

BEFORE THE ENVIRONMENTAL QUALITY COUNCIL  
OF THE STATE OF WYOMING

IN THE MATTER OF:	)	
BASIN ELECTRIC POWER COOPERATIVE	)	Docket No. 07-2801
DRY FORK STATION,	)	Presiding Officer,
AIR PERMIT CT-4631	)	F. David Searle
_____	)	

**AFFIDAVIT OF RANAJIT SAHU**

I, Ranajit Sahu, declare as follows:

1. I have a Bachelor of Technology degree, with Honors (B.Tech (Hons.)) from the Indian Institute of Technology (IIT), a Masters of Science (Mechanical Engineering) degree and a Doctorate in Philosophy (Ph.D), the latter two from the California Institute of Technology (Caltech).

2. I have over seventeen years of experience in the fields of environmental, mechanical, and chemical engineering including: program and project management services as well as design and specification of pollution control equipment. In that time, I have successfully managed and executed numerous projects. This includes basic and applied research projects, design projects, regulatory compliance projects, permitting projects, energy studies, risk assessment projects, and projects involving the communication of environmental data and information to the public.

3. I have provided and continue to provide consulting services to numerous private sector, public sector and public interest group clients. My clients over the past seventeen years include various steel mills, petroleum refineries, cement companies, aerospace companies, power generation facilities, lawn and garden equipment manufacturers, spa manufacturers, chemical distribution facilities, and various entities in the public sector including the Environmental Protection Agency, the United States

Department of Justice, California Department of Toxics Substances Control (DTSC), various municipalities, etc. I have performed projects in over 45 states, numerous local jurisdictions and internationally.

4. In addition to consulting, I have taught and continue to teach numerous courses in several Southern California universities including University of California Los Angeles (air pollution), University of California Riverside (air pollution, process hazard analysis), and Loyola Marymount University (air pollution, risk assessment, hazardous waste management) for the past fifteen years.

5. Finally, I have and continue to provide expert witness services in a number of environmental areas discussed above in both state and federal courts as well as before administrative bodies. For details, please see my resume provided in Attachment A.

6. For the purposes of this affidavit I have reviewed several documents, as cited in the footnotes contained in this affidavit. My understanding of the issues pertaining to the Dry Fork Station are based on my review of these documents. My understanding of general issues pertaining to the power plant and emissions therefrom are based on my educational and professional background as well as professional experience as discussed briefly above and in my resume provided in Attachment A.

7. On October 15, 2007, the Wyoming Department of Environmental Quality, Division of Air Quality (WDEQ-DAQ) issued a permit to construct (CT-4631) to Basin Electric Power Cooperative (BEPC) to allow the construction of a coal-fired electric generating station known as the Dry Fork Station, located near Gillette, Campbell County,

Wyoming.<sup>1</sup> Among other items, this station will consist of one subcritical<sup>2</sup> pulverized coal (PC) boiler rated at 385 MW (net)/422 MW (gross)<sup>3</sup> along with associated air pollution control equipment to meet the permit limits stated in Condition 9 of the issued permit (reproduced below):

**PC Boiler (ES1-01) Allowable Emissions**

Pollutant	lb/MMBtu	lb/MW-hr	lb/hr	tpy
NO <sub>x</sub>	0.05 (12 month rolling)	1.0 (30-day rolling) <sup>1</sup>	190.1 (30-day rolling)	832.4
SO <sub>2</sub>	0.070 (12 month rolling)	1.4 (30-day rolling) <sup>1</sup>	380.1 (3-hr block) 285.1 (30-day rolling)	1165.4
PM/PM <sub>10</sub>	0.012 <sup>2</sup>	–	45.6	199.8
CO	0.15	–	570.2 (30-day rolling)	2497
Hg	–	97×10 <sup>-6</sup> (12 month rolling) <sup>1</sup>	–	0.16
H <sub>2</sub> SO <sub>4</sub>	0.0025	–	9.5	41.6
HF	–	–	2.62	11.5
VOC	0.0037	–	14.1	61.6
NH <sub>3</sub>	–	–	10 ppm <sub>v</sub> <sup>3</sup> , 19.6 lb/hr	85.8

<sup>1</sup> NSPS Subpart Da Limit

<sup>2</sup> Filterable PM/PM<sub>10</sub>

<sup>3</sup> Dry Basis, 3% O<sub>2</sub>

8. It is my understanding based on a review of Protestant’s petition that this permit is now subject to administrative protest and request for hearing before the Environmental Quality Council, State of Wyoming.<sup>4</sup> Notwithstanding this challenge, it is my understanding, based on BEPC’s public pronouncements,<sup>5</sup> that BEPC is proceeding actively and fully to initiate construction activities for the Dry Fork Station.

<sup>1</sup> Permit CT-4631, issued October 15, 2007

<sup>2</sup> See Item 33 in Basin Electric Power Cooperative’s Response and Affirmative Defenses to the Protest and Petition for Hearing, Docket No. 07-2801, submitted to the Environmental Quality Council, State of Wyoming, dated December 21, 2007.

<sup>3</sup> See Memorandum dated June 11, 2007 by Sargent and Lundy, LLC at page 1 of 7. “[T]he unit will have a maximum heat input of approximately 3,801 MMBtu/hr, a maximum gross generation output of approximately 422 MW, and a net generation output of approximately 385 MW at annual average conditions.”

<sup>4</sup> Protestants Protest and Petition for Hearing (Nov. 1, 2007).

<sup>5</sup> See Contractor Fair Slides located at BEPC’s Dry Fork webpage.

[http://dryforkstation.basinelectric.com/miscellaneous/pdf/contractor\\_fair\\_slid.pdf](http://dryforkstation.basinelectric.com/miscellaneous/pdf/contractor_fair_slid.pdf). In particular details pf the construction including schedule are shown on slide 11 and slides 33-36.

9. My review of the Contractor Fair slides and the BEPC website (where the slides are available as referenced above) indicates that these slides were most likely prepared on or before October 27, 2007<sup>6</sup> for the purpose of supporting the November 2, 2007 Contractor Fair held for the project.

10. Based on the Contractor Fair slides as well as recent responses by Basic Electric to document production requests<sup>7</sup> showing the schedule for the project, it appears that:

- The design work as well as construction support activities, entailing significant expenditures, for the boiler and air quality control system including the Selective Catalytic Reduction (SCR) unit, air cooled condenser, dry Flue Gas Desulfurization (FGD) unit, bag house, and the chimney was initiated well before the final permit was even issued (October 15, 2007);<sup>8</sup>
- Initial site work has likely commenced. The bid was awarded on August 20, 2007 and construction “started” on October 17, 2007 as noted on BEPC’s website.<sup>9</sup> In my experience initial site work typically involves clearing and grading activities, planning and establishment of utility corridors, etc. As BEPC’s responses to Protestant’s First Set of Interrogatories indicate, extensive work was done prior to receiving the permit to construct and various site preparation activities have been completed since;<sup>10</sup>

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<sup>6</sup> See slides 34 (of 63) of the Contractor Fair Slides where “Bid Issue” and “BEPC Award” dates for various specification packages are listed. Dates that were prior to the preparation of the slide are shown in red font. Dates into the future at the time of preparation of the slide are shown in white font. A review of this slide shows that the slide (and likely the presentation) was prepared prior to October 27, 2007, the earliest date in non-red font. Based on this, the slides could have been prepared as early as August 21, 2007. However, since the contractor fair was held on November 2, 2007 and construction began on October 16, 2007 (per the BPEC website), I surmise that the slides were most likely prepared in the period October 16 – October 26, 2007.

<sup>7</sup> BEPC’s Responses and Objections to Protestant’s First Set of Interrogatories and Request for Production of Documents Served on BEPC, dated January 31, 2008.

<sup>8</sup> See slide 35 of the Contractor Fair Slides where the Contract Award dates for these activities as shown – are they are all shown as occurring in January, February or March of 2007.

<sup>9</sup> See slide 34 of the Contractor Fair Slides. Also, <http://dryforkstation.basinelectric.com>.

<sup>10</sup> BEPC’s Responses and Objections to Protestant’s First Set of Interrogatories and Request for Production of Documents Served on BEPC, dated January 31, 2008, at Response to Interrogatory #6 (p. 7-9).

- Major subcontractors have been selected and contracts with such subcontractors have either been established or are in the process of being established.<sup>11</sup> In particular, major contracts for the 420 MW Pulverized Coal boiler (Babcock and Wilcox) and the Air Quality Control Systems Equipment (Nooter/Eriksen) have already been let.<sup>12</sup> In many cases such contracts involve upfront commitment of funds. That this has occurred is evident from BEPC's Responses to Protestant's First Set of Interrogatories (Interrogatory #3), which indicates BEPC has paid vendors to the tune of \$117,213,514. This is approximately 18% of the total anticipated to be paid (\$644,431,544). It is my opinion that the value of work actually done to date does not amount to \$117.2 million – thus, BEPC has made significant commitments to the current design. Since BEPC did not provide a break-out of which vendors have been paid how much of this \$117.2 million to date, I am unable to ascertain the level of commitment for specific work activities;
- The detailed design of the subcritical boiler is likely near-complete based on the fact that Babcock and Wilcox will begin ground fabrication of the boiler room on May 1, 2008 and boiler room structural steel erection will begin on August 21, 2008.<sup>13</sup> As noted earlier, the contract for the boiler was awarded in January 2007;<sup>14</sup>
- Structural foundations involving concrete work is expected to begin in April 2008<sup>15</sup> indicating that foundation and civil design (which precedes actual field construction of the foundations) is likely complete or close to complete; and
- Major mobilization for air pollution equipment construction (SCR, dry FGD, bag house, etc.) is set to also to begin in April/May 2008, indicating substantial activity in design and procurement of air pollution control equipment.<sup>16</sup> It is my opinion that the design bases of the air pollution control equipment (reflecting the permit limits in the construction permit) have been finalized and that design of the various air quality control equipment is either complete or is proceeding on the basis of the limits in the construction permit.

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<sup>11</sup> See slides 33 and 34 of the Contractor Fair Slides.

<sup>12</sup> BEPC's Responses and Objections to Protestant's First Set of Interrogatories and Request for Production of Documents Served on BEPC, dated January 31, 2008, at Exhibit 1 to Response to Interrogatory #3.

<sup>13</sup> Ibid. at Exhibit 1 to Response to Interrogatory #5.

<sup>14</sup> See slides 35 and 36 of the Contractor Fair Slides.

<sup>15</sup> See slide 36 of the Contractor Fair Slides showing the start of the Dry FGD/Baghouse as April 15, 2008; see also BEPC's Responses and Objections to Protestant's First Set of Interrogatories and Request for Production of Documents Served on BEPC, dated January 31, 2008, at Exhibit 1 to Response to Interrogatory #5.

<sup>16</sup> See slide 36 of the Contractor Fair Slides.

11. It is my opinion that if protestants prevail in their objections to the issued permit, that many aspects of the Dry Fork plant including the boiler, turbine and air pollution control equipment design and specifications may need to be substantially changed – rendering the activity that is presently underway in terms of planning, design, procurement, and construction – to require alteration and rework, resulting in wasted financial resources on the part of BEPC.

12. Protestants have challenged the permit limits in the issued permit as being not representative of Best Available Control Technology (BACT). If successful, the likely permit limits for this boiler will be lower than what is permitted currently. This may result in a different boiler design (for example, a supercritical boiler as opposed to the subcritical boiler presently proposed) as well as different types of air pollution control equipment (for example, a wet FGD as opposed to a dry FGD). Even in instances where the proposed control technology may be appropriate (for example, the SCR for NO<sub>x</sub> control), the size of the control technology (in this instance the type and amount of catalyst) may need to change in order to conform to the BACT permit limits. These changes will then require, at a minimum and in turn:

- redesign of the boiler and air pollution control equipment, as necessary;
- revisions to the construction drawings as a result of the redesign;
- potentially different plant footprint and layout as a result of different equipment type and size; and
- changes to the specifications for various equipment such as the boiler and air pollution control equipment, affecting their manufacture and procurement.

Without a detailed review of the current engineering plans and specifications as well as a more detailed analysis of the commitments made thus far for specific task items relating

to the boiler and air quality control systems, it is impossible to state how much or how little of the effort expended to date can be successfully accommodated in a revised plant design should Protestants prevail.

13. Based on this, it is my opinion that proceeding with current construction activities and planning in light of the uncertainties associated with the permit limits will only exacerbate the extent to which work that is currently planned and being implemented will have to be redone. It is risky to continue along the present course under the assumption that the pollution control limits and the very design of the plant itself are unlikely to change.

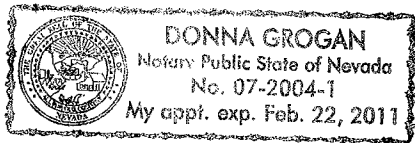
I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge, information and belief.

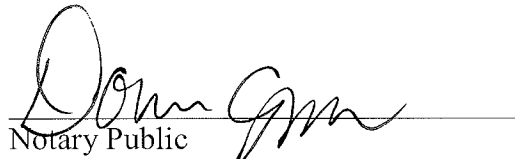
Executed at Henderson NV, this 6<sup>th</sup> day of February, 2008.

  
Ranajit Sahu

STATE OF NEVADA        )  
  )  
COUNTY OF CLARK     )

This instrument was signed and sworn to before me on February 6, 2008 by Ranajit Sahu.



  
Notary Public

My appointment expires: Feb. 22, 2011



Attachment A  
Resume

**RANAJIT (RON) SAHU, Ph.D, QEP, CEM (Nevada)**

**CONSULTANT, ENVIRONMENTAL AND ENERGY ISSUES**

**311 North Story Place  
Alhambra, CA 91801  
Phone: 626-382-0001  
e-mail (preferred): sahuron@earthlink.net**

**EXPERIENCE SUMMARY**

Dr. Sahu has over seventeen years of experience in the fields of environmental, mechanical, and chemical engineering including: program and project management services; design and specification of pollution control equipment; soils and groundwater remediation; combustion engineering evaluations; energy studies; multimedia environmental regulatory compliance (involving statutes and regulations such as the Federal CAA and its Amendments, Clean Water Act, TSCA, RCRA, CERCLA, SARA, OSHA, NEPA as well as various related state statutes); transportation air quality impact analysis; multimedia compliance audits; multimedia permitting (including air quality NSR/PSD permitting, Title V permitting, NPDES permitting for industrial and stormwater discharges, RCRA permitting, etc.), multimedia/multipathway human health risk assessments for toxics; air dispersion modeling; and regulatory strategy development and support including negotiation of consent agreements and orders.

He has over sixteen years of project management experience and has successfully managed and executed numerous projects in this time period. This includes basic and applied research projects, design projects, regulatory compliance projects, permitting projects, energy studies, risk assessment projects, and projects involving the communication of environmental data and information to the public.

He has provided consulting services to numerous private sector, public sector and public interest group clients. His major clients over the past seventeen years include various steel mills, petroleum refineries, cement companies, aerospace companies, power generation facilities, lawn and garden equipment manufacturers, spa manufacturers, chemical distribution facilities, and various entities in the public sector including EPA, the US Dept. of Justice, California DTSC, various municipalities, etc.). Dr. Sahu has performed projects in over 44 states, numerous local jurisdictions and internationally.

In addition to consulting, Dr. Sahu has taught and continues to teach numerous courses in several Southern California universities including UCLA (air pollution), UC Riverside (air pollution, process hazard analysis), and Loyola Marymount University (air pollution, risk assessment, hazardous waste management) for the past fifteen years. In this time period he has also taught at Caltech, his alma mater and at USC (air pollution) and Cal State Fullerton (transportation and air quality).

Dr. Sahu has and continues to provide expert witness services in a number of environmental areas discussed above in both state and Federal courts as well as before administrative bodies (please see Annex A).

He has excellent written and verbal communication skills in English.

References and specific project experience are available upon request.

## EXPERIENCE RECORD

- 2000-present **Independent Consultant.** Providing a variety of private sector (industrial companies, land development companies, law firms, etc.) public sector (such as the US Department of Justice, EPA, State of California DTSC, etc.) and public interest group clients with project management, air quality consulting, waste remediation and management consulting, as well as regulatory and engineering support consulting services.
- 1995-2000 Parsons ES, **Associate, Senior Project Manager and Department Manager for Air Quality/Geosciences/Hazardous Waste Groups**, Pasadena. Responsible for the management of a group of approximately 24 air quality and environmental professionals, 15 geoscience, and 10 hazardous waste professionals providing full-service consulting, project management, regulatory compliance and A/E design assistance in all areas.
- Parsons ES, **Manager for Air Source Testing Services.** Responsible for the management of 8 individuals in the area of air source testing and air regulatory permitting projects located in Bakersfield, California.
- 1992-1995 Engineering-Science, Inc. **Principal Engineer and Senior Project Manager** in the air quality department. Responsibilities included multimedia regulatory compliance and permitting (including hazardous and nuclear materials), air pollution engineering (emissions from stationary and mobile sources, control of criteria and air toxics, dispersion modeling, risk assessment, visibility analysis, odor analysis), supervisory functions and project management.
- 1990-1992 Engineering-Science, Inc. **Principal Engineer and Project Manager** in the air quality department. Responsibilities included permitting, tracking regulatory issues, technical analysis, and supervisory functions on numerous air, water, and hazardous waste projects. Responsibilities also include client and agency interfacing, project cost and schedule control, and reporting to internal and external upper management regarding project status.
- 1989-1990 Kinetics Technology International, Corp. **Development Engineer.** Involved in thermal engineering R&D and project work related to low-NOx ceramic radiant burners, fired heater NOx reduction, SCR design, and fired heater retrofitting.
- 1988-1989 Heat Transfer Research, Inc. **Research Engineer.** Involved in the design of fired heaters, heat exchangers, air coolers, and other non-fired equipment. Also did research in the area of heat exchanger tube vibrations.

## EDUCATION

- 1984-1988 Ph.D., Mechanical Engineering, California Institute of Technology (Caltech), Pasadena, CA.
- 1984 M. S., Mechanical Engineering, Caltech, Pasadena, CA.
- 1978-1983 B. Tech (Honors), Mechanical Engineering, Indian Institute of Technology (IIT) Kharagpur, India

## TEACHING EXPERIENCE

### Caltech

"Thermodynamics," Teaching Assistant, California Institute of Technology, 1983, 1987.

"Air Pollution Control," Teaching Assistant, California Institute of Technology, 1985.

"Caltech Secondary and High School Saturday Program," - taught various mathematics (algebra through calculus) and science (physics and chemistry) courses to high school students, 1983-1989.

"Heat Transfer," - taught this course in the Fall and Winter terms of 1994-1995 in the Division of Engineering and Applied Science.

"Thermodynamics and Heat Transfer," Fall and Winter Terms of 1996-1997.

### U.C. Riverside, Extension

"Toxic and Hazardous Air Contaminants," University of California Extension Program, Riverside, California. Various years since 1992.

"Prevention and Management of Accidental Air Emissions," University of California Extension Program, Riverside, California. Various years since 1992.

"Air Pollution Control Systems and Strategies," University of California Extension Program, Riverside, California, Summer 1992-93, Summer 1993-1994.

"Air Pollution Calculations," University of California Extension Program, Riverside, California, Fall 1993-94, Winter 1993-94, Fall 1994-95.

"Process Safety Management," University of California Extension Program, Riverside, California. Various years since 1992.

"Process Safety Management," University of California Extension Program, Riverside, California, at SCAQMD, Spring 1993-94.

"Advanced Hazard Analysis - A Special Course for LEPCs," University of California Extension Program, Riverside, California, taught at San Diego, California, Spring 1993-1994.

"Advanced Hazardous Waste Management" University of California Extension Program, Riverside, California. 2005.

### Loyola Marymount University

"Fundamentals of Air Pollution - Regulations, Controls and Engineering," Loyola Marymount University, Dept. of Civil Engineering. Various years since 1993.

"Air Pollution Control," Loyola Marymount University, Dept. of Civil Engineering, Fall 1994.

"Environmental Risk Assessment," Loyola Marymount University, Dept. of Civil Engineering. Various years since 1998.

"Hazardous Waste Remediation" Loyola Marymount University, Dept. of Civil Engineering. Since 2006.

### University of Southern California

"Air Pollution Controls," University of Southern California, Dept. of Civil Engineering, Fall 1993, Fall 1994.

"Air Pollution Fundamentals," University of Southern California, Dept. of Civil Engineering, Winter 1994.

University of California, Los Angeles

"Air Pollution Fundamentals," University of California, Los Angeles, Dept. of Civil and Environmental Engineering, Spring 1994, Spring 1999, Spring 2000, Spring 2003, Spring 2006, Spring 2007.

International Programs

"Environmental Planning and Management," 5 week program for visiting Chinese delegation, 1994.

"Environmental Planning and Management," 1 day program for visiting Russian delegation, 1995.

"Air Pollution Planning and Management," IEP, UCR, Spring 1996.

"Environmental Issues and Air Pollution," IEP, UCR, October 1996.

**PROFESSIONAL AFFILIATIONS AND HONORS**

President of India Gold Medal, IIT Kharagpur, India, 1983.

Member of the Alternatives Assessment Committee of the Grand Canyon Visibility Transport Commission, established by the Clean Air Act Amendments of 1990, 1992-present.

American Society of Mechanical Engineers: Los Angeles Section Executive Committee, Heat Transfer Division, and Fuels and Combustion Technology Division, 1987-present.

Air and Waste Management Association, West Coast Section, 1989-present.

**PROFESSIONAL CERTIFICATIONS**

EIT, California (# XE088305), 1993.

REA I, California (#07438), 2000.

Certified Permitting Professional, South Coast AQMD (#C8320), since 1993.

QEP, Institute of Professional Environmental Practice, since 2000.

CEM, State of Nevada (#EM-1699). Expiration 10/07/2009.

**PUBLICATIONS (PARTIAL LIST)**

"Physical Properties and Oxidation Rates of Chars from Bituminous Coals," with Y.A. Levendis, R.C. Flagan and G.R. Gavalas, *Fuel*, **67**, 275-283 (1988).

"Char Combustion: Measurement and Analysis of Particle Temperature Histories," with R.C. Flagan, G.R. Gavalas and P.S. Northrop, *Comb. Sci. Tech.* **60**, 215-230 (1988).

"On the Combustion of Bituminous Coal Chars," PhD Thesis, California Institute of Technology (1988).

"Optical Pyrometry: A Powerful Tool for Coal Combustion Diagnostics," *J. Coal Quality*, **8**, 17-22 (1989).

"Post-Ignition Transients in the Combustion of Single Char Particles," with Y.A. Levendis, R.C. Flagan and G.R. Gavalas, *Fuel*, **68**, 849-855 (1989).

"A Model for Single Particle Combustion of Bituminous Coal Char." Proc. ASME National Heat Transfer Conference, Philadelphia, **HTD-Vol. 106**, 505-513 (1989).

"Discrete Simulation of Cenospheric Coal-Char Combustion," with R.C. Flagan and G.R. Gavalas, *Combust. Flame*, **77**, 337-346 (1989).

"Particle Measurements in Coal Combustion," with R.C. Flagan, in "**Combustion Measurements**" (ed. N. Chigier), Hemisphere Publishing Corp. (1991).

"Cross Linking in Pore Structures and Its Effect on Reactivity," with G.R. Gavalas in preparation.

"Natural Frequencies and Mode Shapes of Straight Tubes," Proprietary Report for Heat Transfer Research Institute, Alhambra, CA (1990).

"Optimal Tube Layouts for Kamui SL-Series Exchangers," with K. Ishihara, Proprietary Report for Kamui Company Limited, Tokyo, Japan (1990).

"HTRI Process Heater Conceptual Design," Proprietary Report for Heat Transfer Research Institute, Alhambra, CA (1990).

"Asymptotic Theory of Transonic Wind Tunnel Wall Interference," with N.D. Malmuth and others, Arnold Engineering Development Center, Air Force Systems Command, USAF (1990).

"Gas Radiation in a Fired Heater Convection Section," Proprietary Report for Heat Transfer Research Institute, College Station, TX (1990).

"Heat Transfer and Pressure Drop in NTIW Heat Exchangers," Proprietary Report for Heat Transfer Research Institute, College Station, TX (1991).

"NO<sub>x</sub> Control and Thermal Design," Thermal Engineering Tech Briefs, (1994).

"From Purchase of Landmark Environmental Insurance to Remediation: Case Study in Henderson, Nevada," with Robin E. Bain and Jill Quillin, presented at the AQMA Annual Meeting, Florida, 2001.

"The Jones Act Contribution to Global Warming, Acid Rain and Toxic Air Contaminants," with Charles W. Botsford, presented at the AQMA Annual Meeting, Florida, 2001.

#### **PRESENTATIONS (PARTIAL LIST)**

"Pore Structure and Combustion Kinetics - Interpretation of Single Particle Temperature-Time Histories," with P.S. Northrop, R.C. Flagan and G.R. Gavalas, presented at the AIChE Annual Meeting, New York (1987).

"Measurement of Temperature-Time Histories of Burning Single Coal Char Particles," with R.C. Flagan, presented at the American Flame Research Committee Fall International Symposium, Pittsburgh, (1988).

"Physical Characterization of a Cenospheric Coal Char Burned at High Temperatures," with R.C. Flagan and G.R. Gavalas, presented at the Fall Meeting of the Western States Section of the Combustion Institute, Laguna Beach, California (1988).

"Control of Nitrogen Oxide Emissions in Gas Fired Heaters - The Retrofit Experience," with G. P. Croce and R. Patel, presented at the International Conference on Environmental Control of Combustion Processes (Jointly sponsored by the American Flame Research Committee and the Japan Flame Research Committee), Honolulu, Hawaii (1991).

"Air Toxics - Past, Present and the Future," presented at the Joint AIChE/AAEE Breakfast Meeting at the AIChE 1991 Annual Meeting, Los Angeles, California, November 17-22 (1991).

"Air Toxics Emissions and Risk Impacts from Automobiles Using Reformulated Gasolines," presented at the Third Annual Current Issues in Air Toxics Conference, Sacramento, California, November 9-10 (1992).

"Air Toxics from Mobile Sources," presented at the Environmental Health Sciences (ESE) Seminar Series, UCLA, Los Angeles, California, November 12, (1992).

"Kilns, Ovens, and Dryers - Present and Future," presented at the Gas Company Air Quality Permit Assistance Seminar, Industry Hills Sheraton, California, November 20, (1992).

"The Design and Implementation of Vehicle Scrapping Programs," presented at the 86th Annual Meeting of the Air and Waste Management Association, Denver, Colorado, June 12, 1993.

"Air Quality Planning and Control in Beijing, China," presented at the 87th Annual Meeting of the Air and Waste Management Association, Cincinnati, Ohio, June 19-24, 1994.

## Annex A

### Litigation Support

1. Matters for which Dr. Sahu has have provided depositions and affidavits/expert reports include:

- (a) Deposition on behalf of Rocky Mountain Steel Mills, Inc. located in Pueblo, Colorado – dealing with the manufacture of steel in mini-mills including methods of air pollution control and BACT in steel mini-mills and opacity issues at this steel mini-mill
- (b) Affidavit for Rocky Mountain Steel Mills, Inc. located in Pueblo Colorado – dealing with the technical uncertainties associated with night-time opacity measurements in general and at this steel mini-mill.
- (c) Expert reports and depositions (2/28/2002 and 3/1/2002; 12/2/2003 and 12/3/2003; 5/24/2004) on behalf of the US Department of Justice in connection with the Ohio Edison NSR Cases. *United States, et al. v. Ohio Edison Co., et al.*, C2-99-1181 (S.D. Ohio).
- (d) Expert reports and depositions (5/23/2002 and 5/24/2002) on behalf of the US Department of Justice in connection with the Illinois Power NSR Case. *United States v. Illinois Power Co., et al.*, 99-833-MJR (S.D. Ill.).
- (e) Expert reports and depositions (11/25/2002 and 11/26/2002) on behalf of the US Department of Justice in connection with the Duke Power NSR Case. *United States, et al. v. Duke Energy Corp.*, 1:00-CV-1262 (M.D.N.C.).
- (f) Expert reports and depositions (10/6/2004 and 10/7/2004; 7/10/2006) on behalf of the US Department of Justice in connection with the American Electric Power NSR Cases. *United States, et al. v. American Electric Power Service Corp., et al.*, C2-99-1182, C2-99-1250 (S.D. Ohio).
- (g) Expert reports and depositions (10/31/2005 and 11/1/2005) on behalf of the US Department of Justice in connection with the East Kentucky Power Cooperative NSR Case. *United States v. East Kentucky Power Cooperative, Inc.*, 5:04-cv-00034-KSF (E.D. KY).
- (h) Deposition (10/20/2005) on behalf of the US Department of Justice in connection with the Cinergy NSR Case. *United States, et al. v. Cinergy Corp., et al.*, IP 99-1693-C-M/S (S.D. Ind.).
- (i) Affidavits and deposition on behalf of Basic Management Inc. (BMI) Companies in connection with the BMI vs. USA remediation cost recovery Case.
- (j) Expert report on behalf of Penn Future and others in the Cambria Coke plant permit challenge in Pennsylvania.
- (k) Expert report on behalf of the Appalachian Center for the Economy and the Environment and others in the Western Greenbrier permit challenge in West Virginia.



- (l) Expert report, deposition (via telephone on January 26, 2007) on behalf of various Montana petitioners (Citizens Awareness Network (CAN), Women's Voices for the Earth (WVE) and the Clark Fork Coalition (CFC)) in the Thompson River Cogeneration LLC Permit No. 3175-04 challenge.
- (m) Expert report and deposition (2/2/07) on behalf of the Texas Clean Air Cities Coalition at the Texas State Office of Administrative Hearings (SOAH) in the matter of the permit challenges to TXU Project Apollo's eight new proposed PRB-fired PC boilers located at seven TX sites.
- (n) Expert reports and deposition (12/13/2007) on behalf of Commonwealth of Pennsylvania – Dept. of Environmental Protection, State of Connecticut, State of New York, and State of New Jersey (Plaintiffs) in connection with the Allegheny Energy NSR Case. *Plaintiffs v. Allegheny Energy Inc., et al.*, 2:05cv0885 (W.D. Pennsylvania).
- (o) Expert reports and pre-filed testimony before the Utah Air Quality Board on behalf of Sierra Club in the Sevier Power Plant permit challenge.
- (p) Expert reports and deposition (October 2007) on behalf of MTD Products Inc., in connection with General Power Products, LLC v MTD Products Inc., 1:06 CVA 0143 (S.D. Ohio, Western Division)

2. Occasions where Dr. Sahu has provided testimony at trial or in similar proceedings include the following:

- (q) In February, 2002, provided expert witness testimony on emissions data on behalf of Rocky Mountain Steel Mills, Inc. in Denver District Court.
- (r) In February 2003, provided expert witness testimony on regulatory framework and emissions calculation methodology issues on behalf of the US Department of Justice in the Ohio Edison NSR Case in the US District Court for the Southern District of Ohio.
- (s) In June 2003, provided expert witness testimony on regulatory framework, emissions calculation methodology, and emissions calculations on behalf of the US Department of Justice in the Illinois Power NSR Case in the US District Court for the Southern District of Illinois.
- (t) In August 2006, provided expert witness testimony regarding power plant emissions and BACT issues on a permit challenge (Western Greenbrier) on behalf of the Appalachian Center for the Economy and the Environment in West Virginia.
- (u) In May 2007, provided expert witness testimony regarding power plant emissions and BACT issues on a permit challenge (Thompson River Cogeneration) on behalf of various Montana petitioners (Citizens Awareness Network (CAN), Women's Voices for the Earth (WVE) and the Clark Fork Coalition (CFC)) before the Montana Board of Environmental Review.

- (v) In October 2007, provided expert witness testimony regarding power plant emissions and BACT issues on a permit challenge (Sevier Power Plant) on behalf of the Sierra Club before the Utah Air Quality Board .