a net increase in total potential resources of 515 Tcf (39%). (See accompanying Table 1.)

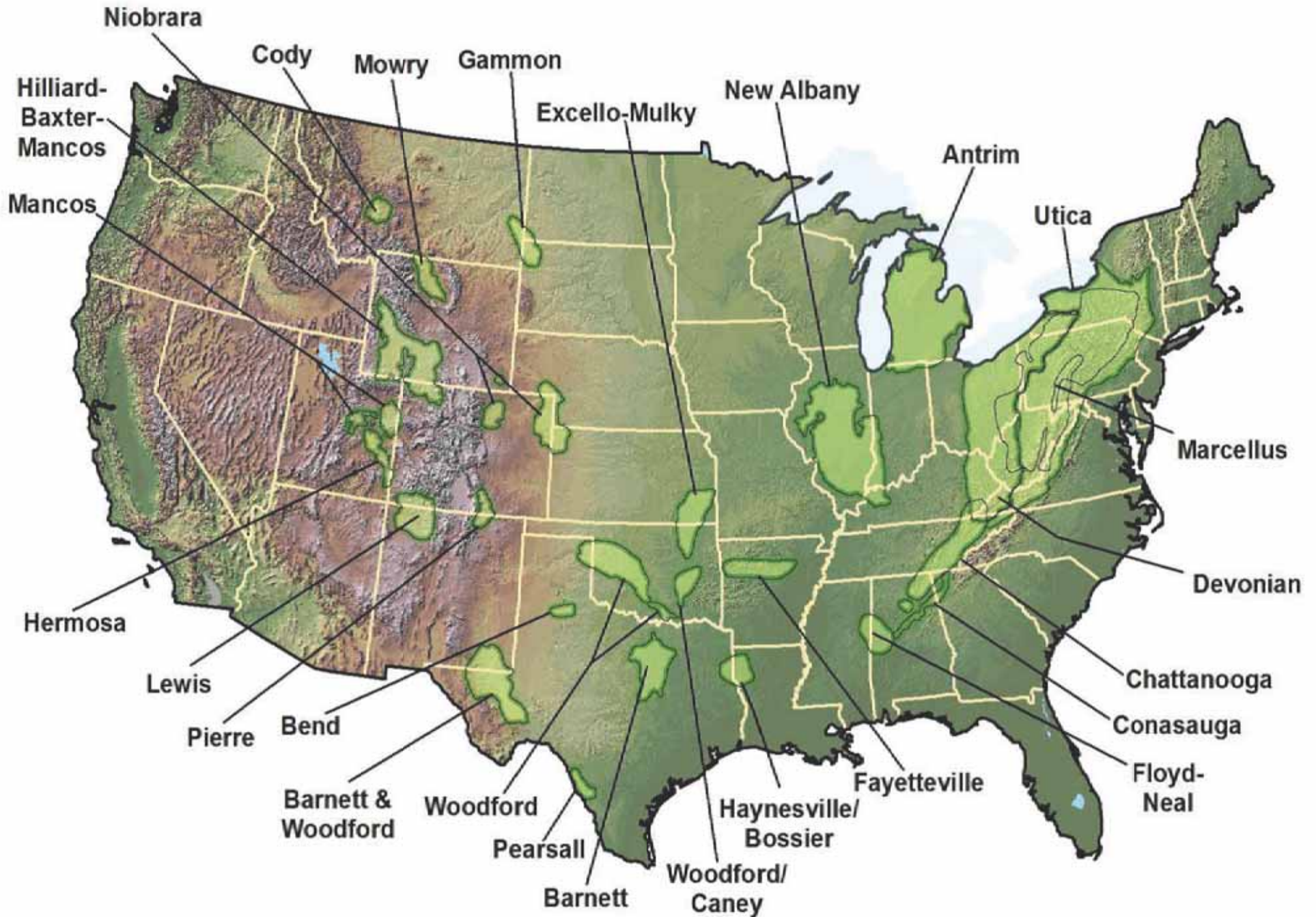
These changes have been assessed in addition to the 41 Tcf of marketed domestic natural gas production recorded during the two-year period since the Committee's previous report.

When the PGC's results are combined with the U.S. Department of Energy's latest available determination of proved gas reserves, 238 Tcf as of year-end 2007, the United States has a total available *future supply* of 2,074 Tcf, an increase

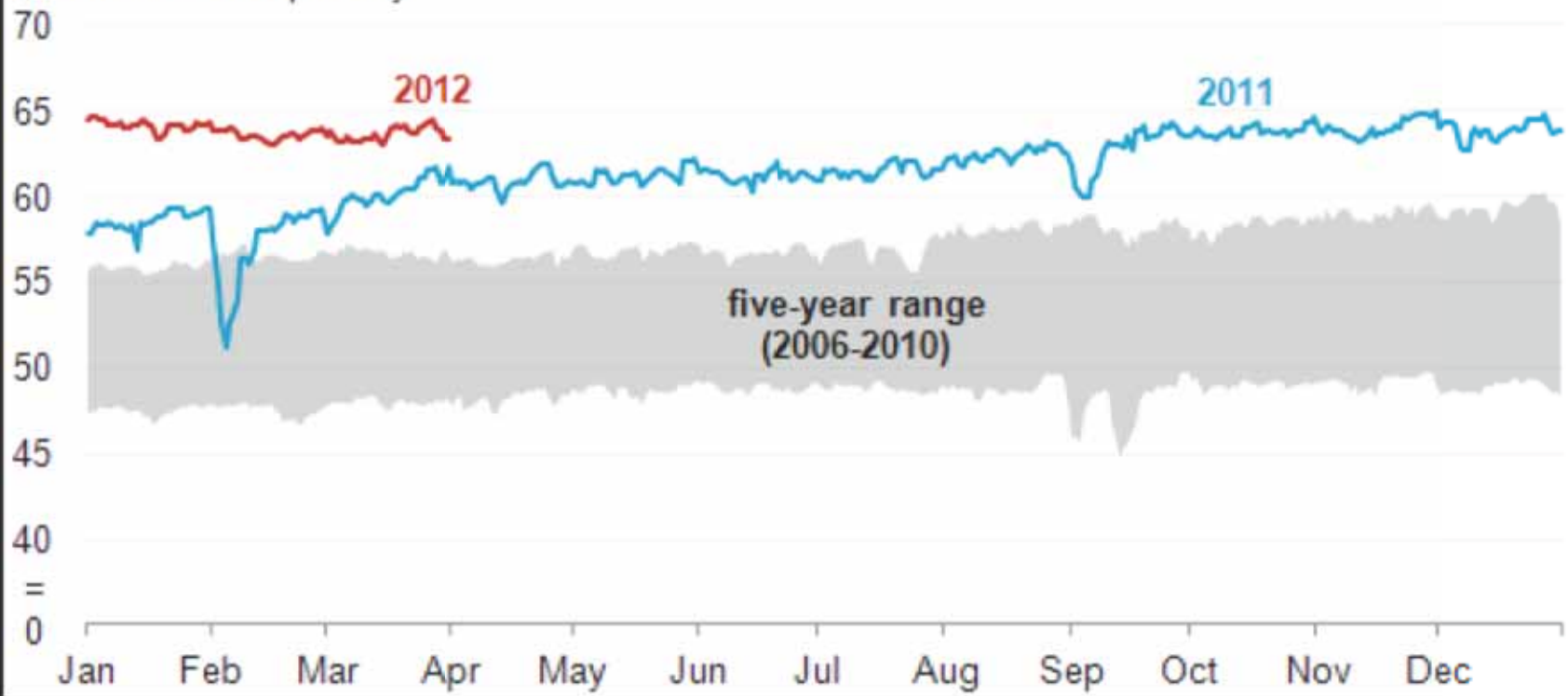
Video



U.S. Shale Gas Plays

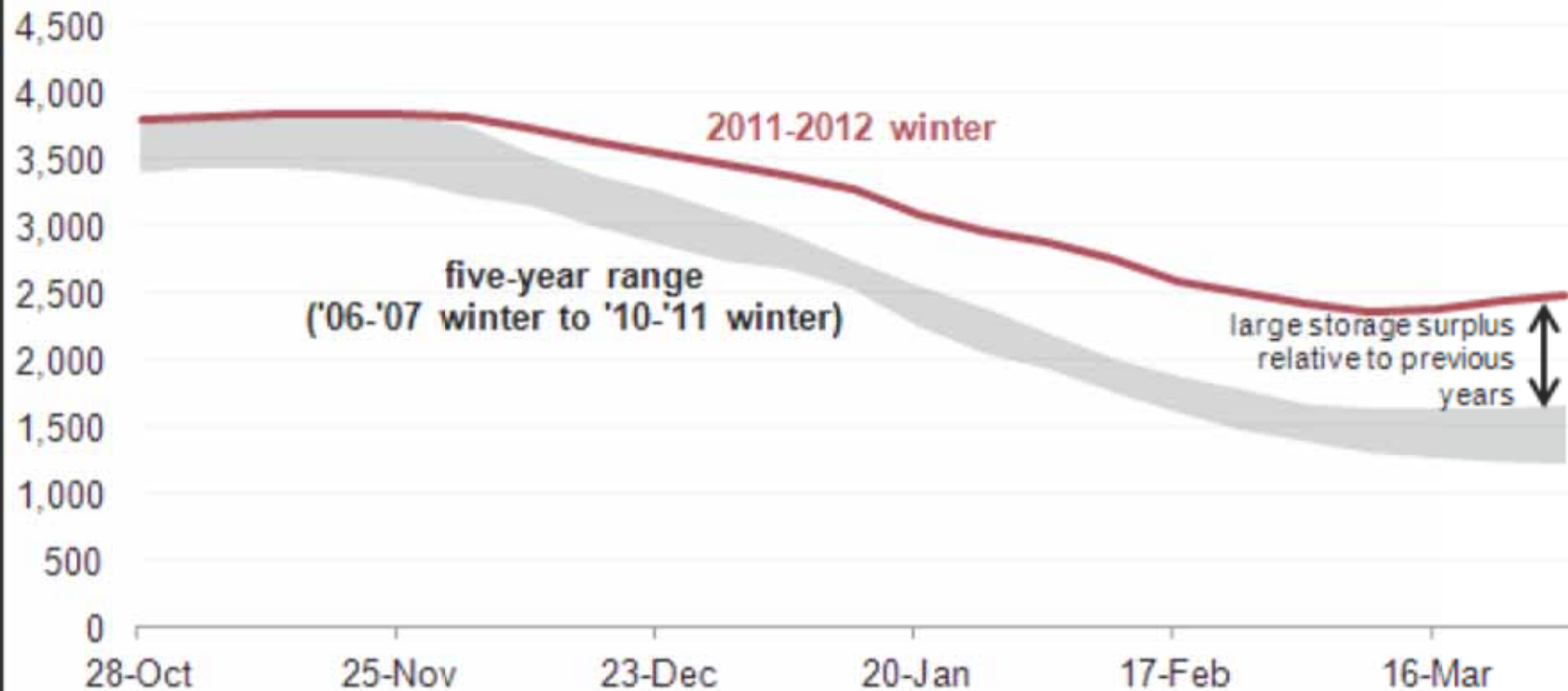


Estimated U.S. daily dry natural gas production billion cubic feet per day

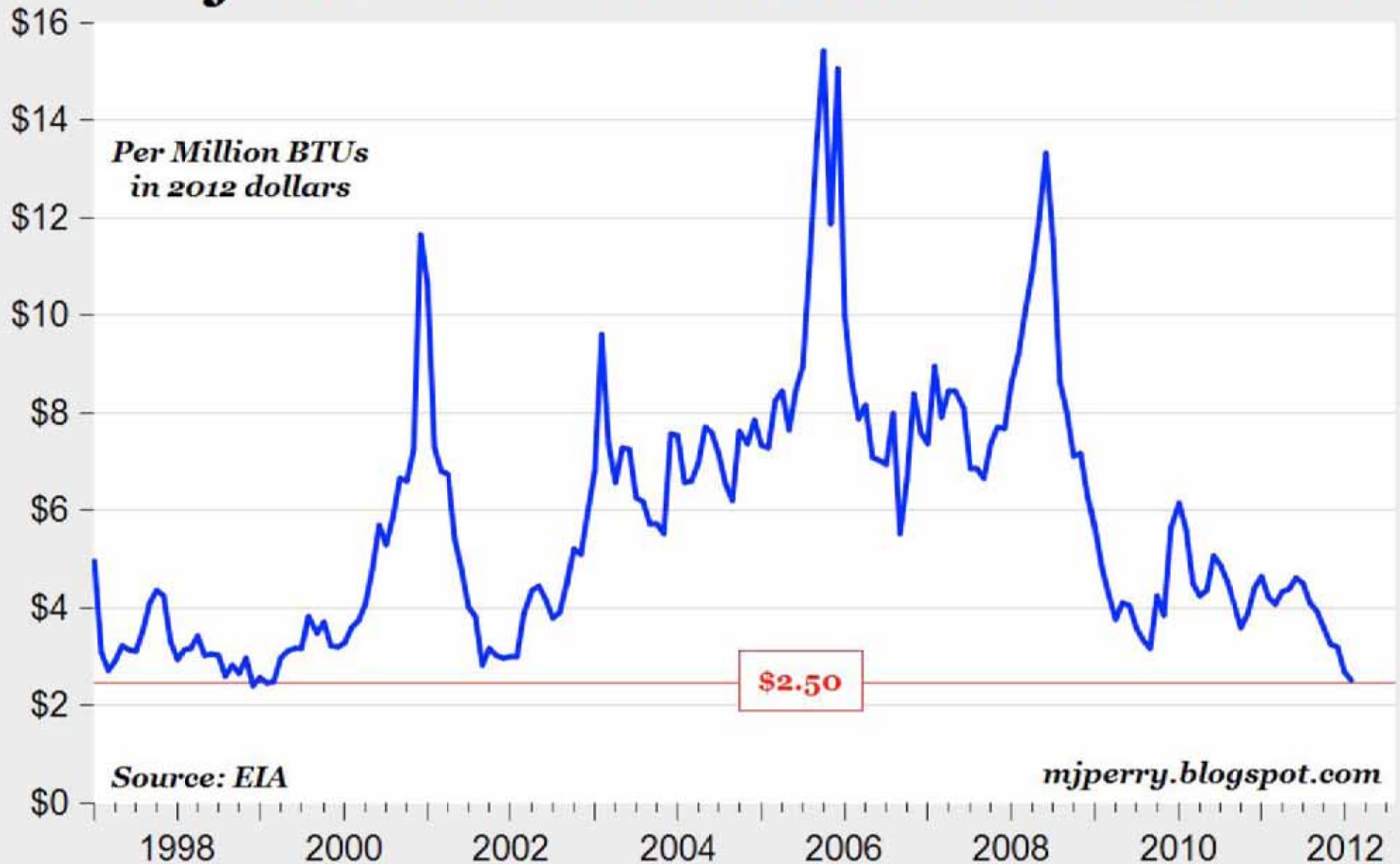


U.S. lower-48 natural gas storage inventories

billion cubic feet



Monthly Spot Prices for Natural Gas Adjusted for Inflation in 2012 Dollars



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R. A. SAYERS.

Sept. 7, 1868.

PLEASE POST UP IN A CONSPICUOUS PLACE.



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FUEL ADMINISTRATION**



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TION



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» Solve Global Warming

STOP BLACK COAL PROJECT!

Clean Energy
Clean Energy Now
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ACT NOW

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COAL IS DIRTY!

COAL IS DIRTY!

POWER RANKS
COAL IS DIRTY!

POWER RANKS
COAL IS DIRTY!

QUIT

C  **AL**



The Economist

JULY 6TH-12TH 2002

The politics of corporate scandals

PAGE 27

East Asia's economies, five years on

PAGES 13 AND 65-67

Why Arab countries have failed

PAGES 24-26

THE GLOBAL ENVIRONMENT

SURVEY, AFTER PAGE 50

CO₂AL

Environmental enemy No.1

student union presents

THE GREAT

C  AIL

DEBATE

moderated by

BRYAN WALSH *of* TIME

**Utility MACT (MATS)
40 CFR 63 Subpart UUUUU**

**Cross-State Air Pollution Rule (CSAPR)
Currently stayed**

**New Source Performance Standard (NSPS) for
Greenhouse Gas Emissions from Electric Utility
Generating Units
40 CFR 60 Subpart TTTT (Proposed)**

**316(b) Cooling Water Intake regulations
Proposed - Final Expected Late July**

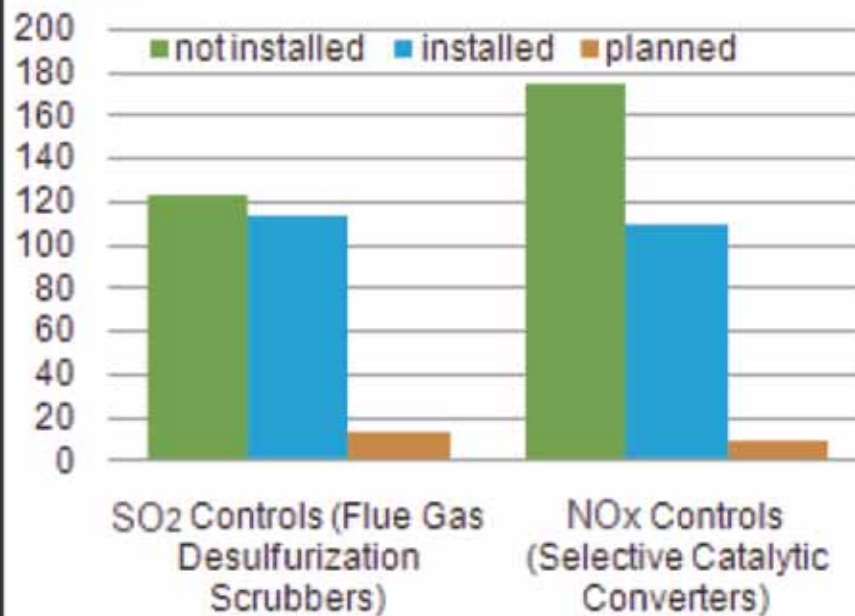


**National Ambient Air Quality Standard (NAAQS)
for PM 2.5 - Expected Summer**

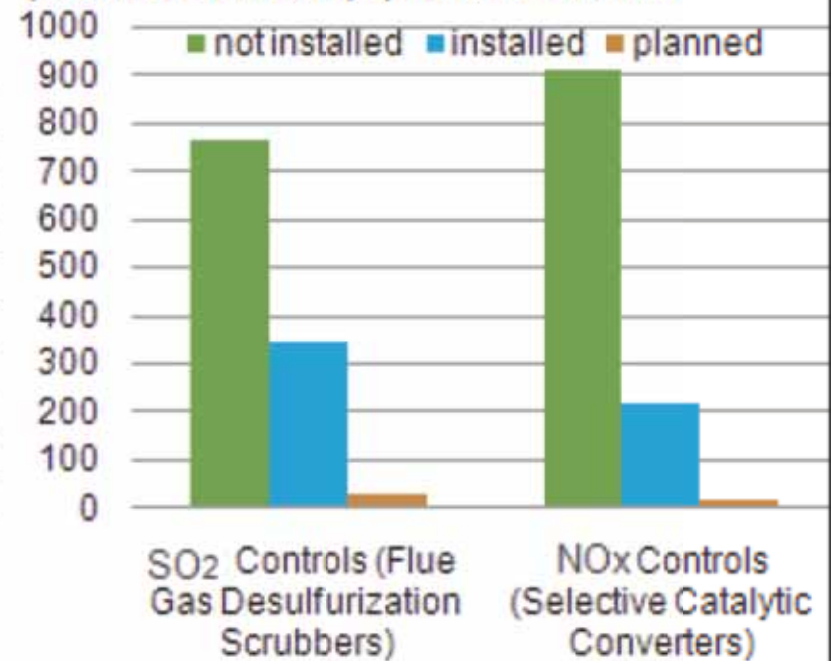
**Coal-Combustion Residuals (CCR) Rule
Proposed - Final Expected This Year**

**Regional Haze
SIPs and FIPs Finalized This Year**

Coal power plant pollution control equipment installed in affected states
gigawatts



Number of coal power plant units with installed pollution control equipment in affected states



Coal-fired plants without controls...

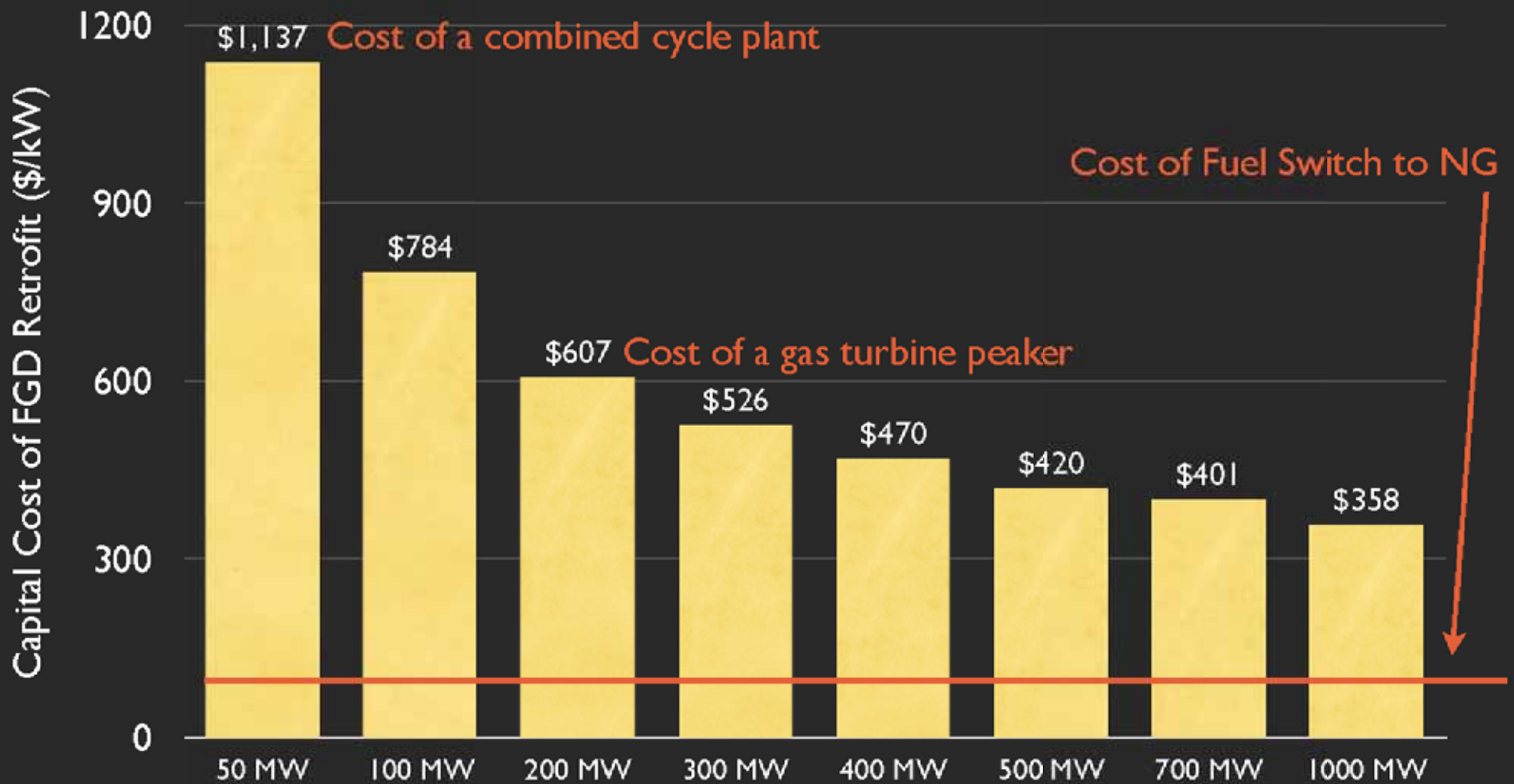
40% are over 50 years old

80% are less than 200 MW

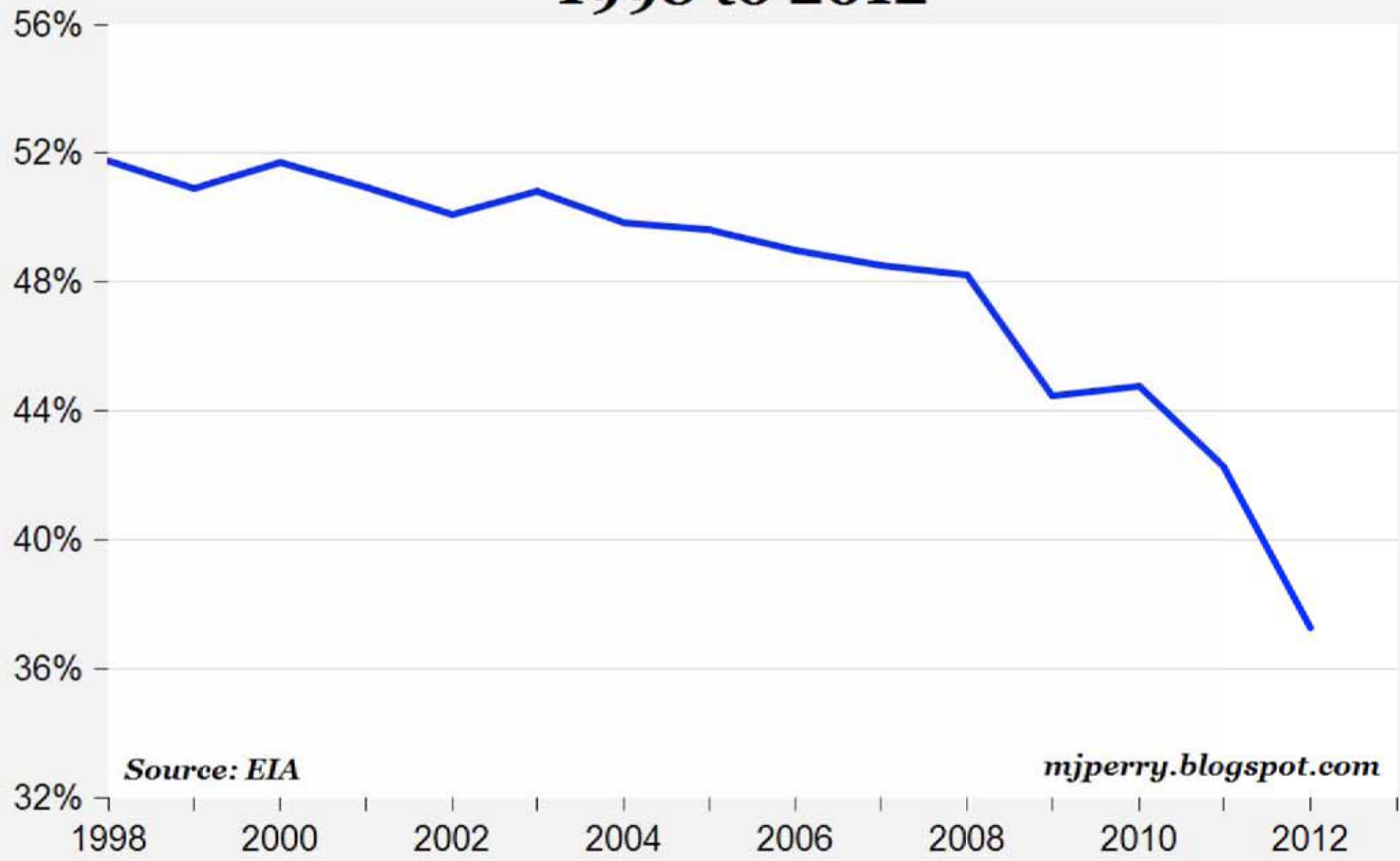
50% are less than 50 MW

40% run less than 50% of the time

Scaleability of FGD Retrofit Costs



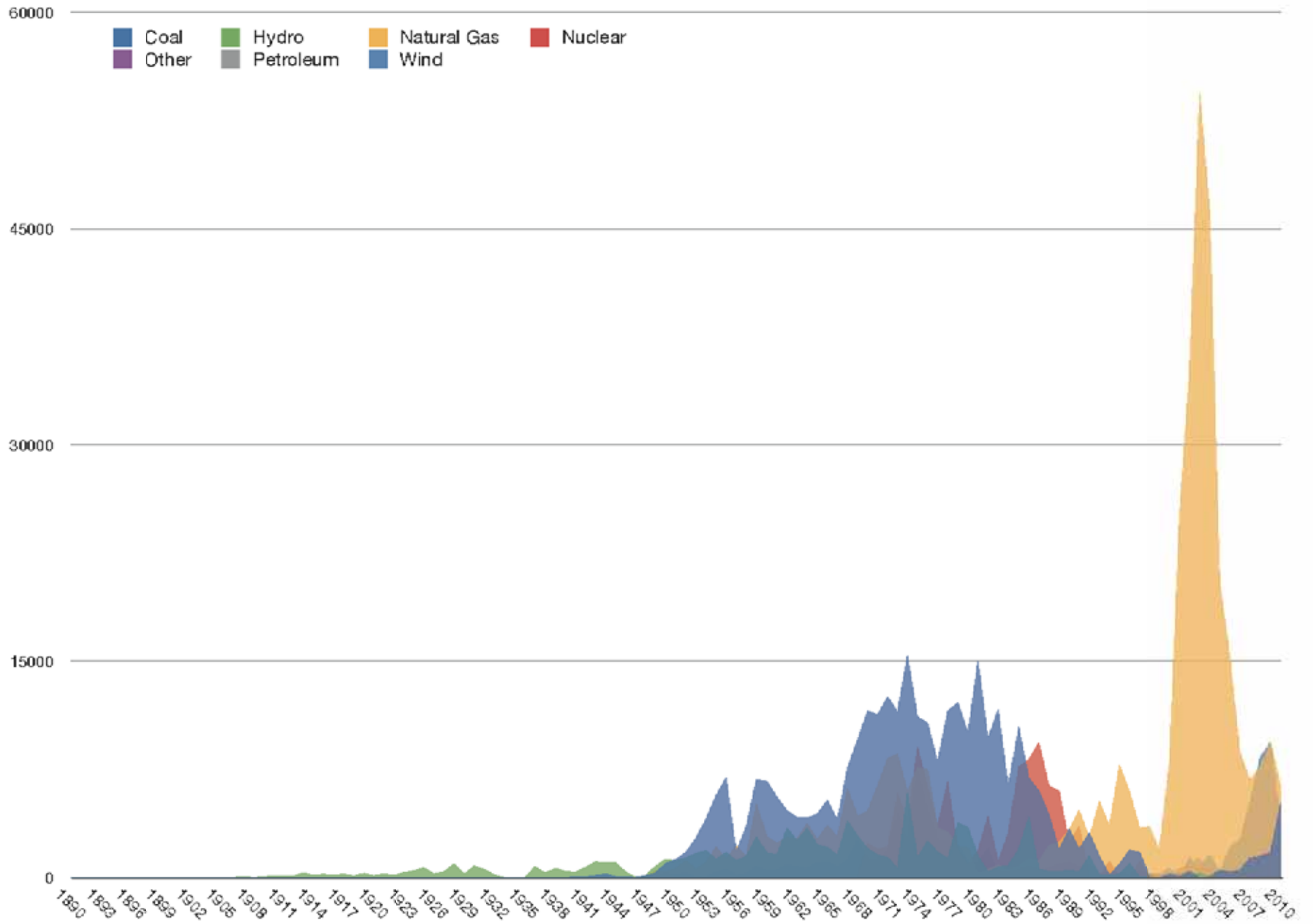
Coal's Share of U.S. Electricity Generation 1998 to 2012



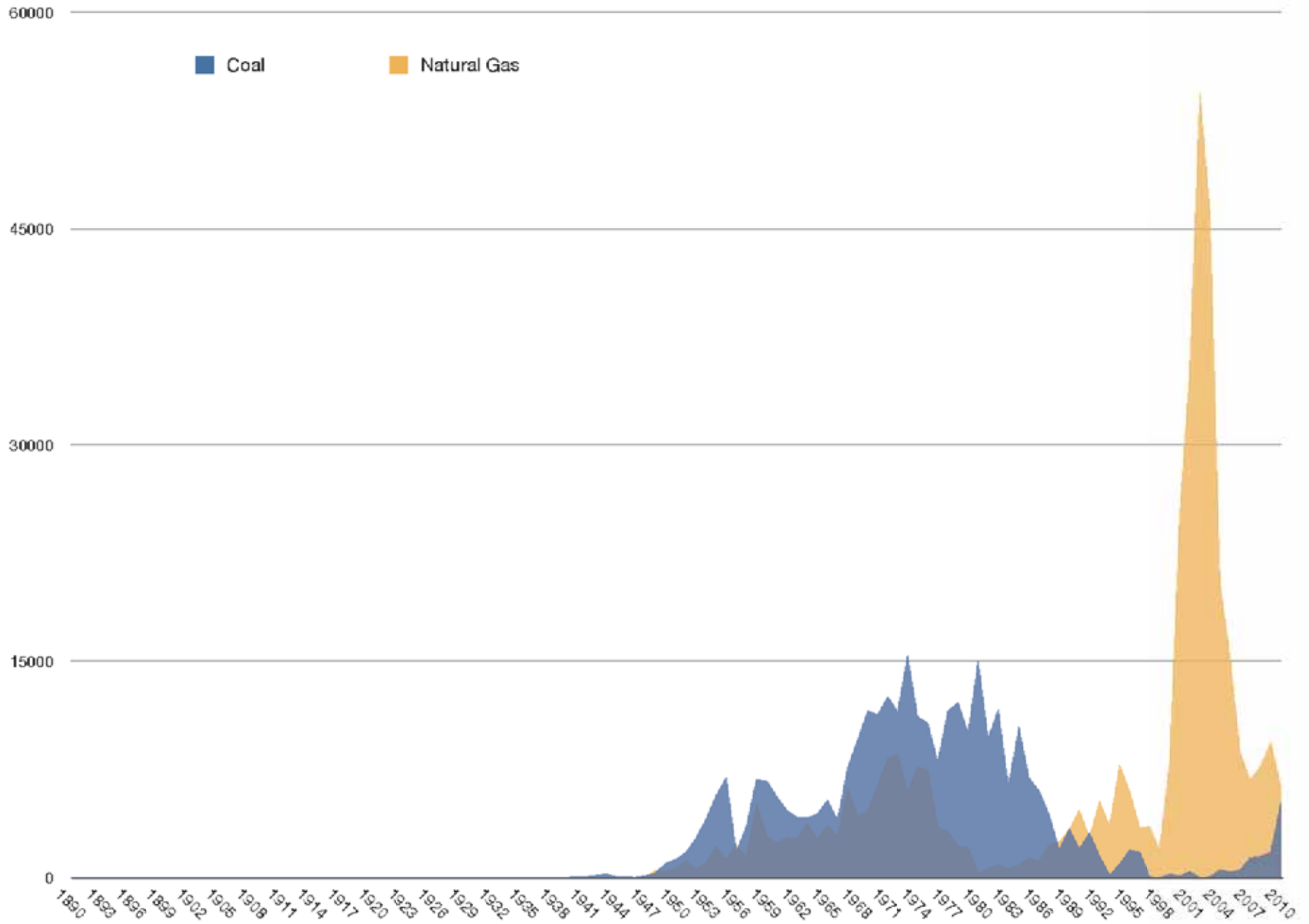
Source: EIA

mjperry.blogspot.com

Current Capacity by Initial Year of Operation and Fuel Type

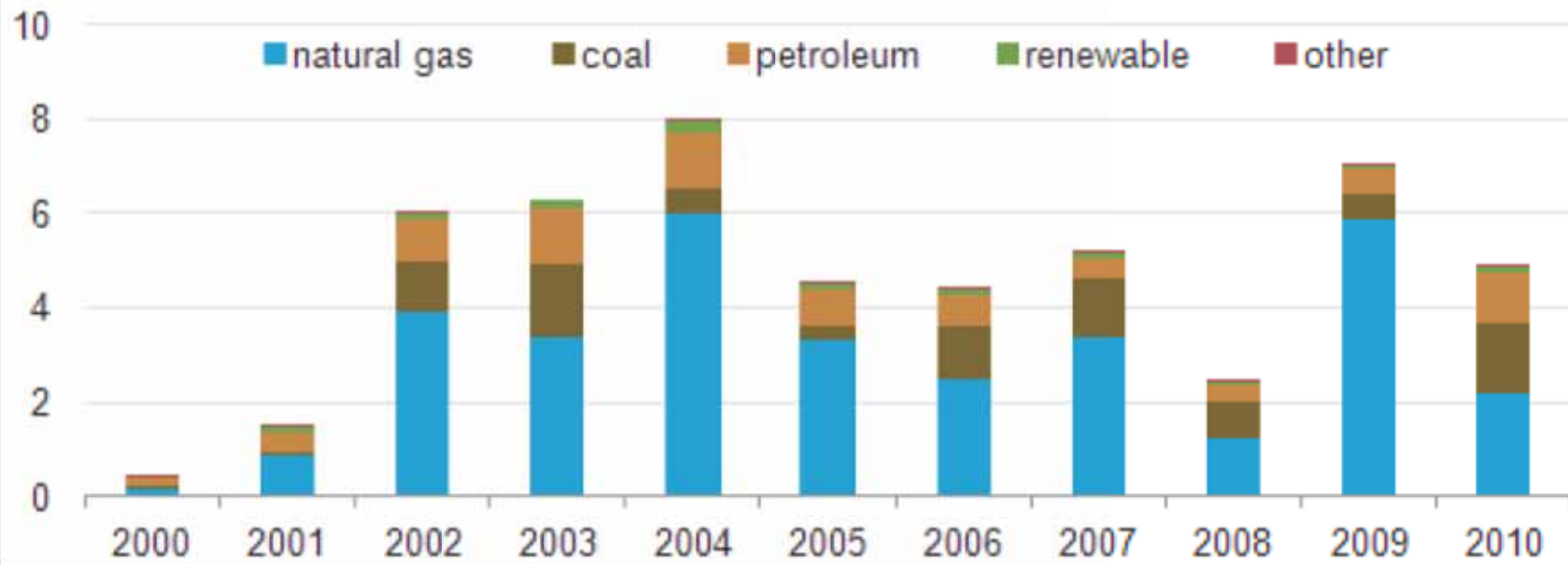


Current Capacity by Initial Year of Operation and Fuel Type



U.S. generator retirements by fuel type, 2000-2010

gigawatts



Coal use in Europe is up...



Low CO₂ credit prices causing resurgence of coal use

7€/metric ton down 60% from 2011



Who's Switching?

Dover Municipal Power Plant

18 MW Stoker

Modified for 8-15%
Natural Gas Co-Firing

Complete and Operating

