

Comments on “A Research Program for Promising Retrofit Technologies”

Edward S. Rubin

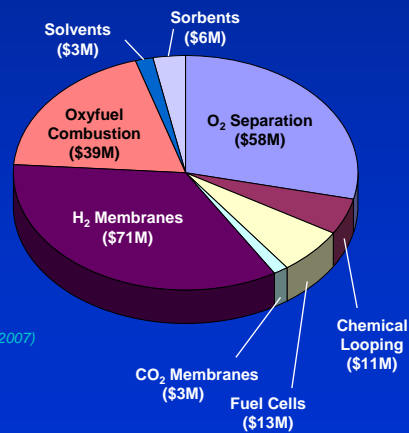
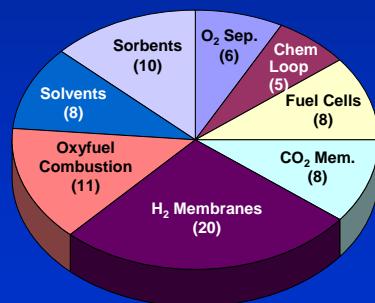
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For discussion at the
MIT Symposium on Retro-Fitting of Coal-Fired Power Plants
for CO₂ Emission Reductions
Cambridge, Massachusetts
March 23, 2009

USDOE Carbon Capture R&D (76 projects in early 2007)

8 technology areas

\$205M over 3.3 yrs, avg



(Source: NETL, 2007)

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Back in the 1980's
What's Hot ...

- In-Duct Injection
- Copper Oxide Process
- LIDS
- PFBC
- Electron Beam Process
- Slagging Combustors
- Limestone Injection
- Multi-Stage Burners (LIMB)
- IGCC
- NOXSO Process
- Regenerative FGD Systems
- SOX-NOX-ROX-BOX
- Chemical Coal Cleaning
- Dry Scrubbing

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...and

What's Not

A utility company view of post-combustion SO₂ capture systems

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Scrubbers described, examined and rejected.

The Environmental Protection Agency recommends that electric utilities install "stack gas scrubbers" to control sulfur dioxide emissions and meet the standards that have been set.

WHAT IS A "STACK GAS SCRUBBER"?

There are many "stack gas scrubber" systems. All have been tested. Some—the most promising—more than others.

Simply stated, the scrubber is designed to eliminate most of the sulfur dioxide emissions by creating, in a chamber, a violent rainstorm of water laced with huge quantities of a chemical, limestone or lime for instance.

WHAT DOES CAREFUL EXAMINATION REVEAL?

Problems. Horrendous problems. Scrubber systems do remove sulfur oxides. But in the process all of them are plagued with one or more problems that make them unelectable and impractical for a major electric utility.

Many scrubber systems produce a by-product that clogs the operation or erodes or corrodes the mechanism. Faults that cause that down. An impossible situation for an electric utility that must have a reliable power supply operation that will work all day, every day.

If the system doesn't clog and shut down it creates massive amounts of sludge. Some—the most popular and most studied system, the wet lime or limestone scrubber—do both.

To understand the vastness of this amount of ground-polluting sludge produced, consider this: if limestone scrubbers were applied to a 12,000 megawatt coal-fired system they would in only five years produce enough of this "gooz" to destroy and cover 10 sq. miles of America to a depth of 5 feet. How is that for a system that's supposed to solve pollution problems?

If it doesn't have either of these major faults chances are it will have some of

several less dramatic problems. And chances are it hasn't been tested at a coal-burning plant.

WHAT MAKES AMERICAN ELECTRIC POWER REJECT SCRUBBERS?

The problems revealed. The poor data on scrubber tests. Time and time again proven too unelectable, too impractical for electric utility use.

But a greater overriding reason is the simple belief that there are better ways to solve the sulfur dioxide emission problem.

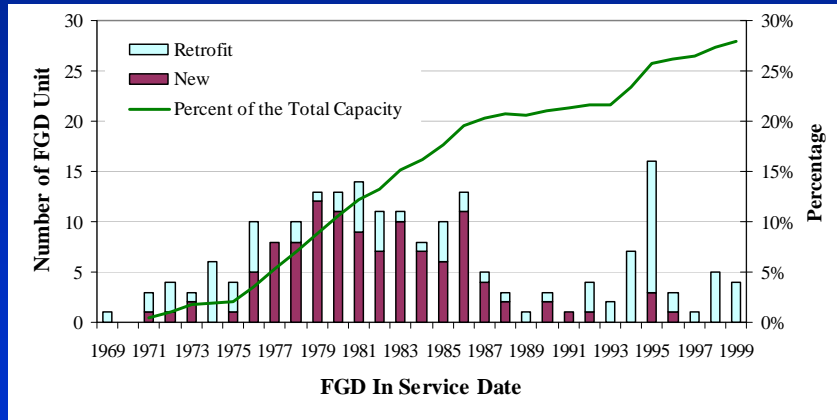
One way is to release the enormous reserves of U.S. Government-owned low sulfur coal in the West. And at the same time continue the investment of time, energy and money in the development of the technology to clean high-sulfur coal before it is burned.

Such a positive program, we think, is in the best interest of the people we serve and the country we live in.

American Electric Power System

American Electric Power System, Inc., 10000 East 15th Avenue, Denver, CO 80231

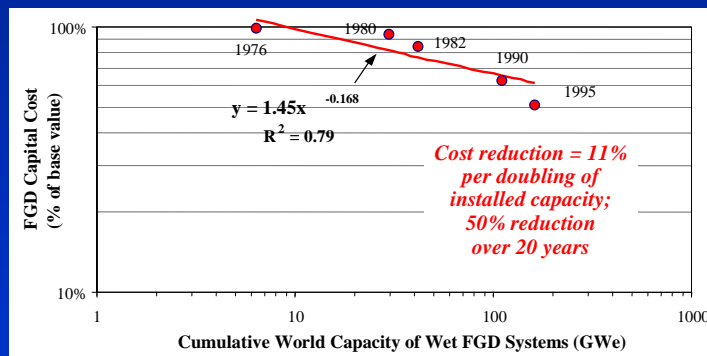
Growth in U.S. FGD Capacity



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Significant declines in cost as FGD technology is deployed

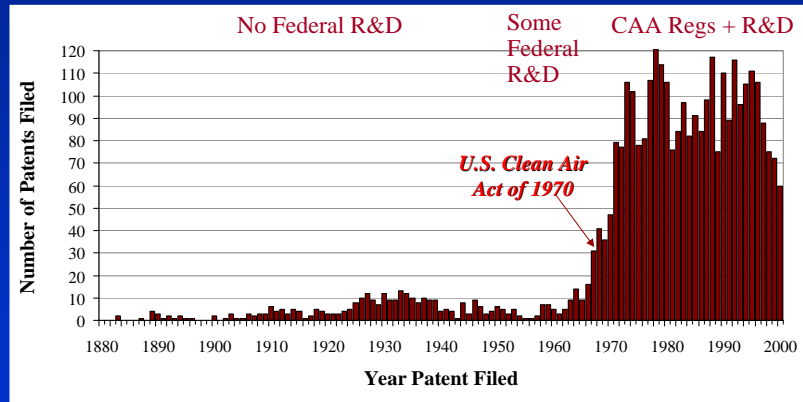
Experience Curve for Wet Limestone FGD Systems



(Based on 90% SO₂ removal, 500 MW plant, 3.5% S coal)

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U.S. Patenting Activity in SO₂ Control Technology



Regulatory policies stimulated innovations that reduced emissions

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How to Get “Over the Horizon Technology”

- Create a market for CCS—performance standards can do this (other policy approaches also may, or may not)
- Pursue continual improvements to current technology (not just R&D on new “breakthrough” options)
- Give it some time (a decade or more)
- Even with better, cheaper capture systems, CCS retrofits will not make economic sense for many existing subcritical units

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