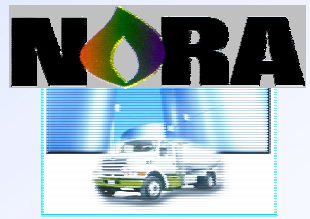
Benefits and Advantages of Marketing Low Sulfur Heating Oil

Including Results from a New York State Low Sulfur Market Demonstration

Roger J. McDonald
BNL-Oilheat Research
Co-Principal Investigator

&

John E. Batey
Professional Engineer
Energy Research Center



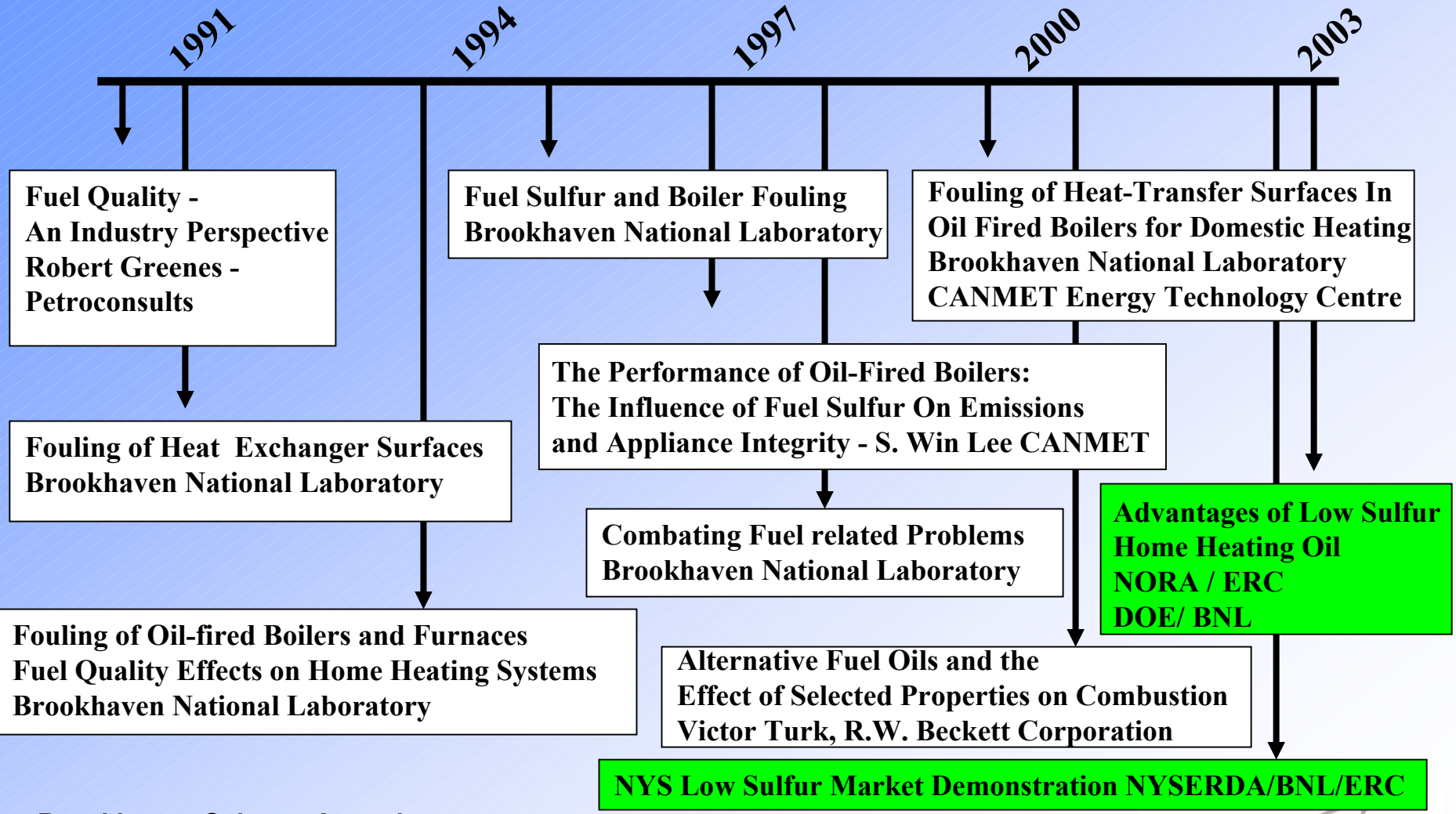
Brookhaven Science Associates
U.S. Department of Energy

BROOKHAVEN NATIONAL LABORATORY

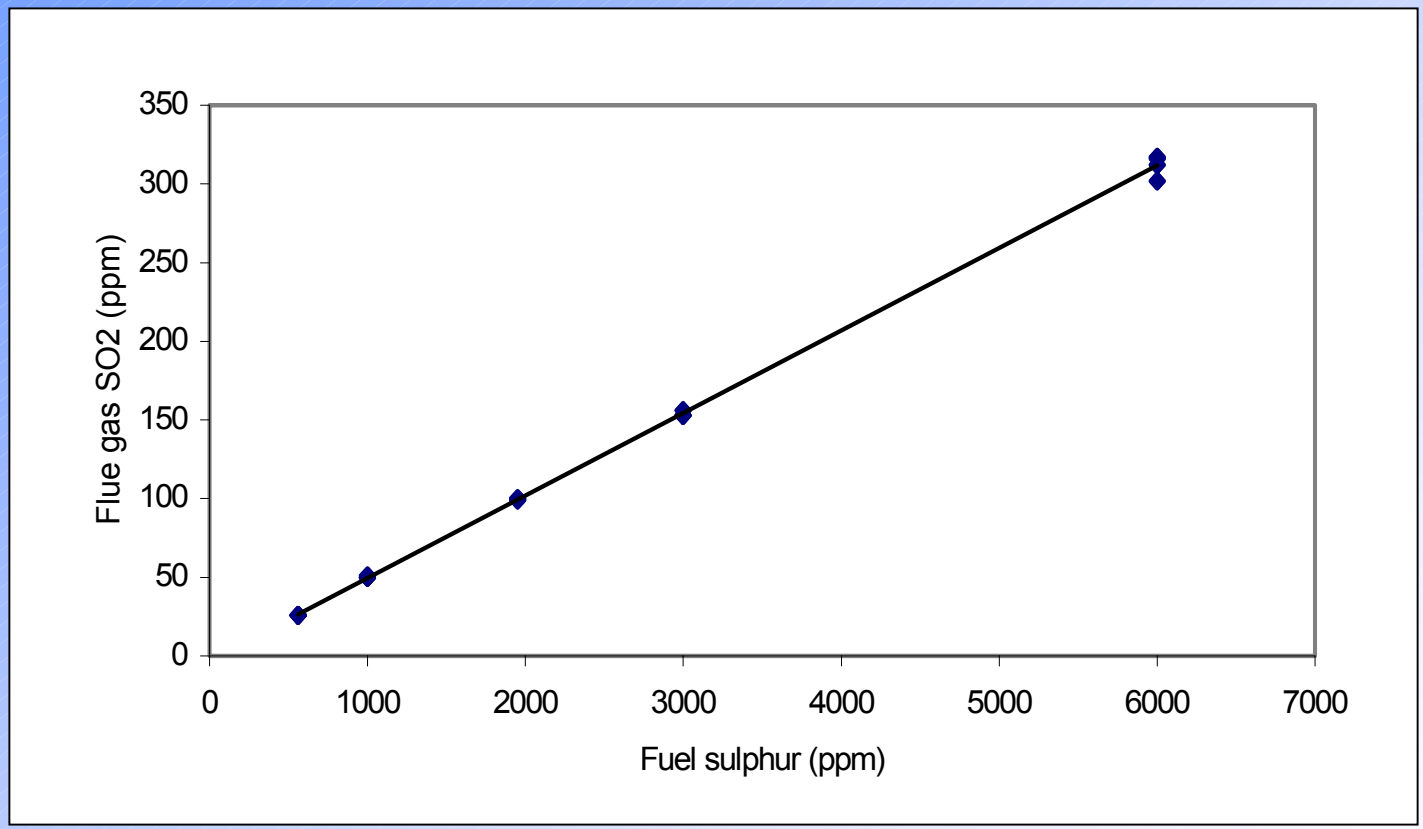
Low Sulfur Benefits and Advantages

- Improved Environmental Emissions = Oilheat Fuel Viability
  - Sulfur Dioxide
  - $PM_{2.5}$ Emissions
  - Nitrogen Oxide
- Cleaner Equipment = Better Business Image
  - Lower Service Department Costs
  - Increased Reliability
  - Enhanced Customer Opinion
- Industry Choice = No Government Mandates
  - Free Market for the Consumers
- New Opportunities = Market Sector Growth
  - New Technologies / Condensing Systems
  - Side Wall Vented Heating Equipment Sales Increases

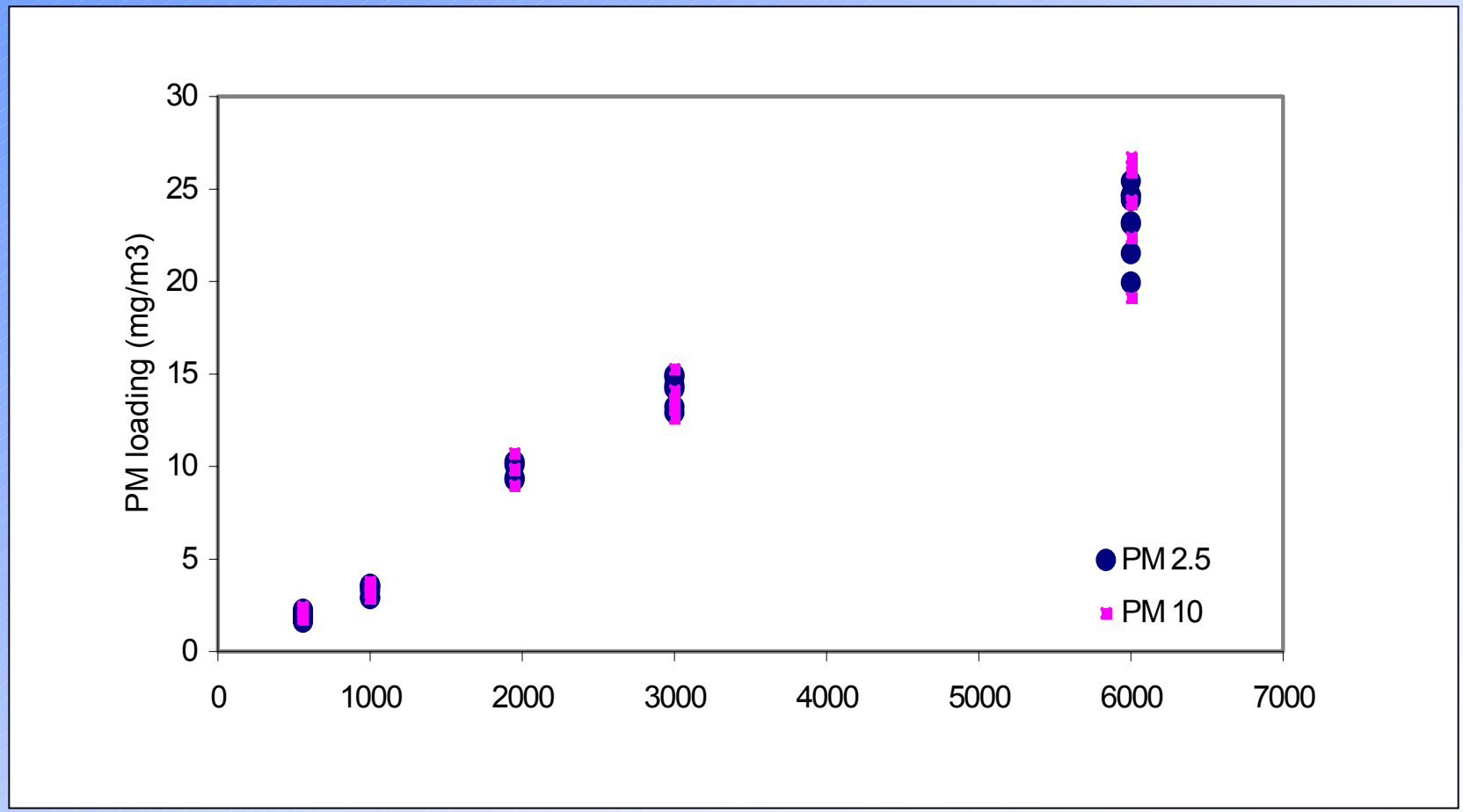
Low Sulfur Heating Oil Research



Effect of fuel sulfur on flue gas SO_2 emissions



Effect of fuel sulfur on $PM_{2.5}$ and PM_{10} emissions



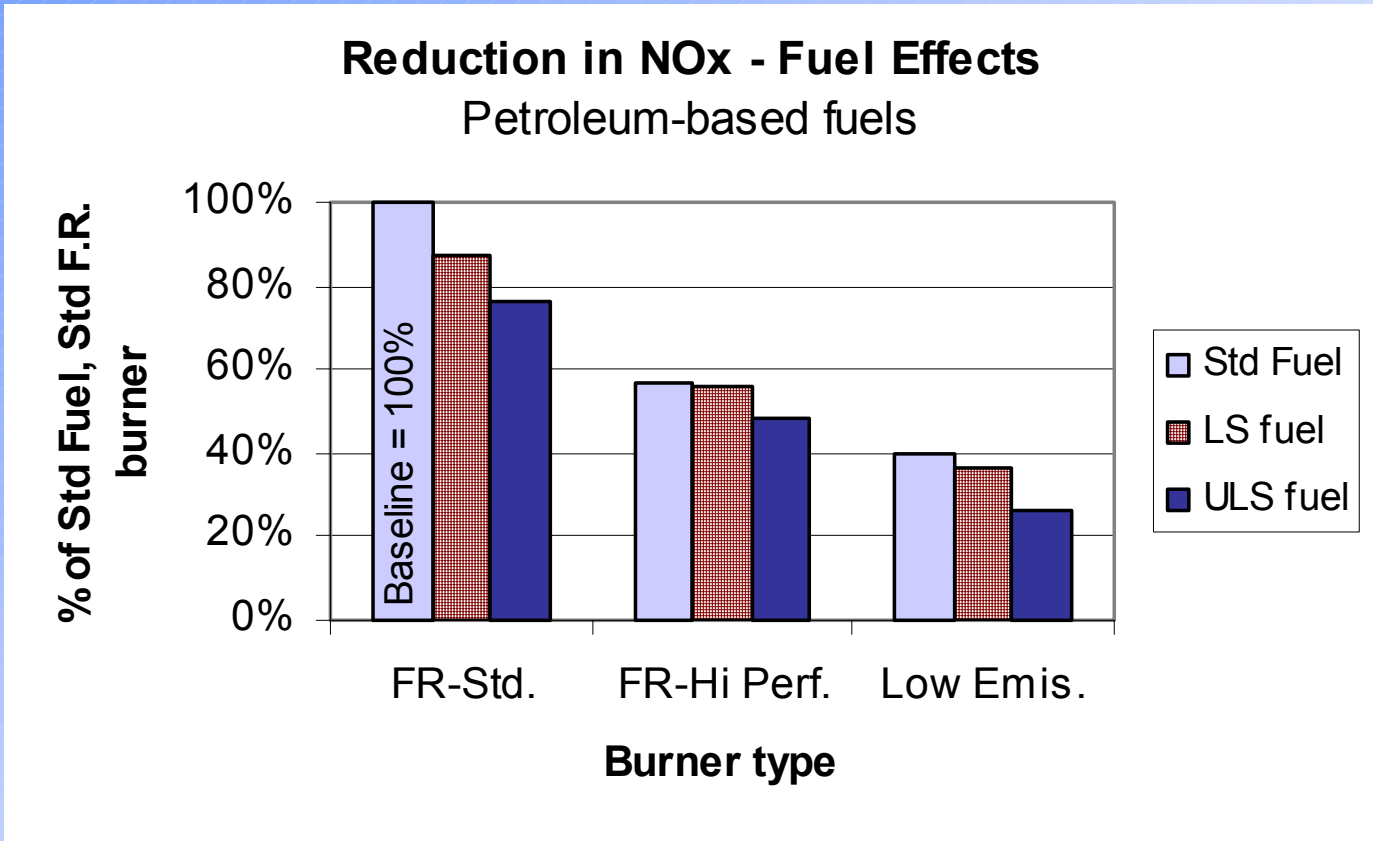
US implementation timeline for PM standards

1997	EPA issues Final $PM_{2.5}$ NAAQS
1998-2000	Ambient PM monitors put in place nationwide
1999-2003	Collect monitoring data
2002	EPA completes 5-year scientific review of standards
2003-2005	EPA designates non-attainment areas
2005-2008	States submit implementation plans for meeting the standard
2012-2017	States have up to 10 years to meet the standards plus one year extensions

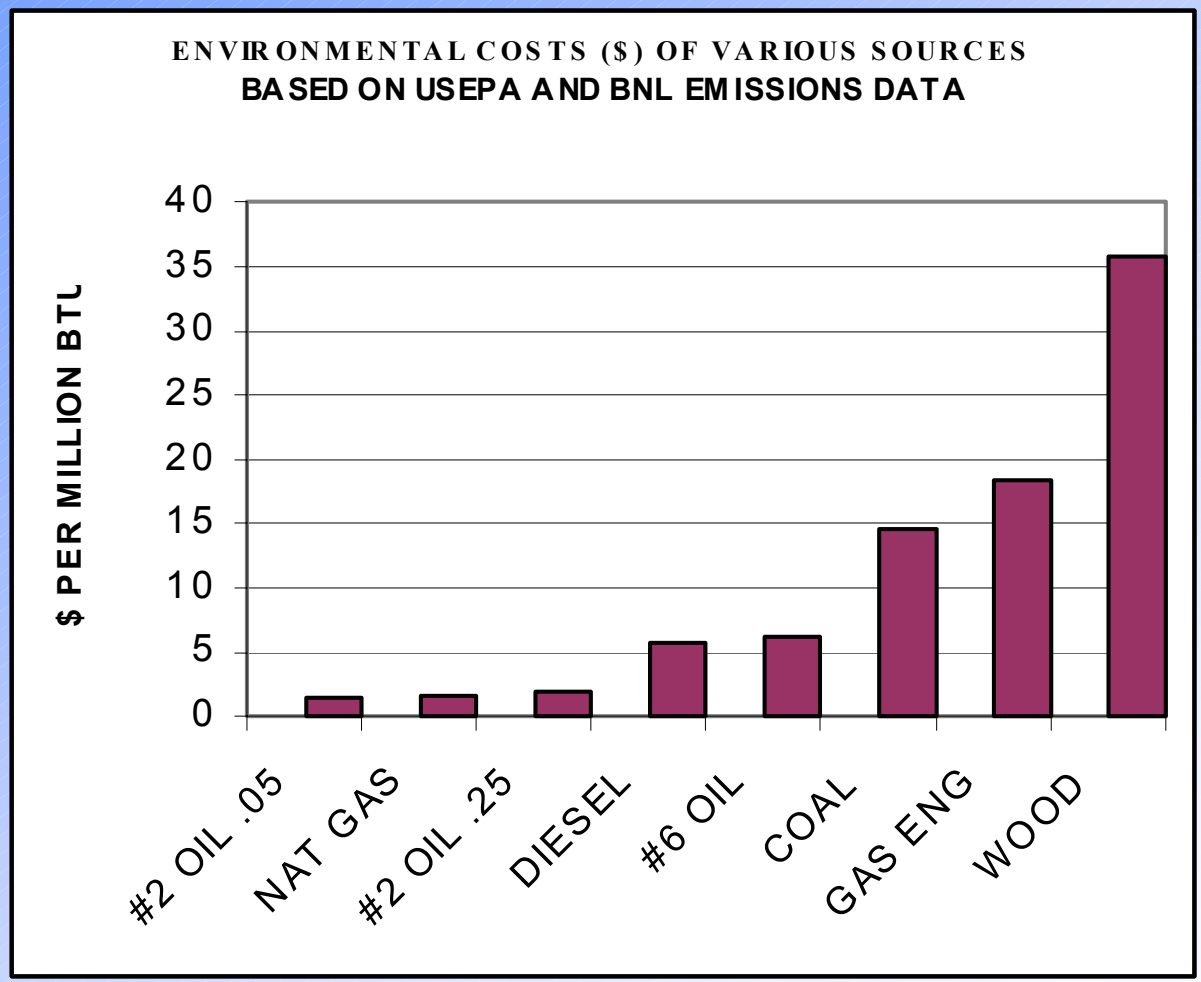
Typical Sulfur and Nitrogen contents in Petroleum Fuels

(all values, ppm)	S-Nom	N-Nom	S-Range	N-Range
Hi-Way Diesel (Gr. 2-D low sulfur)	360	150	< 500	100-200
Off Road Diesel (Gr. 2-D diesel)	3260	350	2000-5000	200-500
Heating Oil (Gr. 2 fuel oil)	1700	650	1000-3000	< 900

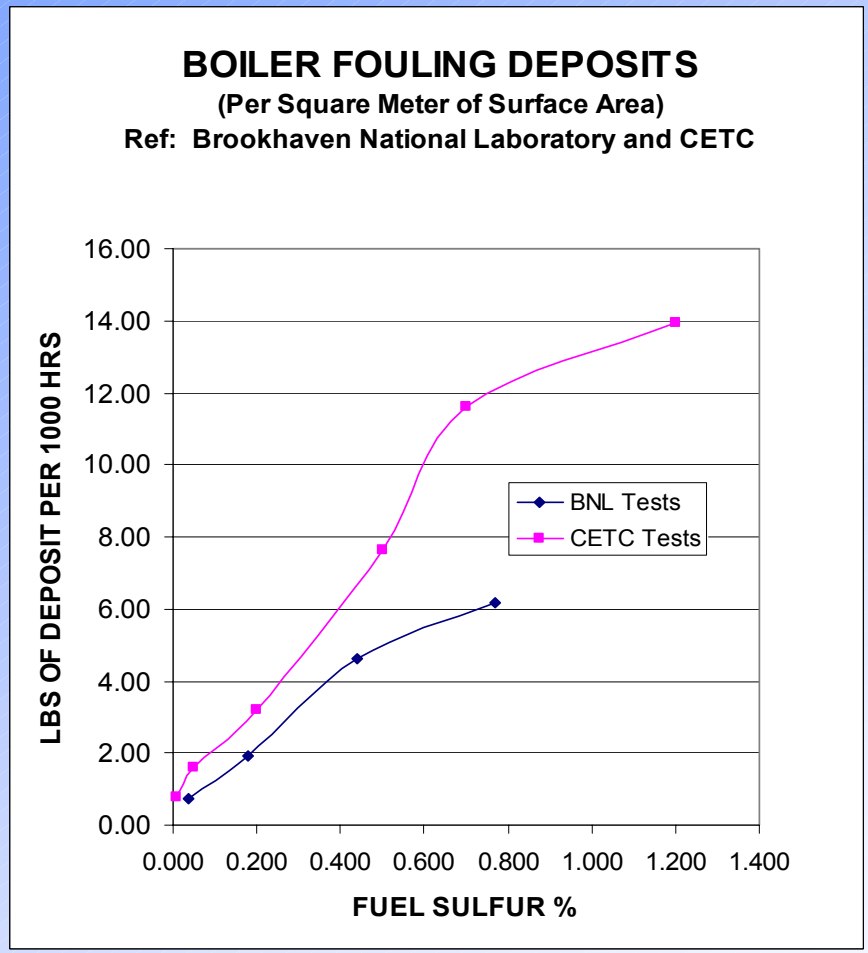
Fuel sulfur effects on NO_X formation



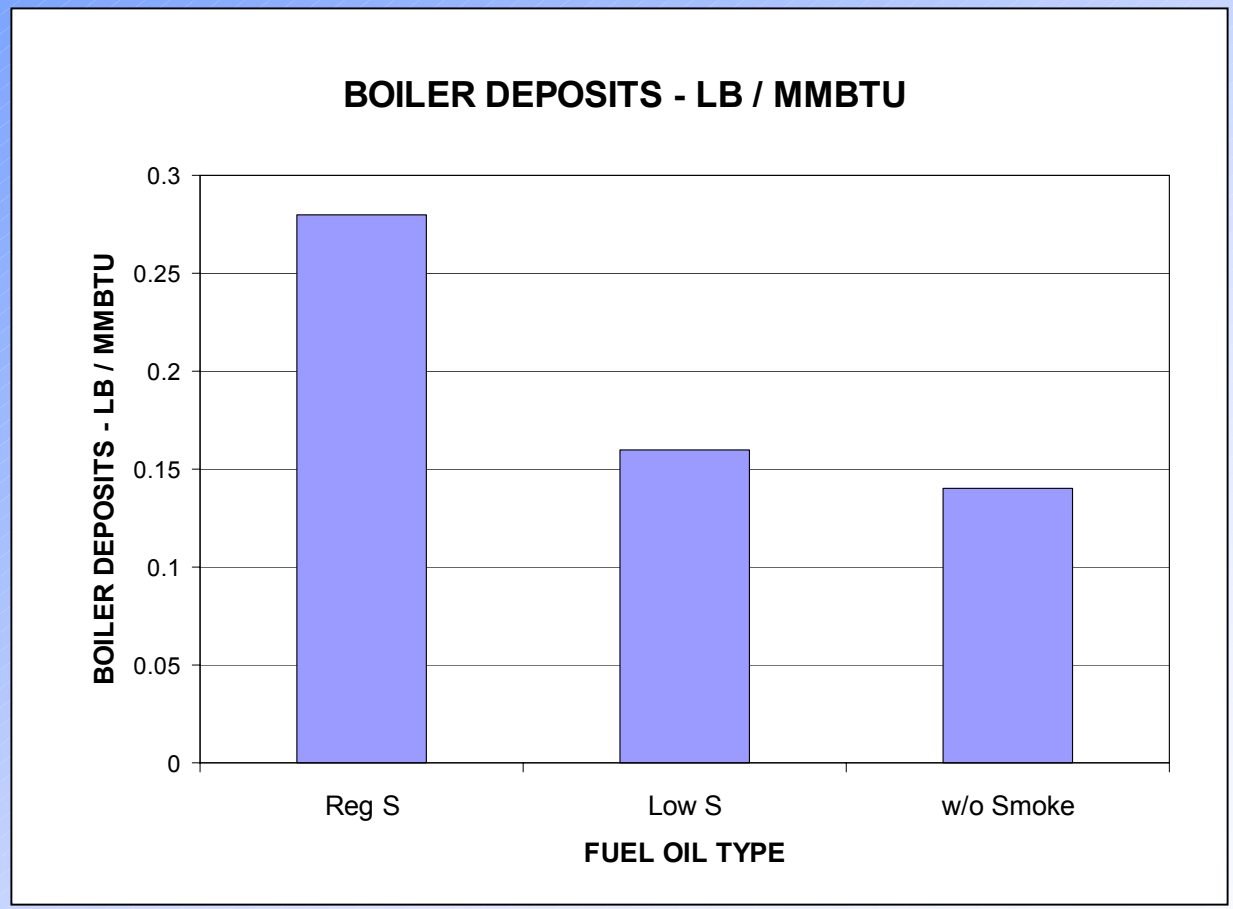
Environmental Costs for Low Sulfur Oil Compared to Other Fuels



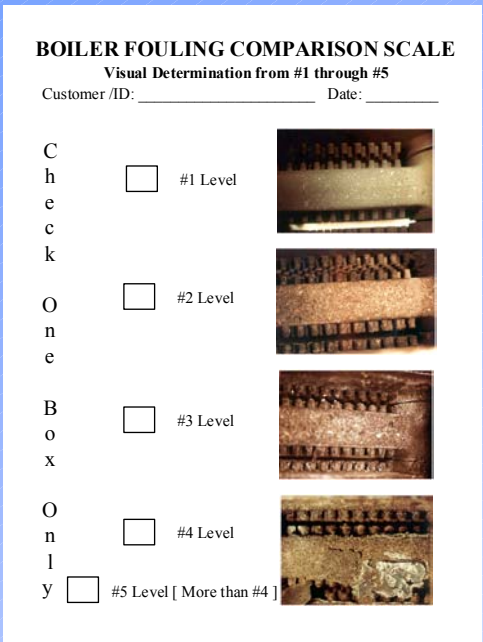
Low Sulfur Translates To Cleaner Heat Exchangers

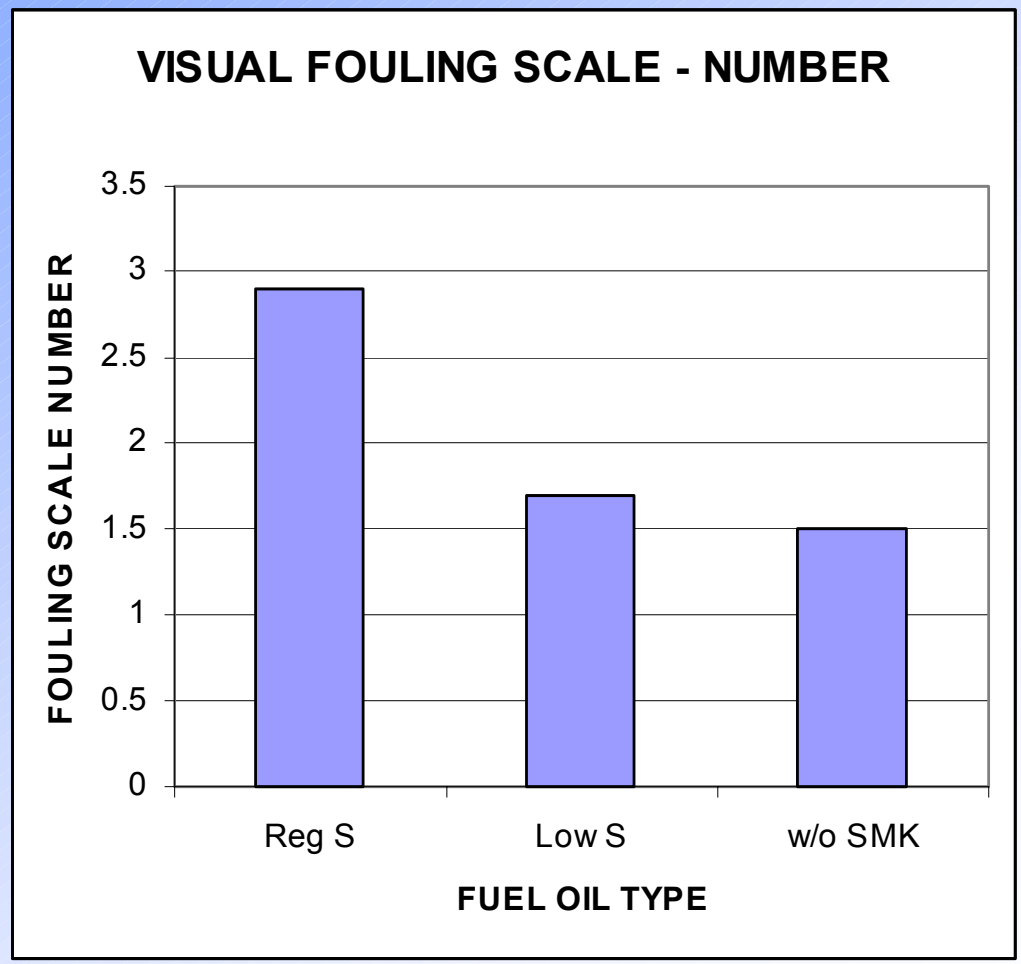


New York Marketing Study in 1000 Homes

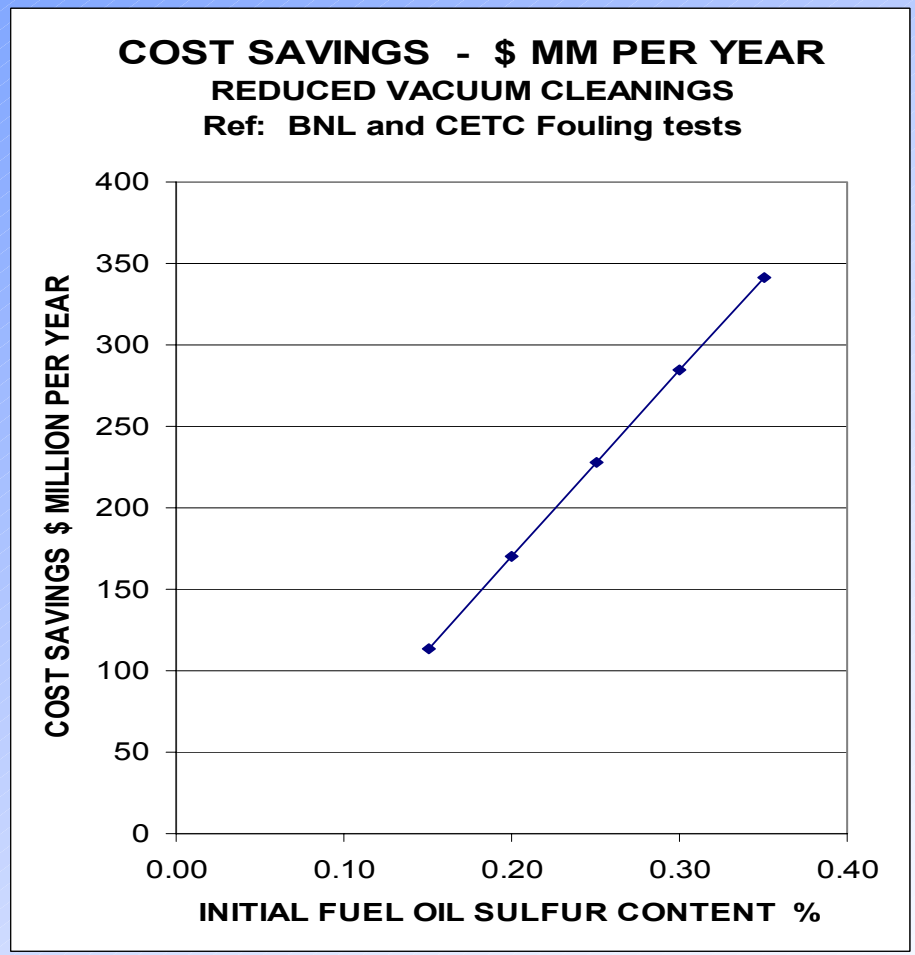


New York Marketing Study in 1000 Homes





Preliminary Cost Saving Estimates



Summary of Low Sulfur Advantages

- Lower Service Costs - $200 MM / Year
- Service Savings versus Slight Added Fuel Cost
- Lower SO_x Emissions ~75% -80%
- Lower PM and NOx emissions
- Extended vacuum cleaning intervals
- Improved Environmental Impact for Oil
- Improved Customer Satisfaction
- Opportunity for New Technology Equipment Sales

April 30, 2003: NORA Board of Directors

"Resolved: That the National Oilheat Research Alliance endorses the use of low sulfur Oilheat in residential and commercial combustion. That NORA publicize the advantages of this fuel to the industry participants, and prepare communications tools and information that will be valuable to customers in their decision making. That the goal of the National Oilheat Research Alliance shall be that 80 percent of the fuel consumed as heating oil shall contain not more than 500 ppm sulfur by 2007."

Acknowledgements

Our Sponsors:
United States Department of Energy / Ronald Fiskum
National Oilheat Research Alliance / John Huber
NYS Research and Development Authority / Raymond Albrecht.

Research Contributions by:
S. Win Lee, Ph.D. / CANMET Energy Technology Centre / Canada
Victor Turk / R.W. Beckett Corporation
National Association of Oil Heat Service Managers
Brookhaven National Laboratory / Oilheat Research Program Staff having conducted over ten years of research on the subject of low sulfur fuel related mechanisms and their impacts on residential heating equipment as well as information from the US EPA