CARY N. BLOYD

Energy and Environmental Policy Scientist
Energy and Environmental Systems Analysis Group (EESA)
Decision and Information Sciences Division (DIS)
Argonne National Laboratory (ANL)

Educational Background

Ph.D.	1982, Engineering and Public Policy, Carnegie Mellon University
M.E.	1979, Mechanical Engineering and Engineering and Public Policy, Carnegie Mellon University
B.S.	1975, Mechanical Engineering, University of Oklahoma

Professional Experience

2002-Present	Energy and Environmental Policy Scientist, Argonne National Laboratory; Senior Engineer, International Center for Sustainable Development, Gaithersburg, MD
2000-2002	Energy and Environmental Policy Scientist, Argonne National Laboratory; Executive Director, APEC Sustainable Development Network, International Sustainable Development Foundation, Portland, OR
1996-2000	Energy and Environmental Policy Scientist, Argonne National Laboratory; Director, Asia-Pacific Sustainable Development Center, East-West Center, Honolulu, HI
1993-1995	Energy and Environmental Policy Scientist, Argonne National Laboratory; Manager, Energy and Environmental Systems Program, Pacific International Center for High Technology Research, Honolulu, Hawaii, and Adjunct Research Fellow, East-West Center, Honolulu, HI
1990- 1993	Assistant Energy and Environmental Policy Scientist, Argonne National Laboratory, and Adjunct Research Fellow, East-West Center, Honolulu, HI.
1988-1990	Assistant Energy and Environmental Policy Scientist, Environmental Assessment and Information Sciences Division, Argonne National Laboratory

Managed and participated in a range of projects associated with the development and integrated assessment of energy and environmental technologies for the United States Department of Energy (USDOE). Project areas have ranged from the development of analytical models of energy systems, to the analysis and development of US National Energy Policy, to international energy and environmental analysis with an emphasis on global climate change. Principal efforts during the 1996-2000 timeframe were directed towards that analysis of international energy and environmental issues at the East-West Center in Honolulu and development of the Tracking and Analysis Framework (TAF) for the USDOE and National Acid Precipitation Assessment Program. Beginning in 2000, a move was made to the Asia Pacific Economic Cooperation (APEC) Sustainable Development Network in Portland, Oregon where work continued with the US DOE APEC program.

Professional Experience

1988-present Argonne National Laboratory

• Asia Pacific Economic Cooperation (APEC) activities

Supported the USDOE in implementing its APEC program in the areas of energy efficiency and renewable energy. APEC brings together the 21 major countries that border the Pacific Ocean. APEC activities consist of defining and conduction multi-country research projects, development of APEC wide energy initiatives, and conducting APEC specific workshops and meetings related to energy efficiency and renewable energy.

APEC 21st Century Renewable Energy Development Initiative. Worked with US DOE to develop this new APEC wide renewable energy initiative which was launched by Secretary Richardson at the US sponsored APEC Energy Ministerial meeting in San Diego in May of 2000.

• Global Climate Change

Climate Change Response Strategy for China. Participating as the energy technology expert in an Asian Development Bank study on the development of a climate change response strategy for the Peoples Republic of China

Asia-Pacific Energy Systems Workshop. In conjunction with the East-West Center's Environment and Policy Institute, organized and directed a month-long workshop on energy technologies and policies to meet global climate change concerns in the Asia-Pacific area. The workshop included representatives from China, India, Indonesia, South Korea, and Thailand.

Congressional Greenhouse Gas Study. Directed Argonne's research effort for DOE's multi-laboratory Congressional Greenhouse Gas Study, which resulted in seven major reports. The reports examined the greenhouse gas reduction potential and reduction costs for the utility, industrial, and transportation sectors. The project involved approximately 40 researchers from three divisions. The project also involved representing ANL at the multi-laboratory project meetings.

Intra-laboratory Global Climate Change Committee. As part of the committee work, made formal presentations on ANL's and DOE's global climate research agenda at a special briefing for the Laboratory Director, a briefing for the Office of Technology Development monthly meeting, and a status briefing to the Electric Power Research Institute, Gas Research Institute, and Commonwealth Edison.

Multi-Laboratory Climate Change Committee. Represented ANL on the multi-laboratory Climate Change Committee, which developed the NES global climate change white paper. The result of this work is a book published by CRC Press, Inc.

- National Energy Strategy

NES Evaluation Panel. Jointly organized a panel of national experts to help DOE evaluate the degree to which the energy technologies currently under development by DOE support the goals established under the "Fortifying Foundations" section of the National Energy Strategy.

NES Electric Utility Modeling. Coordinated the NES-related projects in the Energy Policy Section of PEA in support of the Electricity and Nuclear Technologies Working Group. The major thrust of the research was to provide detailed modeling analysis of the electric utility system in support of the National Energy Strategy.

- Energy System Modeling and Assessment

Integrated Resource Planning. Participated in the development of Hawaiian Electric Company's Integrated Resource Plan through work in the both the supply side and integration advisory groups.

Integrated Assessment of Acid Deposition. Led a 20 person, multi-organizational team developing a decision analysis based integrated assessment model. The model is to be used in support of the U.S. Interagency National Acid Precipitation Assessment Program's Congressionally mandated cost benefit analysis of Title IV of the 1990 Clean Air Act Amendments.

Hawaii State Integrated Energy Strategy. Managing the Argonne portion of a one-year joint study with the East-West Center's Energy Program on fossil energy use and prospects in Hawaii. The study is part of the Hawaii State Integrated Energy Strategy being conducted by the State Department of Business, Economic Development and Tourism, and DOE.

Sustainable Resource Systems. Participating in the development of a broadly based consortium located in Honolulu for the purpose of establishing a center that is designed to provide education and training in sustainable energy technologies and technology transfer and that focuses on Hawaii, the Pacific Islands, and developing countries of the Pacific Rim.

Backcasting with Emission Models. Supervised 10 staff members from two divisions in the preparation of a comprehensive report that compared projections from the NAPAP emission

model set with historical data. Models examined the utility, industrial, transportation, residential, and commercial sectors. Throughout the project, briefings were presented to both the DOE project officer and DOE office director who originally requested the work. In addition, maintained communications with key U.S. Environmental Protection Agency (EPA) program officers who had been responsible for the development of the major utility model (AUSM).

Natural Gas End-Use Assessment. Developed engineering cost models for natural gas use in the utility and commercial sectors. Conducted analysis to show the potential of fuel switching for reducing petroleum use as part of the DOE Natural Gas Initiative.

1976-1988 Carnegie Mellon University, Pittsburgh, Pennsylvania:

1986-1988	Research Scientist, Mechanical Engineering Department
1982-1985	Senior Research Associate, Mechanical Engineering Department
1980-1982	Research Associate, Mechanical Engineering Department,
1976-1980	Research Assistant, Mechanical Engineering/Engineering and Public Policy

Participated in a range of research efforts associated with energy system modeling and the multimedia analysis of emissions from fossil-based energy systems for DOE and EPA.

Integrated Assessment of Acidic Deposition. Participated in the development of a stochastically based computer model that linked models of pollutant emissions, atmospheric conversion and transport, acidic deposition, lake acidification, fish viability, and emission control costs. The model was then used to show comparative effects of uncertainty on the various components of acidic deposition. As part of this work, made a presentation on integrated assessment at the International Acid Precipitation Final Conference in Hilton Head, South Carolina.

Advanced Utility Simulation Model Development. As part of EPA sponsored work to the University Group on Energy (URGE), participated in the development of a FORTRAN-based, generating-unit-specific computer model of the U.S. electric utility system.

Advanced Environmental Controls for Coal-Fired Power Plants. Developed FORTRAN-based computer models of advanced processes for the integrated environmental control of coal-fired power plants. Systems modeled included hot and cold electrostatic precipitators, wet and dry lime/limestone-based flue-gas desulfurization units and associated waste disposal systems, and the selective catalytic reduction process for nitrogen oxide removal.

Coal Gasification/Combined-Cycle Systems. Formulated and developed a computer model to simulate various configurations of low-Btu coal gasification/combined-cycle systems. The model was then used to determine the economic, environmental, and energy effects of proposed environmental regulations as well as to compare the system with a conventional coal-fired electricity-generation system.

Residential Energy Conservation. Co-manager of a 40-person graduate student research group that examined the potential for energy conservation in the residential sector of Allegheny County, Pennsylvania. The project involved characterizing existing housing stock and conducting computer-aided analysis of the costs and performance of various energy conservation devices.

1974-1976	Science and Public Policy Program, University of Oklahoma, Norman, Oklahoma.
1975-1976	Research Specialist
1974-1975	Research Assistant

Participated in several studies associated with the application of technology assessment in an interdisciplinary context to the development of energy resources. Principal funding was from the EPA and National Science Foundation.

Western Energy Technology Assessment. Participated in a three-year technology assessment of energy development in the western United States. The study was concerned with estimating the social, political, economic, and environmental impacts of fossil fuel development.

Coal and Oil Shale Resource Development. Summarized the technologies and residuals associated with coal and oil shale development, from mine site to resource utilization.

Net Energy Analysis of Solar Thermal Systems. Developed a computer model to conduct net energy analyses of various configurations of solar thermal collectors.

Computer Experience

Computer Systems: IBM(370/195, 3033, PC), DEC 2020, VAX 750, SUN Workstations, Macintosh, DOS/Windows

Programming and Control Languages: UNIX, IBM JCL, CMS, FORTRAN, BASIC

Honors

Benedum Foundation Fellow, 1977-1980
Editorial Intern for the *American Political Science Review*, 1977-1978
Tau Beta Pi (national engineering honorary)
Pi Tau Sigma (mechanical engineering honorary)

Professional Societies

American Society of Mechanical Engineers (ASME)
International Association for Energy Economics
Air & Waste Management Association
Sigma Xi

Other Professional Activities

Co-led missions to Chizhou (Anhui Province), and Zhangjiagang, (Jiangsu Province) China in March of 2000 and July of 2002 to advise the city/county government on the development of community energy assessments. The missions developed specific project proposals between the US and China. As part of this activity, we were also able to brief the Administrator of the Chinese Environmental Protection Administration about our APEC Energy for Sustainable Communities Program in China.

Led a four person team to Thailand in April, 1997, to identify opportunities for the use of wind energy for the Provincial Electricity Authority.

Co-Chaired the Sustainable Cities Working Group at the Portland Organizing Conference for a Sustainable Development Training and Information Network in October, 1996.

Led a three person team to Thailand in July, 1996, to identify opportunities for US firms to participate in the recent Thailand National Energy Conservation Act program which has a 5 year budget of $692 million.

Session Chairman: Greenhouse Challenge and Outlook for Coal, 4th APEC Coal Flow Seminar, Japanese Committee for Pacific Coal Flow (JAPAC), Honolulu, HI (Nov. 1997).

Co-Chairman: Working group on greenhouse gas mitigation technologies at the Second U.S./Japan Workshop on Global Change Research: Environmental Response Technologies, East-West Center, Honolulu, Hi. (Feb. 1993).

General conference organization: The InterAmerican Petroleum and Gas Conference, Resources Programs, East-West Center, Houston, TX (Nov. 1991).

Chairman: The Technology Environment, Conference on Energy and the Environment in the Asia-Pacific Region: Planning for an Uncertain Future, East-West Center, Honolulu, Hawaii (Feb. 1991).

Topical area coordinator: Policy Impact on Energy, 25th Intersociety Energy Conversion Engineering Conference, Reno, Nev. (Aug. 1990).

Session Co-chairman: Global Warming: Economic Impacts and Policy Issues, AAAS Annual Meeting, New Orleans, LA (Feb. 1990).

General conference organization: Responding to the Threat of Global Warming: Options for the Pacific and Asia, Argonne National Laboratory and the East-West Center, Honolulu, Hawaii (June 1989).

CARY N. BLOYD

Publications: Journal Articles and Book Contributions

Bloyd, D. and C. Bloyd. *Renewable Energy and Sustainable Development: Lessons Learned from APEC for the Preparation of Rio+10*. Asian Perspective Vol. 25, No. 3, pp. 85-111. 2001

Bloyd, C.N., *Energy and the Environment*, Energy, **21**:11 (Nov. 1996)

Bloyd, C.N., *Energy and the Environment*, in Pacific Energy Outlook- Strategies and Policy Imperatives to 2010, Edited by F. Fesharaki, A. Clark, and D. Intarapravich, East-West Center (1995).

Greer, L.S., H.M. Hubbard, and C.N. Bloyd, *Renewable Energy in Hawaii-- Lessons Learned, Part II*, published in the American Solar Energy Society's Advances in Solar Energy, *10* (1995).

Rubin, E.S., M.J. Small, C.N. Bloyd, and M. Henrion, *An Integrated Assessment of Acid Deposition Effects on Lake Acidification*, Journal of Environmental Engineering, ASCE *118*:1 (Jan./Feb. 1992).

Streets, D.G., C. Bloyd, G. Boyd, D. Santini, and T. Veselka, *Climate Change and U.S. Energy Policy*, Energy, *16*:11-12 (Dec. 1991).

Bloyd, C., J. Eazor, J. Gillette, K. Hub, J. Molburg, and B. Kinzey, *Fossil Energy Technology*, in Limiting Net Greenhouse Gas Emissions in the United States, DOE/PE-0101, R. Bradley, E. Watts, and E. Williams, Editors, U.S. Department of Energy (Sept. 1991).

Boyd, G., M. Ross, C. Bloyd, J. Molburg, D. Hanson, R. Fisher, and E. Kokkelenberg, *Industrial Technology*, in Limiting Net Greenhouse Gas Emissions in the United States, DOE/PE-0101, R. Bradley, E. Watts, and E. Williams, Editors, U.S. Department of Energy (Sept. 1991).

Energy and Climate Change: Report of the DOE Multi-Laboratory Climate Change Committee, ISBN 0-87371-417-2, Lewis Publishers, CRC Press, Inc., Boca Raton, FL (1990).

Rubin, E.S., C.N. Bloyd, M.J. Small, R.J. Marnicio, and M. Henrion, *Atmospheric Deposition Assessment Model: Applications to Regional Aquatic Acidification in Eastern North America*, in Impact Models to Assess Regional Acidification, Juha Kämäri, Editor, Kluwer Academic Publishers, Boston, MA (1990).

Small, M.J., C. Bloyd, G. Keeler, and R.J. Marnicio, *Stochastic Simulation of Meteorological Variability for Long-Range Atmospheric Transport — II. Long-Term Statistical Models*, Atmospheric Environment, *23*(12):2825-2840 (Dec. 1989).

Rubin, E.S., M. Cushey, R.J. Marnicio, C.N. Bloyd, and J.F. Skea, *Controlling Acid Deposition: The Role of FGD*, Environmental Science and Technology, *20*(10):960-969 (Oct. 1986).

Publications: Journal Articles and Book Contributions (Cont'd)

Ayres, R.U., C.N. Bloyd, and J.C. Molburg, *Future Developments in Fossil Energy Resources and Technology*, for the National Research Council, National Academy of Sciences, Washington, D.C. (1979).

Science and Public Policy Program and Radian Corporation, *First Year Work Plan for a Technology Assessment of Western Energy Resource Development*, U.S. Environmental Protection Agency, Washington, D.C. (1976).

Science and Public Policy Program and Radian Corporation, *A Technology Assessment of Western Energy Resource Development, First Year Report*, U.S. Environmental Protection Agency, Washington, D.C. (1976).

Publications: Reports

Bloyd, Cary, William Mixon, and Terry Sharp. "Institutionalization of a Benchmarking System for Data on the Energy Use in Commercial and Industrial Buildings", APEC #99-RE-01.4, APEC Secretariat, Singapore. November 1999.

Bloyd, C.N., M. Henrion, et.al., Tracking and Analysis Framework (TAF) Model Documentation and User's Guide, Argonne National Laboratory Report ANL/DIS/TM-36, Argonne, IL (Dec. 1997).

Intarapravich, D., and C. Bloyd. *Opportunities for Energy Efficiency Investment in Thailand.* Asia-Pacific Sustainable Development Center, East-West Center, Honolulu, Hawaii (Feb. 1997)

Culver-Hopper, J., K. Wu, C. Obadia, S. Rahmasari, and C. Bloyd, *Selected Latin American/ Caribbean Country Profiles, Report No. 1*, prepared for U.S. Trade and Development Program by East-West Energy Program, Honolulu, Hawaii (Jan. 1992).

Bloyd, C.N., G.A. Boyd, R.E. Fisher, E.J. Kohout, and C.L. Saricks, *Backcasting Performance of the NAPAP Emissions Model Set*, Argonne National Laboratory Report ANL/EAIS/TM-32, Argonne, IL (Feb. 1990).

Rubin, E.S., J.S. Salmento, J.G. Barrett, H.C. Frey, and C.N. Bloyd, *Modeling and Assessment of Advanced Processes for Integrated Environmental Control of Coal-Fired Power Plants*, prepared for U.S. Department of Energy by Center for Energy and Environmental Studies, Carnegie Mellon University, Pittsburgh, PA (July 1986).

Bloyd, C.N., J.C. Molburg, E.S. Rubin, and J.F. Skea, *The State-Level Advanced Utility Simulation Model: Analytical Documentation, The Pollution Control Module*, prepared for the U.S. Environmental Protection Agency by Universities Research Group on Energy, University of Illinois, Urbana, IL (Nov. 1984).

Publications: Reports (Cont'd)

Stukey, J.J., Editor, *A Review and Critique of the Teknekron Utility Simulation Model*, prepared for the U.S. Environmental Protection Agency by Universities Research Group on Energy, University of Illinois, Urbana, IL (1981).

Bloyd, C.N., et al., *Enhancement of Comparative Assessment Model Computer Program. Phase I: Coal Cleaning and Coal Gasification — Combined Cycle Processes,* prepared for Argonne National Laboratory by Center for Energy and Environmental Studies, Carnegie Mellon University, Pittsburgh, PA (Dec. 1979).

Science and Public Policy Program, *The Coal and Oil Shale Resource Development System*, The University of Oklahoma, Norman, OK (1974).

Publications: Conference Papers

Bloyd, Cary, *Technology Cooperation on New and Renewable Energy Technologies in the APEC Region*, Proceedings of the 2002 APEC Exhibition On New & Renewable Energy Technology " , Seoul, Korea. November 7-9, 2002.

Bloyd, Cary, Ranjit Bharvirkar, and Dallas Burtraw, *Investment in Electricity Transmission and Ancillary Environmental Benefits.* Proceedings of the Electric Utilities Environmental Conference, Tucson, Arizona, January 2002.

Bloyd, Cary, *APEC 21st Century Renewable Energy Development Initiative: A Summary*. Proceedings of the Electric Utilities Environmental Conference, Tucson, Arizona, January 2002.

Bloyd, Cary, Dallas Burtraw, and Richard Sonnenblick, *Lessons from the Integrated Assessment of Acid Deposition for Assessing Greenhouse Gas Emissions and Climate Change*. Proceedings of the Electric Utilities Environmental Conference of the Air & Waste Management Association, Tucson, Arizona, January 1999.

Burtraw, D, A. Krupnick, K. Palmer, A. Paul, M. Toman, and C. Bloyd, *Ancillary Benefits of Reduced Air Pollution in the US from Moderate Greenhouse Gas Mitigation Policies in the Electricity Sector*. Proceedings of the Electric Utilities Environmental Conference of the Air & Waste Management Association, Tucson, Arizona, January 1999.

Bloyd, C., *Methodological Issues Associated with the Evaluation of GHG Mitigation Options* . The *5th Japan-US Joint Workshop on Global Change: Uses of Improved Global Change Information.* At this workshop, I was the rapporteur for the working group on Research and Development for Adaptation and Mitigation of Global Change (April 1997).

Bloyd, C., and G. Williams, *Institutional Solutions for Renewable Energy,* World Renewable Energy Conference, Denver, Colorado. (June 1996)

Publications: Conference Papers (Cont'd)

Henrion, Max, Richard Sonnenblick, and Cary Bloyd, *Innovations in Integrated Assessment: The Tracking and Analysis Framework (TAF)*, Proceedings of the Air & Waste Management Association's specialty conference on Acid Rain & Electric Utilities II, Scottsdale, Arizona (Jan. 1997).

Bloyd, C., and G. Williams, *Institutional Solutions for Renewable Energy,* World Renewable Energy Conference, Denver, Colorado (June 1996).

Bloyd, C., Henrion, M., and Marnicio, R, *The Tracking and Analysis Framework: A Tool for the Integrated Assessment of the Air Pollution Controls* , Proceedings of the Air & Waste Management Association's specialty conference on Acid Rain & Electric Utilities: Permits, Allowances, Monitoring & Meteorology in Tempe, AZ (Jan. 1995).

Bloyd, C., and G. Williams, *Approaches to the Assessment of Global Climate Change Impacts of Energy Systems,* in Proceedings of the Regional Conference on Environmental Challenges for Asian-Pacific Energy Systems in the 1990s, Asian and Pacific Development Centre, Kuala Lumpur, Malaysia (Jan. 1991).

Bloyd, C., D. Streets, and R. Fisher, *Energy Models and National Energy Policy*, in Proceedings of the 25th Intersociety Energy Conversion Engineering Conference, Reno, Nevada, American Institute of Chemical Engineers, New York, NY (Aug. 1990).

Streets, D.G., C.N. Bloyd, and D.M. Kenski, *U.S. Energy Use: New Technologies and Policies in Response to Global Warming*, in Proceedings of the Conference on Responding to the Threat of Global Warming: Options for the Pacific and Asia, Argonne National Laboratory and East West Center, Honolulu, HI (June 1989).

Hanson, D.A., G.A. Boyd, A. Bando, and C. Bloyd, *Integrated, Long-Term Economic Energy-Market and Emissions Policy Model*, in Proceedings of the CORS/TIMS/ORSA Joint National Meeting, Vancouver, British Columbia, Canada (May 1989).

Streets, D.G., and C.N. Bloyd, I*mplications of the Greenhouse Effect for the Midwest Economy*, in Proceedings of the 16th Annual Illinois Energy Conference, Chicago, IL (Nov. 1988).

Bloyd, C.N., M.J. Small, R.J. Marnicio, M. Henrion, and E.S. Rubin, *The Effects of Uncertainty on the Analysis of Atmospheric Deposition*, in Proceedings of the 81st Annual Meeting, Dallas, Texas, Air Pollution Control Association, Pittsburgh, PA (June 1988).

Rubin, E.S., J. Salmento, J. Barrett, and C.N. Bloyd, *Analysis of Advanced System Designs for Integrated Environmental Control*, in Proceedings of 3rd Symposium on Integrated Environmental Control, Air Pollution Control Association, Pittsburgh, PA (Feb. 1986).

Publications: Conference Papers (Cont'd)

Rubin, E.S., M. Cushey, R.J. Marnicio, C.N. Bloyd, and J.F. Skea, *The Role of FGD in SO_2 Reduction Strategies for Coal-Fired Power Plants*, in Proceedings of Ninth Symposium on Flue Gas Desulfurization, U.S. Environmental Protection Agency, Research Triangle Park, N.C., and Electric Power Research Institute, Palo Alto, CA (June 1985).

Rubin, E.S., C. Bloyd, C. Bullard, M. Morrison, J. Skea, and L. Stiles, *Mitigation Strategies for the Control of Acid Deposition: Assessing Low-Sulfur Coal Versus Flue Gas Desulfurization*, in Proceedings of the Annual Meeting, American Association for the Advancement of Science, Detroit, MI (May 1983).

Bloyd, C.N., E.S. Rubin, and J.F. Skea, *Sensitivity of Air Pollution Control Costs to Site-Specific Variables for Coal-Fired Power Plants*, in Proceedings of 6th World Congress on Air Quality, IUAPPA, Paris, France (May 1983).

Rubin, E.S., C.N. Bloyd, and J.C. Molburg, *Models of Air Pollution Control Costs for Coal-to-Electricity Systems*, in Proceedings of 5th International Coal Utilization Conference, Houston, TX (Dec. 1982).

Bloyd, C.N., and E.S. Rubin, *The Effect of Emission Regulations on the Performance and Cost of Coal Gasification/Combined Cycle Systems*, Paper No. 81-WA/APC-2 in Proceedings of the 1981 Winter Annual Meeting, American Society of Mechanical Engineers, New York, NY (Nov. 1981).

Rubin, E.S., C.N. Bloyd, P.J. Grogan, and F.C. McMichael, *Cross-Media Environmental Impacts of Coal-to-Electric Systems*, in Proceedings of the Third Symposium on Environmental Aspects of Fuel Conversion Technology, U.S. Environmental Protection Agency, Research Triangle Park, NC (Sept. 1977).

Bloyd, C.N., and E.S. Rubin, *A Methodology for Assessing Cross-Media Environmental Impacts of Coal Conversion Plants*, in Proceedings of Second Pacific Chemical Engineering Congress (Pachee '77), American Institute of Chemical Engineers, New York, NY (Aug. 1977).

Oral Presentations

APEC Expert Group on New and Renewable Energy Technologies and Energy Security, APEC Energy Security Initiative Workshop, Chinese Taipei, April 23-24, 2002.

Energy and the Environment, Great Decisions Program, World Affairs Council of Oregon, Portland, Oregon, February 14, 2002.

Overview of Lessons Learned in the Development of TAF, Presented to the CMU-Harvard Workshop on Integrated Assessment, Carnegie Mellon University (Dec. 11-12, 1997).

Oral Presentations (Cont'd)

Energy and Sustainable Development: Issue Identification and Information Exchange, presented at the Pathways to Sustainability, Local Initiatives for Cities and Towns, International Conference, Newcastle, New South Wales, Australia (June 1-5, 1997).

Status and Trends in Clean Coal Technology, presented to the Indonesian Clean Coal Technology Mission, Sponsored by the U.S. ASEAN Council, East-West Center, Honolulu, HI (Nov. 94).

New and Renewable Energy Sources for China, presented at the International Symposium on China's National Response Strategy for Global Climate Change, Beijing, China (Dec. 1993).

U.S. DOE Clean Coal Technology Program, presented at the Hawaii Coal Seminar, sponsored by the Department of Business, Economic Development & Tourism Energy Division, Honolulu, HI (Jan. 1993).

Energy Costs and Energy Models, presented at the annual meeting of the Fellows in Renewable Energy Engineering, Hawaii Natural Energy Institute, Honolulu, HI (Oct. 1991).

ENPEP: An Integrated Approach for Modeling Energy Systems, presented at State Department of Business, Economic Development and Tourism, Honolulu, HI (May 1991).

The Science and Policy of Global Climate Change, Seminar to the East-West Center Group on Environment and Resources, Honolulu, HI (April 1991).

Approaches to the Assessment of Global Climate Change Impacts of Energy Systems, presented at Regional Conference on Environmental Challenges for Asian-Pacific Energy Systems in the 1990s, Asian and Pacific Development Centre, Kuala Lumpur, Malaysia (Jan. 1991).

Advanced Energy Systems and Global Climate Change, presented at Earth Day program, Hawaiian Academy of Sciences, Honolulu, HI (Oct. 1990).

Energy Models and National Energy Policy, presented at 25th Intersociety Energy Conversion Engineering Conference, Reno, NV (Aug. 1990).

Global Climate Change and the Natural Gas Industry, presented at Midwest Gas Institute Annual Meeting, Chicago, IL (June 1990).

Global Climate Change: Science, Policy, and Opportunities, presented at A Look at the Environment, Illinois Mathematics and Science Academy, Aurora, IL (April 1990).

The Science and Policy of Global Climate Change, presented at Group for Environment and Resources, East-West Center, Honolulu, HI (April 1990).

Oral Presentations (Cont'd)

Impact of Greenhouse Gas Reduction on the Electric Utility Sector, presented at 1990 AAAS Annual Meeting, New Orleans, LA (Feb. 1990).

Review of a First Level Integrated Assessment of Acid Deposition, presented at Acidic Deposition: State of Science and Technology, International Conference, Hilton Head Island, NC (Feb. 1990).

Electric Utilities and Global Climate Policy Options, presented at Global Warming: Opportunities for Issues Management, Middle Atlantic Power Pool Annual Meeting, Minneapolis, MN (Nov. 1989).

The Effects of Uncertainty on the Analysis of Atmospheric Deposition, presented at 81st Annual Meeting, Air Pollution Control Association, Dallas, TX (June 1988).

The Effect of Emission Regulations on the Performance and Cost of Coal Gasification/Combined Cycle Systems, presented at 1981 Winter Annual Meeting, American Society of Mechanical Engineers, Chicago, IL (Nov. 1981).

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