

Attachment 4

Experience and Qualifications

I, Kenneth J. Snell, was the primary author of the expert report entitled “Expert Report and Analysis – Basin Electric Power Cooperative’s Dry Fork Station Power Plant: (1) Supercritical Boiler Technology is not a Practical Option for the Dry Fork Station; (2) The Dry Fork Permitting Process was Thorough and Technically Sound; and (3) Emission Limits Included in the Final Permit Represent Best Available Control Technology.” My educational background includes a Bachelor of Arts degree in Environmental Studies from the University of Kansas, a Bachelor of Science degree in Chemical Engineering from the University of Illinois at Chicago, and a Juris Doctorate, cum laude, from the John Marshall Law School in Chicago. I am a licensed attorney and registered Professional Engineer in the State of Illinois.

Since June 2000, I have been employed as an Environmental Consultant at Sargent & Lundy LLC (S&L). S&L provides comprehensive engineering, environmental, energy business consulting, and project services for new and operating power plants throughout the world. Prior to joining S&L I held various positions in environmental management with Safety-Kleen Corp., Vulcan Chemicals, and Advanced Transformer Co. I have worked in the field of environmental compliance, engineering, and permitting for more than 25 years. My experience includes projects subject to all of the major environmental laws including the Clean Air Act, Clean Water Act, Resource Conservation and Recovery Act, Comprehensive Environmental Response, Compensation and Liability Act (Superfund), and Toxic Substances Control Act.

Since joining S&L, my responsibilities have focused primarily on environmental permitting associated with new and existing electric power generating facilities, evaluating the environmental issues associated with siting and constructing new power generating units, and conducting environmental due diligence reviews. I have prepared and supported the preparation of New Source Review (NSR) Prevention of Significant Deterioration (PSD) air construction permit applications for several coal- and natural gas-based generating facilities, including pulverized coal (PC) power plants, circulating fluidized bed (CFB) power plants, natural gas-fired simple-cycle and combined-cycle facilities, and integrated gasification combined cycle (IGCC) facilities.

I have been the primary author of Best Available Control Technology (BACT) analyses evaluating emission control technologies with application to PC, CFB, IGCC and natural-gas fired facilities in several states, including Montana, North Dakota, Illinois, Missouri, Oklahoma, Nebraska, and Wisconsin. Several of the permitting projects on which I was the primary author of the BACT analysis have been through

agency review, as well as public review and comment, and led to the issuance of a final PSD air construction permit. I also provided expert testimony before the Board of Environmental Review of the State of Montana on the Roundup Power PSD permit, addressing issues including BACT for a pulverized coal-fired power plant.

In preparation of this report, I reviewed Basin Electric Power Cooperative's November 10, 2005 air construction permit application, as well as supplemental information submitted to WYDEQ-AQD during the permit review process. I have also conferred with other specialists at S&L, primarily Mr. William Rosenquist as to my opinions on supercritical boiler technologies, and Mr. William DePriest as to my opinions on emission control technologies and achievable emission limits. A copy of my S&L resume, as well as the resumes for Mr. Rosenquist and Mr. DePriest are attached below.

EDUCATION

John Marshall Law School, Chicago, Illinois - J.D. Law (cum laude) - 1994

University of Illinois at Chicago, Chicago, Illinois - B.S. Chemical Engineering (with honors) - 1984

University of Kansas, Lawrence, Kansas - B.A. Environmental Studies - 1980

PROFICIENCIES

Environmental permitting
Environmental due diligence
Environmental management systems
Environmental auditing
Interpretation of federal and state environmental regulations
Power plant siting

REGISTRATION

Professional Engineer - Illinois
Licensed Attorney – Illinois

RESPONSIBILITIES

Mr. Snell is responsible for ensuring that existing and proposed facilities comply with environmental regulations and permit requirements. Mr. Snell's responsibilities include identifying applicable regulatory requirements, determining permit and compliance strategies, preparing environmental permit applications, and interfacing with the appropriate regulatory agencies. He also assesses the environmental impacts of constructing and operating power facilities, including impacts from air emissions, water intake structures, wastewater discharges, and solid and hazardous waste disposal.

EXPERIENCE

Mr. Snell has worked in environmental compliance, engineering, and permitting for more than 25 years. Before joining Sargent & Lundy, he was employed as the environmental manager for a large chemical processing facility and environmental counsel for a leading hazardous waste management company. In his role as an environmental manager, Mr. Snell was responsible for a variety of corporate environmental matters, primarily concentrating on environmental permitting and compliance. His experience includes developing and implementing environmental management systems at chemical processing plants and hazardous waste management facilities; writing corporate environmental compliance manuals; conducting compliance training; and developing environmental auditing programs.

Since joining Sargent & Lundy, Mr. Snell's responsibilities have focused primarily on permitting electric power generating facilities, evaluating the environmental issues associated with siting and constructing new generating units, and conducting environmental due diligence reviews.

Specific project experience includes the following:

AIR PERMITTING – NEW PLANTS

- Nueces Syngas, LLC
Nueces IGCC Plant - 600 MW-net IGCC facility
 - Provided permitting support for a proposed 600 MW net syngas-fired IGCC facility in Texas. Work included preparing emission estimates and BACT analysis for the syngas-fired combustion turbines, gas cleanup systems, emergency flare, sulfur recovery system, and auxiliary boiler; preparing emission control technology descriptions; and supporting preparation of the NSR-PSD permit application for submittal to the state environmental agency. (2006 to 2007).

- Oklahoma Gas & Electric
Red Rock Generating Station - 1 x 950-net MW pulverized coal-fired unit
 - Provided environmental permitting services for a proposed 950 MW-net pulverized coal-fired electricity generating station in Oklahoma. Permitting services included control technology evaluation, preparation of the BACT analysis, emission calculations, preparation of the NSR-PSD permit application for submittal to the state environmental agency, and responding to agency questions. (2006 to present)

- Associated Electric Cooperative, Inc.
Norborne Power Station - 1 x 660-net MW pulverized coal-fired unit
 - Provided environmental permitting services for a proposed 660 MW-net pulverized coal-fired electricity generating station in Missouri. Permitting services included control technology evaluation, preparation of the BACT analysis, emission calculations, supporting preparation of the NSR-PSD permit application for submittal to the state environmental agency, and responding to agency questions (2006 to present).

- Basin Electric Power Cooperative
Dry Fork Power Station - 1 x 385-net MW pulverized coal-fired unit
 - Provided environmental permitting services for a proposed 350 MW-net pulverized coal-fired electricity generating station in Wyoming. Permitting services included generating technology evaluation, emission calculations for several generating technologies and emission control options, control technology evaluation, preparation of the BACT analysis, supporting preparation of the NSR-PSD permit application for submittal to the state environmental agency, and responding to agency questions (2006 to 2007).

- Confidential Client
Coal Gasification Project (no power generation)
 - Provided permitting support for a substitute natural gas facility in Illinois. Work included emission estimates for startup heaters, sulfuric acid production vents, CO₂ vents, flares, auxiliary boilers, and process fugitive emission sources; preliminary BACT and MACT analyses; and a regulatory review to ensure the facility would meet all applicable NESHAP and NSPS requirements. (2006 to 2007).

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- Taylor Energy Center
Taylor Energy Generating Station - 1 x 820-net MW pulverized coal-fired unit
 - Provided environmental permitting services for a proposed 820 MW-net pulverized coal-fired electricity generating station in Florida. Permitting services included a generating technology evaluation, emission control technology evaluation, preparing emission calculations, and supporting preparation of the BACT analysis and NSR-PSD permit application for submittal to the state environmental agency. (2006 to 2007).

 - Westmoreland Energy
Gascoyne Generating Facility - 2 x 250 MW lignite-fired CFB boilers
 - Provided environmental permitting services for a proposed 2 x 250 MW-net circulating fluidized bed coal-fired electricity generating station in North Dakota. Permitting services included a review of potentially feasible emission control technologies, emission calculations, preparation of the BACT analysis, supporting preparation of the NSR-PSD permit application for submittal to the state environmental agency, and responding to agency questions (2005 to 2006).

 - Great Northern Power Development
Nelson Creek Project - 2 x 250 MW lignite-fired CFB boilers
 - Provided regulatory and technical information to support permitting of a new mine-mouth CFB plant in Montana. Evaluated emissions, prepared BACT analysis for PSD permit application, and provided technical information to support emissions impact modeling. (2003 to 2005)

 - Montana-Dakota Utilities
Gascoyne North Dakota Power Plant - 175 MW lignite-fired circulating fluidized bed
 - Evaluated environmental permitting regulations, prepared emission calculations, prepared the BACT analysis, provided technical information to support the facility's NSR-PSD permit application, Worked extensively with the permitting agency throughout the permitting process to provide additional technical information and negotiate permit terms for a new lignite-fired electric generating facility. (2003 to 2005)

 - Intermountain Power Agency
Intermountain Power Project - Unit 3 - 1 x 900-net MW pulverized coal-fired unit
 - Reviewed regulatory requirements, provided technical information to support preparation of the facility's NSR-PSD permit application, and evaluated the facility's BACT and MACT determinations to support the client's application for a new pulverized coal-fired unit at an existing electric power generating facility. Worked extensively with the permitting agency throughout the permitting process to provide additional technical information and support for the air construction permit. (2002 to 2004)

 - Steelhead Energy, LLC
550 MW net IGCC Facility
 - Provided environmental permitting services for a proposed 550 MW-net syngas-fired IGCC facility in Illinois. Permitting services include preparation of the BACT and MACT analyses, reviewing emission calculations, preparing the NSR-PSD permit application for submittal to the state environmental agency, and responding to agency questions. (2004 to 2005).

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- Bull Mountain Development Company
Roundup Power Project - 2 x 390 MW coal-fired units
 - Prepared BACT and MACT analyses for a proposed new coal-fired facility, prepared emission calculations, and provided technical information to support PSD permitting. Worked extensively with the permitting agency throughout the permitting process to provide additional technical information to support issuance of the air construction permit. (2002 to 2004)

 - MidAmerican Energy
Council Bluffs Energy Center - 1 x 750 MW pulverized coal unit
 - Provided regulatory and technical information to support permitting of a new pulverized coal unit at an existing site. Reviewed the facility's BACT and MACT determinations, and evaluated alternate emission control technologies. (2002 to 2005)

 - Dominion Energy, Inc.
Kincaid Project, Evaluation of a new 500 - 770 MW coal-fired unit
 - Prepared a fatal flaw analysis for a proposed new coal-fired unit. Prepared an environmental permit list, evaluated potential permitting issues, prepared a preliminary BACT evaluation and an evaluation of the NPDES intake/discharge issues. (2001 to 2002)

 - Edison Mission Energy
Midwest Generation, Collins Conversion Project, 2 x 500 MW coal-fired units
 - Prepared environmental reviews and technical information to support the environmental permitting efforts for the conversion of two existing oil-fired boilers to coal-fired boilers. Prepared BACT/LAER analysis, PSD emission netting calculations, and description of alternate emission technologies. (2001)

 - Confidential Client
2 x 750 MW coal-fired facility
 - Prepared regulatory review and technical information to support the PSD air permitting effort for a new pulverized coal-fired unit. Prepared BACT analysis and MACT evaluation of hazardous air emissions from the proposed units. Technical support included emission calculations, description of emission control technologies and input for emission modeling. (2001-2002)

 - LS Power LLC
500 - 800 MW pulverized coal facility
 - Prepared an environmental evaluation of three potential locations for a new pulverized coal-fired unit. Reviewed state-specific air permitting and water intake/discharge requirements. (2000 -2001).

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- City of Grand Island, Nebraska
Burdick Station Combustion Turbine Project - 100 MW natural gas
 - Identified permit requirements and prepared permit applications for two simple cycle combustion turbines in Grand Island, Nebraska. Work included preparation of a PSD permit application and BACT analysis. (2001-2002)
 - Wisvest Corporation
South Works Combined Cycle Project - 500 MW natural gas
 - Researched permit requirements and prepared permit applications for a new combined cycle facility located at the site of a former steel mill in Chicago. Key issues included BACT requirements, and water intake/discharge issues associated with Lake Michigan.
 - Southern Illinois Power Cooperative
Marion Station, coal/gas/oil, 290 MW total - repowering project
 - Prepared permit applications for a new coal-fired fluidized bed boiler and two gas/oil-fired combustion turbines. Work included review of permit requirements and preparation of PSD permit application. (2001)

AIR PERMITTING – EXISTING PLANTS

- Nebraska Public Power District
Gerald Gentleman Station, Units 1 & 2 BART Evaluation
 - Prepared a Best Available Retrofit Technology (BART) evaluation for two existing nominal 700 MW coal-fired boilers. Tasks included evaluating potentially feasible NO_x, SO₂ and PM₁₀ control technologies, preparing emission calculations, preparing cost-effectiveness assessments, and supporting visibility impact modeling. Prepared the BART assessment for submittal to the permitting agency for review. (2008)
- Dairyland Power Cooperative
J.P. Madgett Station – carbon monoxide control BACT analysis - 435 MW coal-fired boiler
 - Prepared a BACT control technology analysis for CO and VOC emissions associated with boiler modifications including installation of low-NO_x burners. (2007)
- Dairyland Power Cooperative
Genoa Station – Particulate matter control BACT analysis - 380 MW coal-fired boiler
 - Prepared a BACT control technology analysis for particulate matter and PM₁₀ control associated with installation of a dry flue gas desulfurization control system, including a control technology evaluation for boiler PM/PM₁₀ as well as material handling particulate controls systems. (2007)
- Montana-Dakota Utilities
Heskett Unit 2 BART Analysis - 75 MW lignite-fired atmospheric fluidized bed
 - Prepared a Best Available Retrofit Technology (BART) evaluation for an existing 75 MW lignite-fired fluidized bed boiler. Tasks included evaluating potentially feasible NO_x, SO₂ and PM₁₀ control technologies, preparing emission calculations, preparing cost-effectiveness assessments, and supporting visibility impact modeling. Prepared the BART assessment for submittal to the permitting agency for review. (2006)

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- Coal Conversion Projects
 - Prepared emission calculations, emission netting calculations, and air-permit modifications for several PRB coal conversion projects at existing coal-fired generating facilities throughout the Midwest and eastern U.S. Projects included evaluating fugitive dust emissions and boiler emission changes associated with PRB conversions. (2002 through present)
 - Activated Carbon Injection Projects
 - Prepared emission calculations, emission netting calculations, and air-permit modifications for several activated carbon injection projects at existing coal-fired generating facilities throughout the Midwest. Projects included evaluating potential impacts activated carbon injection may have on existing particulate control systems, evaluating fugitive dust emissions associated with activated carbon handling, and preparing air construction permit applications. (2007 through present)
 - Flue Gas Desulfurization Retrofit Projects
 - Prepared emission calculations, emission netting calculations, and air-permit modifications for several flue gas desulfurization projects at existing coal-fired generating facilities throughout the Midwest and eastern U.S. Projects included evaluating fugitive dust emissions associated with limestone handling, and evaluating boiler emission changes associated with the FGD control system. (2002 through present)

WATER INTAKE AND WASTEWATER DISCHARGE PERMITTING

- Flue Gas Desulfurization – NPDES Permitting
 - Prepared NPDES permit modifications for wastewater treatment systems and wastewater discharges associated with flue gas desulfurization retrofit projects at several existing coal-fired power plants. NPDES permitting projects included characterization of the FGD wastes, providing detailed descriptions of the proposed wastewater treatment systems, providing characteristics of the treated wastewater and wastewater flow rates, and preparing the appropriate NPDES permit documents for submittal to the permitting agency. (2003 to present)
- Oklahoma Gas & Electric
Fleetwide 316(b) Compliance Project
 - Reviewed applicability of the Phase II 316(b) regulations to client's existing cooling water intake structures. Prepared a comprehensive technical evaluation of potentially feasible impingement mortality and entrainment control technologies. Developed preliminary compliance strategy and supported implementation of the applicable impingement and entrainment characterization studies. Prepared the Proposals for Information Collection (PICs) for each of the client's existing facilities. (2005 to present)
- Indianapolis Power & Light
Fleetwide 316(b) Compliance Project
 - Reviewed applicability of the Phase II 316(b) regulations to client's existing cooling water intake structures. Prepared a comprehensive technical evaluation of potentially feasible impingement mortality and entrainment control technologies, and developed preliminary compliance strategy. (2004 to 2005)

- Midwest Generation
Joliet Generating Station 316(b) Compliance Evaluation
 - Evaluated potential 316(b) compliance issues associated with proposed cooling system modifications an existing generating station. Evaluated proposed cooling system modifications for compliance with the Phase II 316(b) performance standards. (2005)

NEW SOURCE REVIEW, CLEAN AIR INTERSTATE RULE, AND CLEAN AIR MERCURY RULE EVALUATIONS

- Prepared New Source Review (NSR) applicability assessments for several proposed maintenance and modification projects at existing electric generating facilities. NSR applicability review projects include preparing emission calculations (e.g., past-actual emissions and project future-actual emissions), preparing NSR netting calculations, and preparing a comprehensive report describing the applicability of the NSR rules and summarizing the project-specific NSR requirements. (2002 to present)
- Prepared Clean Air Interstate Rule (CAIR) evaluations for several existing power generating facilities throughout the U.S. CAIR evaluations include: (1) projecting the number of NO_x and SO₂ allowances that will be issued to the facility pursuant to CAIR; (2) projecting future-actual emissions based on existing emission rates and projected capacity factors; (3) comparing projected emissions to projected allowances; (4) evaluating potentially feasible emission control technologies capable of reducing emissions to meet allowance obligations; (5) preparing emission calculations for each potentially feasible control technology; and (6) developing compliance strategies and timelines for the installation of emission control technologies.
- Prepared Clean Air Mercury Rule (CAMR) evaluations for several existing power generating facilities throughout the U.S. CAMR evaluations include: (1) projecting the number of mercury allowances that will be issued to the facility pursuant to CAMR; (2) projecting future-actual Hg emissions based on existing emission rates, fuel characteristics, control technologies, and projected capacity factors; (3) comparing projected emissions to projected allowances; (4) evaluating potentially feasible mercury control technologies; (5) preparing emission calculations for each potentially feasible control technology; and (6) developing compliance strategies and timelines for the installation of mercury control technologies.
- Prepared emission calculations for several proposed pulverized coal-fired units. Calculations accounted for emission reductions associated with post-combustion control systems including: selective catalytic reduction, selective non-catalytic reduction, fabric filters, electrostatic precipitators, and wet and dry flue gas desulfurization.
- Prepared emission calculations for numerous natural gas-fired and oil-fired simple cycle combustion turbine and combined-cycle combustion turbine projects. Calculations accounted for mission reductions associated with post-combustion control systems, including selective catalytic reduction and oxidation catalysts.

ENVIRONMENTAL DUE DILIGENCE AND FACILITY SITING

- Power Plant Evaluations
 - Evaluated the electrical generating assets of a large northeastern power supply generator in the United States for compliance with existing environmental regulations, and prepared an estimate of capital costs relating to compliance with future anticipated regulations.
 - Evaluated potential sites in several southern states for siting an 800-MW coal-fired power plant. Work included a review of available data and field reconnaissance to evaluate the property for potential wetlands, critical habitats, and sensitive receptors.
 - Evaluated potential sites for a 500-MW to 1000-MW combined cycle combustion turbine facility in California. Work included field reconnaissance to evaluate the property for potential wetlands, critical habitats and sensitive receptors.
- RCRA Siting
 - Evaluated locations to determine the feasibility of expanding an existing, or siting a new, hazardous waste treatment, storage and disposal (TSD) facility. Evaluations generally included a review of existing site data, a review of permitting requirements, site reconnaissance, and meetings with local community leaders.
- Property Acquisitions
 - Responsible for the environmental due diligence associated with the acquisition of several hazardous waste management facilities and used oil storage and recycling facilities. Work included preparation of a Phase I environmental assessment, document review, field reconnaissance, evaluation of existing data, developing and implementing a Phase II onsite investigation, and evaluating data generated from the Phase II investigation.

OTHER PERMITTING

- Toxic Substance Control Act (TSCA) - Polychlorinated Byphenyls (PCB) Alternative Destruction Permit
 - Permitted a refinery hydrotreating operation as an alternative destruction method for the destruction of PCBs in used oils. Work included preparing the permit application, designing the destruction evaluation/test program, negotiating permit conditions with state and local officials, and participating in public meetings and hearings.
- Hazardous Waste Deep Well Injection Permit
 - Permitted four deepwells associated with the manufacturing of chlorinated solvents for the disposal of acidic hazardous wastewaters. Work included permit preparation; overseeing the no-migration demonstration; interfacing with local, state, and federal authorities; and participating in public meetings and hearings.

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- Permits Associated with the Construction of New 120 Million Gallon Used Oil Refinery
 - Prepared environmental permits required for the construction and operation of a 120-million gallon per year used-oil refinery. Permits included air permits for the construction and operation of process heaters, storage tanks, and process equipment; preparation a wastewater pretreatment permit for the discharge of treated wastewaters to a publicly owned treatment works; preparation of a hazardous waste storage facility permit; and preparation of a Corps of Engineers permit for the installation of a barge loading/unloading facility.

 - Resource Conservation and Recovery Act (RCRA) Permitting
 - Prepared and submitted several RCRA Part-B permit applications for the treatment, storage and disposal of hazardous wastes. Negotiated permit terms and conditions with state and federal authorities.

 - National Pollution Discharge and Elimination System (NPDES) Permitting
 - Prepared NPDES permit applications for the discharge of wastewater generated by an electrical transformer manufacturing company with facilities located in Illinois, Wisconsin, and Tennessee. Work included the implementation of a routine discharge monitoring program.

 - Prepared an NPDES permit application for the discharge of wastewaters generated from the manufacturing of chlorinated solvents.

 - Ontario Wastewater Discharge Permit
 - Prepared a permit application in accordance with requirements of the Ontario Ministry of the Environment for the discharge of wastewaters generated from the re-refining of used oils and recycling of spent antifreeze.

ENVIRONMENTAL COMPLIANCE AND MANAGEMENT

- Southern Illinois Power Cooperative
Marion Station, 290 MW CFB.
 - Prepared a comprehensive PSD permit compliance document for facility personnel.

- Bainounah Power Company, Abu Dhabi, United Arab Emirates
Taweelah A1 Water and Power Project
 - Prepared an environmental baseline report to review existing data regarding soil and groundwater conditions at the Taweelah A1 facility, and determine whether the data was sufficient to establish a baseline of current environmental conditions at the site.

- MidAmerican Energy
 - Conducted a review of environmental rules and regulations governing the management and disposal of coal combustion waste products, and prepared an evaluation of the company's existing coal combustion waste management system.

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- Compliance Programs
 - Developed a program to screen used oils in the field for contamination with hazardous wastes. Presented the program to state and federal regulators.
 - Comprehensive Environmental Response, Compensation and Liability Act
 - Represented corporations listed as a Potentially Responsible Party (PRP) at several Superfund sites. Worked with PRP defense groups, interfaced with agency officials and advised corporate management of its potential CERCLA liabilities.
 - Environmental Auditing
 - Developed and implemented environmental audit programs for a chemical manufacturing facility located in Wichita, Kansas; including compliance with hazardous waste regulations, hazard communication requirements, wastewater discharge monitoring, and air emission monitoring.
 - Environmental, Health and Safety Audits
 - Conducted environmental, health, and safety audits at over 40 manufacturing facilities throughout the midwestern United States. Programs audited included hazardous and solid waste management, hazard communication, and employee training. Prepared a report summarizing findings and presented findings to company management.
 - Spill Prevention, Control and Countermeasure (SPCC) Plans
 - Developed a template for the preparation of SPCC Plans at used oil storage facilities located throughout the United States. The program included procedures to review, evaluate, and update the SPCC plans every three years.
 - Training Programs
 - Developed an employee training program concerning the proper handling of hazardous wastes. Training included waste storage procedures, container labeling, shipping, manifesting, record keeping, and emergency response. Conducted training programs throughout the United States.

PUBLICATIONS

Snell, K.J., "Permitting New Coal: Best Available Control Technology – How Low Can Technology Support," proceedings of the 9th Annual Electric Power Conference and Exhibition, Rosemont, IL, May 2007.

Snell, K.J., "316(b) Phase II Final Rule: Regulatory Review and Compliance Options – April 2006 Update," proceedings of the 8th Annual Electric Power Conference and Exhibition, May 2006.

Snell, K.J., Schowalter, D. (Fluent, Inc.), and Cook, R. (Cook Legacy), "Effective Compliance Strategies for EPA's 316(b) Rule on Cooling Water Intakes," Electric Power 8th Annual Conference and Exhibition, Pre-Conference Workshop, Atlanta, Georgia, May 2006.

Snell, K.J., Marmer, D., "316(b) Phase II Final Rule: Regulatory Review and Compliance Options," proceedings of the 7th Annual Electric Power Conference and Exhibition, May 2006

Snell, K.J., Krause, T.P., "Permitting a New Coal-Fired Electric Generating Unit – Lessons Learned," proceedings of COAL-GEN 2004, Overland Park, Kansas, July 2004.

Snell, K.J., Krause, T.P., Farber, P.S., "Multi-Pollutant Emissions Control Requirements for Power Plants," proceedings of COAL-GEN 2004, Overland Park, Kansas, July 2004.

Snell, K.J., "Planning for Future Regulations and Multi-Emission Legislation," proceedings of American Coal Council, Mercury & Multi-Emission Compliance: Strategies & Tactics Seminar, March 2003.

"New Source Review Changes, Multi-Pollutant Legislation, and Regulatory Initiatives Affecting Power Plants," (coauthor), Air & Waste Management Association, 96th Annual Conference and Exhibition, June 2003.

Snell, K.J., Krause, T.P., Farber, P., "New Source Review Changes," Electric Light & Power, January 2003.

Snell, K.J., "NO_x Compliance and Pending Regulatory Changes," Electric Light & Power, March 2002.

Snell, K.J., Krause, T.P., "Cooling Water Intake Regulations Hit Nuclear, Fossil-Fuel Plants," Electric Light & Power, August 2002.

EDUCATION

Loyola University - M.B.A - 1973

Valparaiso University - B.S. Mechanical Engineering - 1968

EXPERTISE

Conceptual design development, Coal Units (PC, CFB & IGCC)

Conceptual design development, CC/CT

Biomass co-firing for new and retrofit boilers

Acid rain compliance studies SO₂ and NO_x

Technology Assessment for Generating Alternatives

Fossil betterment and backfit work

Unit Life Assessment

Valve specialist

Project management

Mechanical engineering

Coordination among client, site construction manager, and contractors

New unit fossil plant design

Cycling

Cooling towers

Combustion turbine

Combined cycle

Cogeneration

RESPONSIBILITIES

Mr. Rosenquist is responsible for the planning, budgeting, scheduling, and performance monitoring of Sargent & Lundy's work on projects to which he is assigned. He leads the project engineering staff in the preparation of such management documents as engineering and construction schedules, cost estimates, and the scope of work. Mr. Rosenquist controls Sargent & Lundy's project engineering man-hour expenditures by regularly monitoring expended man-hours versus projected man-hour estimates. He advises the client regarding the project's status in monthly engineering and construction progress reports, during review meetings, and in his day-to-day communications with the client. Through the project engineers, he coordinates the project engineering across all disciplines. He coordinates the development of engineering documents such as design criteria, specifications, licensing documents, schematic and working drawings, bid evaluations, and design instructions. On major purchases, he works with the client and vendors to select equipment best suited for specialized plant operating duty. Mr. Rosenquist maintains surveillance of Sargent & Lundy's vendor document review process to monitor how these documents are employed in the overall project design. He is also responsible for ensuring that project design and deliverables meet the needs and requirements of the client.

During the initial phase of a power plant project, Mr. Rosenquist is responsible for developing and optimizing a conceptual design to suit the owner's needs and meet site-specific requirements. He directs the efforts of the various discipline engineers on the project team in

optimizing the cycle configuration, preparing piping and instrumentation diagrams, optimizing the site layout, and developing plant arrangement drawings. He works closely with Sargent & Lundy's Preliminary Design Section to develop and optimize plant arrangements.

EXPERIENCE

Mr. Rosenquist has extensive experience in the mechanical engineering and design of major steam-electric generating stations and their backfits and upgrades. He has over 35 years of experience. He has significant experience with coal-fired power plant design and with managing power plant projects. He also has considerable experience in developing conceptual designs site studies for power plants alternatives. He has participated in or led the development of conceptual designs for several recent power plant projects. His early experience was with detailed engineering for one 520 MW supercritical unit for NIPSCO's Michigan City 12 (1969-1972) and one 670 MW supercritical unit for AEP, Cardinal Unit 3 (1972-1977). He served as a Mechanical Engineer on Michigan City #12 and Project Engineer and Project Manager on Cardinal #3. He served as Project Manager on Middle South Utilities six 890-MW PC units. (1978-1982)

Mr. Rosenquist was responsible for commercialization of the CAT Workstation (emission compliance planning tool). He has interfaced with numerous clients to make them aware of this product and provided training for users. He has performed SO₂ and NO_x Compliance Studies using the work station on for over 10 utilities.

He has worked closely with several utilities to evaluate applicable NO_x reduction alternatives and thus develop a compliance strategy.

As the project manager on a 650 MW coal-fired power plant project, Mr. Rosenquist was responsible for developing the initial conceptual design and for leading the subsequent detailed design and engineering work. During the conceptual design phase of this project, he worked closely with Sargent & Lundy's Preliminary Design Section, Sargent & Lundy's project team, and the client to develop a customized conceptual design.

As a project manager on an 890 MW power plant project, Mr. Rosenquist participated in the development of a detailed conceptual design. This particular project required that a single standard design be developed for plants that would be capable of firing either western coal or lignite and be located at many sites. The plant arrangements were developed so that auxiliary equipment from all manufacturers could be used interchangeably. Major equipment procurement specifications were prepared for six 890 MW units and included power block equipment such as steam generators, turbine generators, flue gas desulfurization (FGD) systems, cold precipitators, feedwater heaters, boiler pumps, etc.

He is also one of Sargent & Lundy's valve specialists providing consultation to other teams on valve issues.

His experience includes:

NEW UNIT CONCEPTUAL DESIGN DEVELOPMENT AND PERMITTING

- AEP
 - Conceptual design development of standard 600-MW/PC and CFB units.
 - Site selection for 600MW's of IGCC technology

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- AES
 - Numerous conceptual design development projects (PC & CFB) to support permitting of new units at several different locations (Confidential Projects).
 - AMP-Ohio
 - Site selection permitting support and conceptual design for new two-unit coal plant. (2003 to present)
 - Basin Electric
 - Conceptual design development for a 250 to 400 MW new PRB fueled unit. Reviewed alternative technologies for using the mine-mouth PRB fuel, including PC, CFB and IGCC. Developed air emission estimates for each for inputs to air modeling. Prepared layouts and estimated total costs (capital, O&M, and fuels). (2004 to present)
 - Dairyland Power
 - Conceptual design and technology screening evaluation for a new coal unit at an existing site. Size 250 to 500 MW. (2004)
 - Tondur Corporation
 - Prepared layouts, capital costs, and performance estimates for converting a combined-cycle site to an IGCC facility. (2005)
 - Review fuel alternatives at Flier City, which burns wood, coal, and tires. Evaluate NOX reduction alternatives. (2007-2008)
 - Florida Power & Light
 - Site selection, permitting support and conceptual design for new 2x850 MW coal unit. (2004)
 - LCRA
 - Prepared a unit feasibility study for the addition of power at a Greenfield site. Evaluated PC, CFB and IGCC technologies in two different megawatt size ranges, 250MW-n and 500MW-n. Prepared layouts, cost estimated and overall applicability to the client's need for power. (2003)
 - Updated previous study referenced above. (2006)
 - Confidential Midwest Client –
 - New unit screening study, evaluating solid fuel steam generation options, PC's CFB, and IGCC. Study included assessing the ability of each technology to fire biomass.
 - AES

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- Project consisted of preparing conceptual design and permitting documents for a coal/wood burning CFB in British Columbia, Canada. Plant was developed to burn up to 40% wood in a nominal 190 MW CFB boiler. Include separate wood receiving, storage, reclaim, preparation, and delivery system to the boiler. (2006-2007)
 - Mitsui
 - Conceptual design development and permitting support for a 2x2x1 "F-technology" CTCC facility. Project includes site development, cost estimates, performance calculations, general arrangements, water balances.
 - PP&L
 - Technology screening, feasibility, conceptual design of selected technology, air emissions estimates, pollution control equipment selection, cost estimate, heat balances, for a coal-based repowering of existing steam turbines. (2004)
 - Total
 - Combustion Turbine Combined cycle – Cogeneration plant for Northern Alberta, Study involves evaluation of CT for producing steam and electrical power.
 - Wisvest – Southworks
 - 500 MW Combined Cycle plant conceptual design, performance, cooling system evaluation, cost estimate. (2001)
 - CFB Plants; Conceptual design and feasibility study for a 2 x 250 MW CFB plant at two different West Virginia sites. Cost estimate, layouts, performance estimates. (2000)
 - Intermountain Power
 - 950 MW Coal Unit conceptual, design cost estimate, air permit application, emission estimates, heat balances, photo rendering, water balance. (2002)
 - Alliant – Corn Products
 - 3x3x1 GE-7FA - 950 MW Combined Cycle, cogen plant, conceptual design, performance, cost estimate, four emission calculations. (2001)
 - Midwest Gen
 - Conceptual design for converting two 550-MW units to burn coal, included cost estimate, layouts air permit input. (2001)
 - Wisconsin Electric (We energies)
 - 2 x 660 MW new coal unit 1 x 500 MW IGCC. Technology screening, feasibility, conceptual design of selected technology, air emissions estimates, pollution control

equipment selection, cost estimate, heat balances, photo renderings and water balance. (2000-2001)

- Westcoast Power, Inc.
 - Project manager. Working with SNC-Integ to support the development of cogeneration projects. (1992)
- Wisconsin Public Service
 - 2000X, new unit.
Evaluation of new unit generation options and evaluation of multiple sites for new unit capacity addition. (1991)
- Pacific Gas and Electric Company
 - Cost estimates and design review for combustion turbine repowering project and combustion turbine/combined cycle new unit using GE-7FA combustion turbines. (1991)
 - Conceptual cost estimates for five simple cycle combustion turbines and five-combined cycle unit alternatives, including performance data. (1990)
- Portland General Electric
 - Preparation of conceptual cost estimate, life cycle costs, and performance data for a 250 MW combined cycle facility located at three different sites. (1991)
- Multitrade Group, Inc.
 - Undesignated unit, coal, 400 MW.
Project Manager. Development of conceptual design, including arrangement, piping and instrumentation diagrams (P&ID), cost estimates, and schedules. (1988)
- Middle South Services, Inc.
 - Six standard units, coal and lignite, 890 MW each.
Detailed design authorized following completion of conceptual design. (1982)
 - Project Manager. Conceptual design of coal-fired unit that could be duplicated. Final report consisted of four volumes detailing the conceptual design. Cost estimates and schedules were included. (1977 to 1978)
- Wisvest
 - Owner's Engineering support for Blythe project (2x2x1 CC/CT 500 MW) design activities for Blythe Project (1999-2001)

PLANT BETTERMENT

- Wisvest

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- Owner's Engineer to support non-regulated side in retrofit work at units recently purchased and ones which they are developing. Work includes PC-coal unit, oil-fired unit, new CFB unit feasibility studies and Owner's Engineering support for new combined cycle units. (1998 – present)
 - Plant refurbishment projects for Bridgeport Harbor including multi-pollutant reduction study, station auxiliary power upgrade and fuel switching for BHS and miscellaneous projects for New Haven Station. (1999-2000)
 - Wisconsin Electric
 - Prepared conceptual designs for two 660 MW supercritical coal units 1-500 MW IGCC unit, one 500 MW combined cycle unit to replace existing 70 year-old coal unit and wood-fired stoker boiler at a third site.
 - SO₂ compliance planning for Phase I (SO₂) and Phase II (NO_x).
 - Project Manager. Engineering service agreement covering a wide array of support services involving all engineering disciplines. (1988)
 - Oak Creek 8, coal, 310 MW.
 - Preparation and evaluation of turnkey specification for new fly ash storage silo located at an existing site. (1991)
 - Managed site team of engineers and designers who prepared approximately 500 new P&IDs for the units. (1988 to 1989)
 - Addition of process steam header common to all four units. Addition of pressure-reducing and steam-conditioning stations off each unit's main steam header for supply steam. (1988 to 1989)
 - Pleasant Prairie 1 and 2, coal, 617 MW each.
 - Economic study for providing energy sources (steam, hot water, and chilled water) from the power plant to a nearby industrial park; heating, ventilating, and air conditioning modifications. (1988)
 - Addition of four miles of new railroad track to tie into a second railroad trunk line.
 - Oak Creek 5-8, coal, 1120 MW total.
 - Analysis of high-energy piping systems, including safety-valve thrust load analysis. (1987)
 - Commonwealth Edison Company
 - Various fossil stations (coal and oil).
 - Project Manager. Betterment projects including coal-handling dust collector additions, chimney liner repairs, buried piping repairs and upgrading, fire protection enhancements, etc. for all fossil units. (1980 to 1981)
 - Hot Reheat Pipe Replacement
 - Project Manager for two hot reheat pipe replacement projects for 2-500 MW units.
 - DTE Energy

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- Trenton Channel #9 Hot Reheat Pipe Replacement retrofit project (1999)
 - Trenton Unit 7A - Replaced existing 50 year-old steam turbine with new controlled extraction turbine and generator, new feedwater heaters and associated piping and integrated extraction steam line across entire station.

COMPLIANCE PLANNING STRATEGY DEVELOPMENT

- Wisconsin Electric
 - Phase I SO₂ Compliance Planning.
Identified applicable SO₂ reduction technologies, develop cost performance and perform an economic evaluation to determine least cost strategy alternatives. Follow on activity included updating the cost and performance of the SO₂ alternatives and economic analysis utilizing the CAT Work Station.
 - NO_x compliance planning. Identify applicable NO_x reduction technologies for all units in the WE System, develop cost and performance data for each technology, perform economic analysis of these cost alternatives utilizing the CAT Workstation.
- Tampa Electric
 - Prepare a response for Tampa Electric to the proposed Title IV Phase 2 NO_x rules. This included identifying the applicable reduction technologies for each unit including capital and O&M cost and NO_x reduction performance. Included in the O&M evaluation was the effect of secondary environmental impact such as added ash disposal, loss of flyash sales, etc.
 - Prepare a response to the EPA's response to the previously prepared comments to Phase 2-rule making. This response included detailed conceptual design for SCR installation at 9 units.
- Dairyland Power
 - Identify applicable NO_x reduction technologies, develop capital O&M cost and estimated NO_x performance, utilize the CAT Work Station to identify least cost alternatives for meeting various proposed regulations such as Title IV, Phase 2 and proposed OTAG regulations.
- Dominion Energy
 - Develop cost and performance for applicable NO_x reduction technologies for Kincaid Units 1&2 to support Dominion Energy in developing their Phase 2 and OTAG compliance strategies develop. Work included conceptual designs for both induct and full scale SCR retrofits.
- Consumer Energy
 - System-wide NO_x reduction evaluation included identifying applicable NO_x reduction technologies for each unit developing capital and O&M cost and NO_x reduction performance at each. Also included CAT Work Station least cost analysis of pending rule making such as Title I OTAG compliance alternatives by the year 2002, 2004 or 2007.

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- Rochester Gas and Electric
 - SNCR Retrofit Project including boiler baseline testing and temperature window mapping includes preparation of procurement specification for SNCR technologies.
 - South Carolina Electric & Gas
 - System-wide NO_x compliance strategy development included identifying applicable capital and O&M cost for each technology and NO_x reduction performance and included the CAT Work Station analysis of least cost alternatives for meeting various proposed regulations.
 - Polish Power Grid
 - Participated in a project team organized by NYSEG through the US Trade and Development Program. Basis of the program was technology transfer in the area of NO_x emission and developing lease costs compliance alternatives.
 - Montana Dakota Utilities
 - NO_x emission reduction study to identify strategies for improving NO_x emission rate at low loads on a lignite-fired CE unit.
 - Alliant/Corn Products
 - Phase I engineering of 950 MW combined-cycle cogeneration plant involving 3 GE 7FA's and two steam turbines. Developed controlled-extraction layouts, cost estimates, schedules, and electrical interconnect. (2000)

CYCLING AND UNIT ASSESSMENT

- We Energies
 - Unit condition assessment for 4 coal plants, 17 units; developed long-range financial requirements for continued operation.
- Centerior Energy
 - Evaluation of low load operation for 10 fired units to determine suitability for variable pressure operation at low load.
- Central Hudson Gas & Electric
 - Roseton
 - Provide engineering services for low load/ cyclic duty study of the plant. (1995)
- Minnesota Power
 - Low load improvement study at Clay Boswell Station, including review of low load NO_x emission rate.
- Hydro Quebec
 - Assisted SNC-Integ on life assessment work at Tracy Station. (1990)
- TU Electric

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- Eagle Mountain 1-3, gas, 707 MW total.
Project Manager. Conversion of existing turbine-generator water seals to steam seals for future cycling duty. (1986 to 1987)
 - Public Service Electric and Gas Company
 - Hudson 2, coal, 660 MW.
Project Manager. Cycling study review to determine modifications for obtaining 10%, 30% low-level, and/or on-off cycling capabilities. (1985 to 1987)
 - Florida Power Corporation
 - Project Manager. Cycling study review of three-unit oil-fired plants and recommendation of cycling modifications for all three units; cost-benefit analysis to identify appropriate recommendations for improvement projects. (1986)
 - Electric Power Research Institute (EPRI)/Public Service Electric and Gas Company of New Jersey
 - Hudson 2, coal, 650 MW.
Project team member for cycling conversion strategy study. Study involved preparation of cycling design conversion guidelines for converting the base-loaded supercritical unit to cycling duty. (1985 to 1986)
 - Middle South Services, Inc.
 - Six standard units, coal and lignite, 890 MW each.
Assistant Project Manager. Detailed design including cycling duty capability. (1978 to 1980)

PLANT DESIGN

- Middle South Services, Inc.
 - Six standard units, coal and lignite, 890 MW each.
Assistant Project Manager. Detailed design of standard unit capable of firing either western coal or lignite and that could be duplicated six times at different sites. Project included conceptual design developments. (1977 to 1980)
- American Electric Power Service Corporation/Buckeye Power
 - Cardinal 3, coal and oil, 676 MW.
Project Manager. Complete design of new supercritical unit. Project included development of initial conceptual design, site optimization, and detailed design. (1972 to 1977)
- Northern Indiana Public Service Company
 - Michigan City 12, coal, 521 MW.

Mechanical Engineer. Design of new supercritical unit, including participation in conceptual and detailed design activities. (1969 to 1972)

CLIENT COORDINATION

- Wisconsin Electric
 - Fossil engineering. Primary contact between client's fossil engineering personnel and Sargent & Lundy personnel for development of client's engineering standards. (1988 to present)
- Florida Power Corporation
 - Fossil engineering. Primary contact between Sargent & Lundy personnel and client's staff for coordination of high-energy pipe assessment project. (1988)
- Seminole Electric
 - Fossil engineering.

Primary contact between Sargent & Lundy personnel and client's staff for coordination of high-energy pipe assessment project. (1988)

STUDIES

- Pacific Gas and Electric Company
 - Performed a two-phased study to evaluate full and partial repowering alternatives on several units. Final report included performance data, conceptual layouts, and capital and operating and maintenance cost estimates. (1991 to present)
 - Performed low-level heat recovery study in which conceptual designs, cost estimates, and performance data were developed for retrofit of low-level heat recovery equipment (liquid coupled economizer and heat pipe) downstream of an existing air heater. (1989 to 1991)
 - Conceptual design and cost study for retrofitting selective catalytic reduction technology to 10 boilers. Developed layouts, material balances, and capital and other cost estimates. (1990)
- Southwestern Electric Power Company
 - Developing conceptual arrangements and costs for adding coal-unloading facilities at an existing mine-mouth lignite field plant. (1990)
- Wisconsin Electric
 - Clean Air Act acid rain compliance study to develop least-cost option for compliance. Includes macro-screening of more than 80 technologies as well as technical and economic analyses to determine least-cost control strategy for implementation of options in 22-unit system. (1990)
 - Development of conceptual layouts, including preparation of cost estimates and performance data, for alternative FGD systems for two 600 MW coal-fired units, two 250 MW coal-fired units, and two 350 MW coal-fired units. (1990 to present)

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- Performance of study to identify heat rate and unit capability impacts due to heat extraction from various parts of power plant cycle. Heat was to be furnished to a nearby industrial park. (1987)
 - DesignPower of New Zealand
 - Performed several studies for conversion of one of Electricorp's existing units to burn orimulsion fuel. Studies involved identifying alternative FGD systems and associated costs as well as reviewing balance of plant modification requirements. (1990 to 1992)
 - TU Electric
 - Closed bottom ash cycle system study involving preparation and evaluation of various schemes for bottom ash water recycling using open settling ponds, surge tanks, clarifiers, and heat exchangers. (1986)
 - Arkansas Power & Light Company
 - Conceptual design of lignite/charcoal-fired unit; study to determine the capital and operating costs of modifying a 900 MW lignite-fired unit to provide the capability for supplementary charcoal combustion. (1978 to 1979)

SPECIAL PROJECTS

- Quality Improvement Program (QIP)
 - Member of one of the first five company QIP teams. Team's recommendations are being implemented. (1990)
- Wisconsin Electric
 - Development of engineering standards, procedures, and guidelines for client, based on existing Sargent & Lundy documents. (1988 to 1989)
- Planning & Scheduling Committee
 - Mechanical Department representative on a Sargent & Lundy interdepartmental committee to develop and implement a project planning and scheduling program. The company's current Engineering Project Monitoring System (EPMS) was developed by this committee. Also chaired subcommittee of Mechanical Department's divisional representatives to further implement the EPMS system and to develop a feedback cycle. (1982)

PUBLICATIONS

"NO_x Reduction Strategies," Sargent & Lundy's General Engineering Conference, Chicago, Illinois, Spring 1992

"Low Cycle Fatigue--Large Centrifugal Draft Fans," presented at EPRI's Cycling Workshop, Princeton, New Jersey, October 1987

"Cooling Towers in Northern Climates," Electric Light and Power, October 1978

"Evaluation of SCR as a NO_x Control Option for Pacific Gas & Electric," presented at the EPRI/EPA 1993 Joint Symposium on Stationary Combustion NO_x Control, May 24-27, 1993

"NO_x Compliance Planning Using the CAT Workstation TM," presented at EPRI's NO_x Workshop, August 6-8, 1996

"Evaluating the Environmental Value of Various Coal Switching/Cleaning & Blending Options as an Emission Reduction Technology," presented at EPRI's Conference on Effects of Coal Quality on Power Plants, August 12-19, 1996

"Petroleum Coke as an Alternative Fuel for New Generation & Repowering," presented at American Power Conference, April 9-11, 1996

"NO_x Control Analysis Using the CAT Workstation TM", presented at the American Power Conference, April 1994

"Phase II Positioning, Evaluating Phase II Alternatives Before the Regulations are Issued," presented at the 1995 Joint Symposium on Stationary Combustion NO_x Control, May 1995

Evaluating Coal-Fired Power Generation Technologies to Meet Future Generation Needs presented at COAL-GEN 2001, Chicago, Illinois July 25-27, 2001

Environmental Control Technologies for our next generation of coal plants presented at DOE/EPA/EPRI Mega Symposium, August 2001.

Complexities of Achieving Fuel Flexibility on New Coal Units presented at the Electric Power 2005 conference in Chicago. May 2005

Abstract

This paper will discuss the issues that need to be considered early in the project's development to allow for not only competitive fuel delivery but maximum flexibility in fuel sourcing as well. Impacts such as choosing air emission rates for various pollutants for use in air modeling, selecting pollution control equipment that can support the proposed permit limits for a range of fuels, impacts to coal-handling layouts, ash handling and sales of waste products, impacts on materials of construction.

"Design Considerations for the Combustion of Bitumen-Based Fuels", presented at the Oil Sands and Heavy Oil Conference in Calgary, Alberta, Canada, July 2007.

"Update of Design Considerations for the Combustion of Bitumen-Based Fuels, based on Recent Test Burns", presented at the World Heavy Oil Conference in Edmonton, Alberta, Canada, March, 2008.

EDUCATION

Michigan Technological University - B. S. Chemical Engineering - 1972

REGISTRATIONS

Professional Engineer - Wisconsin

EXPERTISE

Air toxic control technologies
Combined NO_x and SO₂ control technologies
Coal gasification and its integration with combustion turbines and combined cycles (IGCC)
Condition assessment of emission control systems and equipment
Combustion and post-combustion NO_x control technologies (LNB, OFA, SNCR, SCR, etc.)
ESP and FF particulate control technologies
Emission control byproduct development (gypsum, fertilizer, etc.)
Emission control technologies
Flue gas desulfurization (FGD)
Repowering with advanced combustion technologies

RESPONSIBILITIES

As Senior Vice President and Director of Environmental Services, Mr. DePriest is responsible for ensuring that all fossil-related projects are fully supported with the appropriate environmental related expertise for successful execution of the project. He is also responsible for maintaining current expertise in environmental technologies for fossil fired power facilities including PC, CFB, and IGCC plants.

EXPERIENCE

Mr. DePriest has more than 30 years of experience dedicated to the application of emission control technology in the utility industry. This expertise primarily focuses on the areas of NO_x, SO₂, and particulate control with expanding expertise in air toxin and CO₂ control.

As Sr. Vice President and Director of Environmental Services, Mr. DePriest has directed the application of both combustion-based and post-combustion-based NO_x control technologies on a variety of coal and gas fired utility plants representing well over 30,000 MW of capacity. These NO_x control technologies covered the spectrum of commercially available technologies including

low NO_x burners (LNB), over-fire air (OFA) systems, neural networks, selective non-catalytic reduction (SNCR), selective catalytic reduction (SCR), reburning, and combinations of these.

In addition, Mr. DePriest has directed, or is currently directing, the application of flue gas desulfurization (FGD) technology on 20 recent retrofit FGD projects representing over 12,000 MW of coal-fired generating capacity.

Mr. DePriest has also directed S&L's IGCC Program through work with utility clients, EPRI, and permitting agencies.

Mr. DePriest is a recognized expert in the industry on environmental control technology and he has written and published extensively on the subject.

Before joining Sargent & Lundy, he was the environmental product manager for a major equipment supplier to the utility industry. He had responsibility for the company's environmental product lines, including, NO_x reduction systems, FGD systems (wet and dry), precipitators and baghouses. In this capacity he managed the functional engineering on more than 10 wet and dry FGD systems. This functional engineering involved equipment sizing, specifications, material of construction, and overall process design from the air heater outlet to the stack. Also included was similar design work on auxiliaries, such as reagent preparation systems and waste dewatering and disposal systems. Two of these systems produce gypsum as a byproduct, which is currently being used by leading wallboard manufacturers.

Mr. DePriest managed a field process-engineering group in conjunction with this design work, which started up and serviced utility emission control systems. He also supervised the operation of two emission control pilot projects operated at coal-fired utility sites. One used magnesium-promoted lime as the reagent and the other used waste soda liquor. Information generated from these pilots was then used in the process design of full-scale FGD systems.

His specific experience over his 20 years with Sargent & Lundy includes:

COAL GASIFICATION EXPERIENCE (IGCC)

- Minnesota Power
 - Advanced integrated gasification/pressurized fluid bed combustion.

Project Manager. Development of an advanced integrated gasification/pressurized fluid bed combustion conceptual design with a major boiler manufacturer. Project included hot/pressurized particulate and sulfur clean-up processes as well as advanced combustion turbine technology. (1992 to 1994)

- Electric Power Research Institute

- PRENFLO-based integrated-gasification combined cycle (IGCC) study.

Project Manager. Study investigating the advantages and disadvantages of integration of the air separation plant with the combustion turbine on a PRENFLO-based IGCC power plant. Study also included the use of advanced high-temperature particulate control of the raw syngas prior to desulfurization and combustion. (1989 to 1993)

- Advanced IGCC concepts study.

Project Engineer. Study of advanced concepts of IGCC power facilities. Study quantified the heat rate improvements expected from employing advanced cycle designs and the related costs for a nominal 400-MW plant. (1987 to 1989)

- IGCC Site Selection

- Under Mr. DePriest's direction, S&L has assisted utilities with the selection of sites for IGCC deployment in Indiana, Virginia, Oklahoma, Kentucky, Louisiana, Arkansas, Ohio, Tennessee, West Virginia, Virginia and Indiana.

- IGCC Permit Application and Support

- Under Mr. DePriest's direction, S&L has written permit applications and/or performed BACT analysis for IGCC deployment in IL, MT, NT, ND, WY, and MI.

RECENT EMISSION CONTROL PROJECT EXPERIENCE

- SO₂ Control Projects

20 FGD projects representing over 12,000 MW of coal-fired capacity. Included in this experience are the following example of utility FGD programs:

- Cinergy
- Kentucky Utilities (LGE)
- American Electric Power
- Santee Cooper

- Strategic Planning Projects

Strategic Compliance (NO_x, SO_x, particulate and Hg) Plan Development for 36 different utility systems representing over 40,000 MW of capacity. Included in this experience are the following examples of utility system-wide emission compliance plans:

- Ameren UE/Ameren CIPS
- Associated Electric
- Cinergy
- MidAmerican
- Reliant Energy
- TXU

- NO_x Control Projects

Over 30 low NO_x burner (LNB) projects representing over 6,000 MW of capacity, 30 selective catalytic reduction (SCR) retrofit design projects for coal fired units representing 16,000 MW of capacity, and 13 gas fired units representing over 8000 MWs of capacity. Some recent examples are:

- Dynegy (LNB, OFA, SCR, ESP)
- Reliant Energy (LNB, OFA, SCR)
- Santee Cooper (SCR, FGD)
- Cinergy (LNB, SCR, FGD)

- Electric Power Research Institute

- Development of advanced retrofit FGD concepts for compliance with the 1990 Clean Air Act Amendments. (1991 to 1992)
- Development of the Clean Air Technology (CAT) computer workstation to identify least-cost SO₂ and NO_x compliance strategies. (1991 to 1992)
- Project Manager: Study involves the screening of over 60 advanced combined NO_x/SO₂ processes, selecting the eight most promising for utility application, performing

conceptual design and cost estimates, and identifying research and development requirements to bring to commercial viability. (1988 to 1992)

- Project Manager. Study of FGD systems in cycling service that investigated the effect that various types of unit cycling will have on six different generic types of FGD processes. Guidelines for design and operation resulted from the study. (1988 to 1991)
- Project Consultant. Retrofit FGD design improvement study to identify and investigate design improvements to reduce the cost of retrofitting FGD to utility power plants. (1988 to 1990)

Some specific examples of Mr. DePriest's work with the control of SO₂ while with Sargent & Lundy follow:

As Manager of Environmental Services, Mr. DePriest has managed the process design on all of S&L's 20 FGD projects since 1990. The following five FGD retrofit projects are examples of these projects:

- Kentucky Utilities: Ghent 1, coal, 550 MW
- Owensboro Municipal Utilities: Elmer Smith 1 and 2, coal, 416 MW total
- TXU: Monticello 3, coal, 750 MW and Martin Lake 1-3, coal, 720 MW each
- Cinergy: Gibson 4, coal, 650 MW
- Santee Cooper Winyah 1 and 2, coal, 320 MW each

The following are other examples of Mr. DePriest's experience with SO₂ control on coal-fired power plants:

- Owensboro Municipal Utilities
 - Elmer Smith 1 and 2, coal, 416 MW total
 - Emission Control Consultant. Acid rain legislation compliance study. (1989 to 1990)
- Ameren
 - Systemwide coal-fired units.
 - Project Manager. System Strategic NO_x and SO₂ compliance planning study. (1989 to 1990)

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- Northern Indiana Public Service Company
 - Bailly 7 and 8, coal, 616 MW total
 - Provided expert advice on the retrofit of a Mitsubishi wet FGD system (Pure Air) to the combined flue gases from these two units. (1988 to 1989)
 - Central Louisiana Electric Company, Inc.
 - Dolet Hills 1, lignite, 719 MW
 - Provided expert advice on performance test methodologies, interpretations of testing results, and comparison of results with contract guarantees. Systems tested included the electrostatic precipitator and FGD systems. (1987 to 1989)
 - TXU
 - Sandow 4, lignite, 591 MW
 - Designed process to recover di-basic acid from the spent slurry leaving a limestone-based FGD system. This facilitated recycling the di-basic acid for reduced plant operating expense. (1986 to 1987)
 - Southwestern Electric Power Company
 - Pirkey 1, lignite, 720 MW
 - Developed a performance test specification and methodologies for contract guarantee testing of the air heaters, precipitators, and FGD system. Interpreted test results and system suppliers' compliance with guarantees. Provided general process expertise for solving performance problems that were causing load reductions to maintain compliance with emission regulations. (1985 to 1986)

OTHER FLUE GAS DESULFURIZATION PROJECT EXPERIENCE PRIOR TO JOINING SARGENT & LUNDY

- Pacific Power & Light Company/Idaho Power Company
 - Jim Bridger 2, coal, 508 MW
 - Managed the process design and functional engineering of the backfitted sodium-based FGD system. Managed the one-year/\$1,000,000 pilot project at the station, the results of which were used in the full-scale equipment design. (1983 to 1985)

- Lakeland Department of Electric & Water Utilities

- McIntosh 3; coal, oil, and municipal refuse; 350 MW

Managed the process design and functional engineering of the FGD system on this multi-fueled power plant. Plant typically operates on high-sulfur augmented with refuse. (1978 to 1982)

- San Miguel Electric Cooperative

- San Miguel 1, lignite, 400 MW
(1976 to 1982)

- Sikeston, Board of Municipal Utilities

- Sikeston 1, coal, 235 MW
(1978 to 1981)

- South Carolina Public Service Authority/Santee Cooper

- Winyah 2 and 3, coal, 270 MW each
(1975 to 1980)

- Southern Illinois Power Cooperative

- Marion 4, coal, 173 MW

Process Design Engineer and Supervisor. Control and instrumentation systems design and supervisor of field process engineering and startup services for limestone-based FGD systems. (1976 to 1978)

- Allegheny Power System/Monongahela Power Company

- Pleasants 1 and 2, coal, 626 MW each

Process Design Engineer and Supervisor. Control and instrumentation systems design as well as supervisor of field process engineering and startup services for limestone-based FGD system. Designed a 5,000 cfm pilot to simulate the full-size unit and develop data for use in its ultimate design. (1977 to 1980)

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- Kansas City Power & Light Company/Kansas Gas and Electric Company
 - LaCygne 1, coal, 848 MW

Field Service Engineer. Pioneering (5% to 7%) limestone-based FGD system. (1973 to 1975)
 - Commonwealth Edison Company
 - Will County 1, coal, 188 MW

Field Service Engineer. Company's first FGD system, which was also a retrofit application. (1972 to 1973)

NO_x CONTROL EXPERIENCE:

Mr. DePriest has been the Environmental Services Director for both combustion-based and post-combustion-based NO_x control projects.

Following are example utilities where Mr. DePriest has experience with the retrofit of the low NO_x burners (LNB) and overfire air (OVA) systems:

- Reliant Energy (Texas Genco)
- Owensboro Municipality Utilities
- Mid American

Following are example utilities where Mr. DePriest has experience with the design of post combustion SCR projects:

- Dynegy
- Reliant Energy (Texas Genco)
- Santee Cooper

EMISSION CONTROL BYPRODUCT DEVELOPMENT

- Owensboro Municipal Utilities

- Elmer Smith 1 and 2, coal, 450 MW

Conversion of forced oxidation system to commercial grade gypsum production for wallboard use. (1994)

Houston Lighting & Power Company

- Limestone 1 and 2, lignite, 809 MW each

Performed a detailed technical and economic study for the conversion of the existing FGD system to forced oxidation and the production of a marketable gypsum byproduct. (1986)

- Applied Energy Services

- Deepwater 1, petroleum coke, 135 MW

Manager. Process design and functional engineering for the FGD, wet electrostatic precipitator, and pressurized forced oxidation system. Wet precipitator removed sulfuric acid mist resulting from firing a high vanadium petroleum coke. The pressurized oxidation system produced a high-quality wallboard gypsum. Managed field startup service activities. (1983 to 1985)

- Grand Haven Board of Light & Power

- J. B. Sims 3, coal, 65 MW

Managed the process design and functional engineering of lime-based FGD system. Design included a unique concept for force oxidizing the sulfite-rich slurry to produce a marketed gypsum product (for wallboard) while enhancing the SO₂ removal capabilities of the system. Managed the field startup and field process engineering activities. (1980 to 1984)

CONDITION ASSESSMENT

- Louisville Gas & Electric Company
 - Cane Run 4-6, coal, 645 MW total.
Project Engineer for condition assessment of FGD equipment. (1991)
- Duquesne Light Company
 - Elrama 1-4, coal, 425 MW
Project engineer on the FGD portion of the plant condition assessment study to assess operation to the year 2007. (1987 to 1988)

MEMBERSHIPS

American Society of Mechanical Engineers
Committee PTC-40, Performance Test Code on Flue Gas Desulfurization
Environmental Control Division FGD Subcommittee (chairman)
Environmental Control Division Economic Evaluation Committee
Air & Waste Management Association

PUBLICATIONS

"Technologies and Emission Allowances", Emission Management Association 8th Annual Spring Meeting, New Orleans, May 2004

"Condensable Particulate Matter Emission Sources and Control in Coal-Fired Power Plants", EPRI-DOE-EPA-AWMA Combined Power Plant Air Pollution Control Mega Symposium, Washington, DC, August 2004

"Economics of Lime and Limestone for Control of Sulfur Dioxide", EPRI-DOE-EPA-AWMA Combined Power Plant Air Pollution Control Mega Symposium, Washington, DC, May 2003

"Prospects for Lime in Future FGD Markets", National Lime Association Meeting, Santa Monica, CA, February 2003

"Mercury Speciation and Impact of Current Controls: An Interpretation of the ICR Database", CoalGen Conference, July 2001

"Reliant Energy's NO_x Reduction Program for their Houston Area Generating Facilities",
Technology Selection and Design Challenges" EPA-DOE-EPRI Power Plant Air Pollution Control
Symposium, Chicago, August 2001

"Development and Maturing of Environmental Control Technologies in the Power Industry",
Emissions Trading: Environmental Policy's New Approach, Copyright 2000 University of Illinois
at Chicago

"Optimizing SCR Reactor Design for Future Operating Flexibility" ICAC FORUM 2000 on
"Cutting NO_x Emissions", March 2000

"Control Technology Selection and Application to Meet NO_x Compliance", Plant Design and
Operating Committee Meeting, Galveston, TX, 2000

"Short-Term NO_x Emission Reductions with Combustion Modifications on Low to Medium Sulfur
Coal-fired Cyclone Boilers", EPRI-DOE-EPA Combined Utility Air Pollutant Control Symposium,
Washington, D.C., 1997

"Revisiting Your NO_x Compliance Strategy: The Impact of Title IV - Phase II, Title I-OTAG, and
Proposed New NAAQS", 59th American Power Conference, 1997, Chicago, Illinois

"Impacts of Title III and IV of the Clean Air Act and the Revised NAAQS on Particulate Control
Strategies for Year 2000 and Beyond", International Joint Power Generation Conference,
Denver, 1997

"Cost Effective Deployment of Technology to Meet Air Emission Compliance in Developing
Regulatory Environment" PowerGen Asia Conference, New Delhi, India, 1996

"Options for Repowering the Utility Industry" PowerGen Conference, Anaheim, California 1995

"Compliance and Competition: Obstacle or Opportunity," 1995 Sargent & Lundy Fossil
Engineering Conference, Chicago, Illinois, 1995

"Key Issues for Low Cost FGD Installation," Energy and Environment: Transitions in East
Central Europe, Prague, 1994

"Cost-Effective Retrofits for Emission Controls," Energy and Environment: Transitions in East
Central Europe, Prague, 1994

"CO₂ and Air Toxins: Planning for Future Regulatory Uncertainty," 1994 International Joint
Power Generation Conference, Phoenix, Arizona, 1994 (et al.)

"Clean Air Technology (CAT) Workstation: Case Study" 1993 SO₂ Symposium, Boston,
Massachusetts, 1993

WILLIAM DEPRIEST
Senior Vice President and Director
Environmental Services
Fossil Power Technologies

Sargent & Lundy^{INC}

"Flue Gas Desulfurization Cycling Guidelines" 1993 SO₂ Symposium, Boston, Massachusetts, 1993

"Novel Integration Concepts for GCC Power Plants," Fifth International Power Generation Conference, Orlando, Florida, 1992

"Clean Air Technology Workstation," 1991 SO₂ Control Conference, Washington, D.C., 1991

"Comparison of Coal Gasification Combined-Cycle Integration Concepts," EPRI 10th Annual Conference on Coal Gasification Power Plants, San Francisco, California, 1991

"Engineering Evaluation of Combined NO_x/SO₂ Controls for Utility Application," 1991 SO₂ Control Conference, Washington, D.C., 1991 "Acid Rain Compliance Analysis Evaluating Technology Options Within a Market-Based Regulatory Scheme," IJPGC, Boston, Massachusetts, 1990

"Combining SO₂ and NO_x Control Technologies as a Strategy for Environmental Compliance," Clean Power from Coal Conference, Brussels, Belgium, 1990

"Design and Operation of FGD Systems for Cycling Service," EPA/EPRI 1990 SO₂ Control Symposium, New Orleans, Louisiana, 1990

"Engineering Evaluation of Combined NO_x/SO₂ Removal Processes: 2nd Interim Report," EPA/EPRI 1990 SO₂ Control Symposium, New Orleans, Louisiana, 1990

"Integrated Coal Gasification Combined Cycle: Is It Competitive With a Pulverized Coal-Fired Boiler for Power Generation?" Sargent & Lundy Engineering Conference, Chicago, Dallas, and Houston, Texas, 1990

"A Second Look at Cogeneration in a Coke Oven Plant," Annual Association of Iron and Steel Engineers Convention, Pittsburgh, Pennsylvania, 1989

"Conceptual Design and Economic Evaluation of a Coal Dechlorination Plant," EPRI First International Conference on Chlorine in Coal, Chicago, Illinois, 1989

"Engineering Evaluation of Combined NO_x/SO₂ Removal Processes: Interim Report" Joint Symposium on Stationary Combustion NO_x Control, San Francisco, California, 1989

"Review of Potential Cycle Improvements for an IGCC Plant" 8th EPRI Coal Gasification Conference, Palo Alto, California, 1988

"Flue Gas Desulfurization: Growing Pains/Proven Remedies," Sargent & Lundy Engineering Conference, Dallas, Texas, 1987

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"Gypsum - An FGD Byproduct," Coal Technology '85, Pittsburgh, Pennsylvania, 1985

"Wet Lime FGD System Design and Early Operating Experience at the City of Grand Haven, Michigan, Board of Light and Power's J. B. Sims Unit 3," National Lime Association, Denver, Colorado, 1983

"Dry SO₂ System Design and Early Operation Experience at Basin Electric's Laramie River Station," 32nd Canadian Chemical Engineering Conference, Vancouver, British Columbia, Canada, and the Joint Power Conference, Denver, Colorado, 1982

"Wet SO₂ Removal Operating Experience at Cincinnati Gas & Electric Company's East Bend Station," American Power Conference, Chicago, Illinois, 1982

"Three Years of SO₂ Control Experience at Winyah Station, South Carolina Public Service Authority," American Power Conference, Chicago, Illinois, 1981

"Lime and Limestone Wet Scrubber Performance," Third International Coal Utilization Exhibition and Conference, Houston, Texas, 1980