

APPENDIX B

RESUME OF DANIEL E. KLEIN

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**Prefiled Rebuttal Testimony of Daniel Klein
North Dakota Public Service Commission
Case No. PU-06-481 & PU-06-482**

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RESUME

DANIEL E. KLEIN

EDUCATION

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| 1975 | M.B.A., Graduate School of Business, Stanford University |
| 1973 | S.B., Urban Studies, Massachusetts Institute of Technology |

EXPERIENCE

Daniel E. Klein, President of Twenty-First Strategies, has over 30 years of consulting experience in energy, environmental, and economic analysis. For many years a Senior Vice President and Director of ICF Resources Incorporated, he founded Twenty-First Strategies in 1995 to offer energy and environmental consulting services to energy companies, government agencies, and others.

Over the course of his consulting career, Mr. Klein has conducted hundreds of projects related to energy and environmental concerns, energy markets, electric utility fuel use, coal supply, transportation, and antitrust issues. His work in recent years has focused primarily on climate change, electric power, and related issues, both on policy issues from the government side as well as strategies for the private sector. Mr. Klein earned a Bachelor's degree from MIT and an MBA from the Stanford Graduate School of Business. Selected examples of his recent work include the following:

Environmental Policy and Analysis

- Global Climate Change and Electric Utilities.** Mr. Klein has directed efforts with electric utilities and government agencies to develop data and methods for assessing and planning for potential climate change initiatives. These efforts include developing new analytic frameworks for estimating potential impacts on electric power systems, and evaluating risk mitigation strategies. He directed efforts to assist the Administration develop and implement portions of the Climate Change Action Plan in the 1990s, and is continuing a variety of analytic efforts related to the Global Climate Change Initiative. In the electric utility/DOE Climate Challenge program, he was responsible for recruiting new member utilities and for helping measure and report on progress made. He is presently working with electric utilities and others to identify and implement voluntary programs to reduce greenhouse gas emissions as part of their efforts under the Power PartnersSM program.
- Environmental Externalities.** Mr. Klein has directed several efforts supporting the U.S. Department of Energy in matters related to the use of environmental externalities. For DOE's Fossil Energy office, he directed an assessment of the socioeconomic impacts associated with potential rate increases that may result from the inclusion of externalities in electric power resource planning. He

1 has provided internal critiques and analytic support to efforts to use the damage function approach
 2 for quantifying externalities. Working with private sector groups, he has developed a framework for
 3 evaluating mortality implications stemming from income effects of changes in power costs, and has
 4 used this framework in testimony.

- 5 • **Carbon Sequestration.** Mr. Klein has provided numerous support efforts to DOE's Carbon
 6 Sequestration Program since its inception. He has co-authored over 20 papers and conference
 7 presentations communicating the potential for carbon sequestration and DOE's activities in this
 8 area. He has additionally co-authored several book chapters and industry journal articles on the
 9 topic. He assisted DOE in its review of the recent draft IPCC Special Report on Carbon Dioxide
 10 Capture and Storage. He developed, compiled, and maintains what has become the most
 11 comprehensive database of carbon sequestration R&D activities available, and made this available
 12 via the Internet at <http://carbonsequestration.us>.
- 13 • **Clean Air Act Analyses.** In numerous studies for public and private sector clients, Mr. Klein has
 14 analyzed the impacts of acid rain mitigation proposals, New Source Performance Standards, NO_x
 15 restrictions, and several other Clean Air Act issues on the electricity, coal, transportation, and labor
 16 markets. He developed state-of-the-art models and approaches for estimating impacts on electric
 17 utilities, coal mining, and transportation industries.
- 18 • **Climate Change Mitigation Strategy in Eastern Europe.** Mr. Klein led the U.S. portion of a
 19 multinational team to create a climate change strategy for the city of Donetsk, Ukraine. Under
 20 funding provided by U.S. Agency for International Development, Twenty-First Strategies partnered
 21 with the Ecology and Environment Department of the Donetsk City Council and the U.S.-based
 22 Center for Clean Air Policy. The project developed a GHG inventory for the city of Donetsk, and
 23 identified potential GHG mitigation activities and the associated cost and effectiveness.
- 24 • **Utility Coal Combustion By-Products.** Mr. Klein has analyzed issues related to disposal practices
 25 and potential standards for electric utility ash and sludge wastes. These efforts have included
 26 estimating past and future waste disposal volumes, identifying current regulatory requirements, and
 27 evaluating the costs and other potential impacts of alternative waste management practices.
 28 Working with the American Coal Ash Association, Utility Solid Waste Action Group, and others, he
 29 has directed studies and made conference presentations concerning beneficial use of coal
 30 combustion by-products and associated reductions in greenhouse gas emissions.
- 31 • **Environmental Aspects of Coal Mining and Transportation.** Mr. Klein has led numerous studies of
 32 the impacts of strip mining regulations, fugitive dust limits for surface coal mining, federal coal
 33 leasing policies, environmental impacts of rail deregulation, and related issues.
- 34 • **Oil Spill Environmental Impacts.** On behalf of several Alaskan Native Corporations, Mr. Klein
 35 directed litigation support efforts related to the Exxon VALDEZ oil spill. These efforts have
 36 included field and technical studies, economic impacts, and impacts on land values.

37 Economic and Market Analysis and Forecasting

- 38 • **Energy Market Forecasting.** For 20 years, Mr. Klein directed major portions of ICF Resources'
 39 extensive efforts in forecasting short- and long-term conditions in the fuel and power markets. He
 40 developed forecasting methodologies and related data bases, developed and enhanced ICF's Coal
 41 and Electric Utilities Model, and designed its successor models. These models and methodologies
 42 were used in dozens of market and strategic studies for private clients and policy analyses for the
 43 public sector.
- 44 • **Antitrust Market Analysis.** In major antitrust cases, Mr. Klein has served as an expert witness in the
 45 identification of relevant coal and transportation markets. In work with the Department of Justice

1 and major coal companies, he tested and implemented new market delineation techniques based
 2 upon demand cross-elasticities; this work currently serves as the basis for Department of Justice
 3 policy. Mr. Klein has also testified as a witness before the ICC on issues regarding railroad
 4 transportation markets, and in private antitrust cases.

- 5 • ***Energy and Mineral Appraisals.*** Rapid swings in energy and minerals markets over the past two
 6 decades have led to sharp changes in the value of reserves and producing operations. Appraisals
 7 have often been needed to set property values at different points in time for tax basis determination,
 8 prudence of procurement decisions, losses resulting from federal takings, property tax assessments,
 9 and other purposes. Mr. Klein has led numerous projects relating to reconstructing appraisals
 10 appropriate to past market conditions and knowledge. These efforts have included oil, gas, coal,
 11 geothermal, and various metals and mineral properties.

12 **Energy and Transportation Issues**

- 13 • ***Energy Security.*** As oil and gas prices reach historically high levels, our dependence on foreign
 14 sources creates massive economic outflows to countries that are often unfriendly to our interests.
 15 The continuing high level of oil imports, together with our growing reliance on imported liquefied
 16 natural gas, create security concerns as well as economic ones. Together with growing pressures to
 17 act on climate change, we face a “perfect storm” of intertwined energy, security, and climate
 18 problems – a once-in-a-generation set of challenges and opportunities. In testimony, presentations,
 19 and analyses, Mr. Klein has explored numerous aspects of these issues.
- 20 • ***Adequacy of Energy Data.*** Mr. Klein is a recognized expert on the use and misuse of coal and other
 21 energy data, particularly as they apply to modeling and forecasting efforts. He has developed new
 22 approaches toward incorporating disparate sources of information, and has been published at length
 23 on the pitfalls of using public data. For the Department of Justice, Mr. Klein directed the
 24 development of the coal reserve data base now used in DOJ's competition review procedures. He
 25 has testified as an expert witness in an intellectual property case regarding originality of methods
 26 for data collection and application in forecasting models.
- 27 • ***Federal Coal Leasing Policies.*** In several studies for public and private sector clients, Mr. Klein
 28 has evaluated impacts of leasing moratoriums, approaches to determining levels of leasing, concepts
 29 of fair market value, impacts of diligence and royalty requirements, and many other aspects of this
 30 complex regulatory program. He testified as an expert witness before the Commission on Fair
 31 Market Value Policy for Federal Coal Leasing.
- 32 • ***Transportation Policy.*** Mr. Klein has led studies evaluating impacts of rail rate deregulation,
 33 economic and energy impacts of coal slurry pipelines, railroad leasing of federal coal, coal
 34 transportation costs for different modes, and many others. In efforts with DOE, he conducted
 35 studies of the effects of the Staggers Rail Act on coal and electricity markets. He has testified before
 36 the Interstate Commerce Commission on market dominance issues.
- 37 • ***Transportation Strategies.*** Mr. Klein has worked with shippers to formulate strategies for
 38 enhancing their competitive alternatives and improving their bargaining position. Working with
 39 carriers, law firms, investment bankers, and others, he has developed market forecasts of rail traffic
 40 and revenues, analyzed impacts of economic and legislative uncertainties, and helped to develop
 41 approaches for enhancing market share and contribution.

42 **SELECTED PUBLICATIONS AND PRESENTATIONS**

43 “Progress and New Developments in CO₂ Capture and Storage” (co-authored with Robert L. Kane (DOE),
 44 Sean I. Playsynski (DOE/NETL), and Rameshwar D. Srivastava (SAIC)), presented at the 11th

- 1 Electric Utilities Environmental Conference: Air Quality & Global Climate Change, Tucson,
2 Arizona, January 29-31, 2008.
- 3 “Use of Coal Combustion Products and Implications for GHG Emissions,” presented to the EUCU
4 Conference on New Business Opportunities in Coal Combustion Products, Charlotte NC, July 16,
5 2007.
- 6 “Use of Coal Combustion Products and Implications for GHG Emissions,” presented to the Flyash Concrete
7 & GHG Reductions Workshop, Wal-Mart Sustainable Value Initiative, Durham NC, May 4, 2007.
- 8 “A Perfect Storm for Energy, National Security, & Climate,” presented to the National Hydropower 2007
9 Annual Conference, Washington DC, March 17, 2007.
- 10 “New Developments in Carbon Capture and Storage” (co-authored with Robert L. Kane (DOE), Sean I.
11 Playsynski (DOE/NETL), and Rameshwar D. Srivastava (SAIC)), presented at the 10th Electric
12 Utilities Environmental Conference: Air Quality & Global Climate Change, Tucson, Arizona,
13 January 22-24, 2007.
- 14 “Climate Change: Reporting Responsibilities under the Climate VISION Memorandum of Understanding,”
15 presented to the American Public Power Association 2006 National Conference, Chicago IL, June
16 13, 2006.
- 17 “Climate Vision, Power PartnersSM, & GHG Activities for Public Power,” presented to the American Public
18 Power Association seminar on “Climate Change: Making Community-Based Decisions in a
19 Carbon-Constrained World,” Washington DC, Feb. 28, 2006.
- 20 “New Developments in Carbon Capture and Storage” (co-authored with Sean Playsynski, DOE/NETL),
21 presented at the 9th Electric Utilities Environmental Conference: Air Quality & Global Climate
22 Change, Tucson, Arizona, January 23-25, 2006.
- 23 “Prospects for Participation of Methane Sectors in Emissions Trading Programs in California,” prepared for
24 the Center for Clean Air Policy, October 2005, [http://www.climatechange.ca.gov/documents/2005-
25 10-14_CCAP_REPORTS/CCAP_REPORT_METHANE.PDF](http://www.climatechange.ca.gov/documents/2005-10-14_CCAP_REPORTS/CCAP_REPORT_METHANE.PDF)
- 26 “Suitability of Methane Sources for Greenhouse Gas Emissions Trading,” prepared for the Center for Clean
27 Air Policy, Washington D.C. Draft report dated August 2005; report publication upcoming.
- 28 “New Developments in DOE’s Carbon Sequestration Program” (co-authored with Robert L. Kane, DOE),
29 presented at the 8th Electric Utilities Environmental Conference: Air Quality & Global Climate
30 Change, Tucson, Arizona, January 24-26, 2005.
- 31 “Climate VISION Update: Policy Drivers for Climate Change and Energy Security” (co-authored with
32 David Berg, DOE), presented at the 8th Electric Utilities Environmental Conference: Air Quality &
33 Global Climate Change, Tucson, Arizona, January 24-26, 2005.
- 34 “CCP Use and Their Impact on Greenhouse Gases,” presented to American Coal Ash Association, Canadian
35 Industries Recycling Coal Ash, Midwest Coal Ash Association, Dearborn, Michigan, June 8, 2004.
- 36 “Climate VISION & the Administration’s Global Climate Change Initiative” (co-authored with David Berg,
37 DOE), presented at the 7th Electric Utilities Environmental Conference: Air Quality & Global
38 Climate Change, Tucson, Arizona, January 20-22, 2004.
- 39 “Estimating GHG Savings from Use of Coal Combustion Products: Methodology & Results for 2000-2001”
40 (co-authored with James Roewer, Utilities Solid Waste Action Group (USWAG)), presented at the
41 7th Electric Utilities Environmental Conference: Air Quality & Global Climate Change, Tucson,
42 Arizona, January 20-22, 2004.

- 1 “DOE’s Carbon Sequestration Program and New Directions for Meeting Global Climate Change Goals”
2 (co-authored with Robert L. Kane, DOE), presented at Combustion Canada '03, Vancouver, British
3 Columbia, Canada, September 21-24, 2003.
- 4 “Database of Carbon Sequestration R&D Projects in the U.S.” (co-authored with Robert L. Kane, DOE),
5 presented at 2nd Annual Conference on Carbon Sequestration, May 5-8, 2003, Alexandria, Virginia.
- 6 “Incorporating Mortality Reductions From Use of Low-Cost Power into Evaluations of Externality
7 Proposals,” presented at the Valuing Externalities Workshop, U.S. Dept. of Energy National Energy
8 Technology Laboratory, Alexandria VA, Feb. 20-21, 2003,
9 <http://www.netl.doe.gov/publications/proceedings/03/valuing-ext/Klein.pdf>.
- 10 “Mortality Reductions from Use of Low-Cost Coal-Fueled Power: An Analytical Framework,” presented at
11 the 6th Electric Utilities Environmental Conference: Air Quality & Global Climate Change, Tucson,
12 Arizona, January 27-29, 2003.
- 13 “DOE’s Carbon Sequestration Program and New Directions for Meeting Global Climate Change Goals”
14 (co-authored with Robert L. Kane, DOE), presented at the 6th Electric Utilities Environmental
15 Conference: Air Quality & Global Climate Change, Tucson, Arizona, January 27-29, 2003.
- 16 “Mortality Reductions from Use of Low-Cost Coal-Fueled Power: An Analytical Framework” (co-authored
17 with Ralph L. Keeney, Duke University Fuqua School of Business), prepared for the Center for
18 Energy and Economic Development, *et al.*, December 2002,
19 <http://www.ceednet.org/kkhealth/index.asp>.
- 20 “Carbon Sequestration: An Option for Mitigating Global Climate Change” (co-authored with Robert L.
21 Kane, DOE), published as Chapter 6 in *Environmental Challenges and Greenhouse Gas Control for
22 Fossil Fuel Utilization in the 21st Century*, edited by M. Mercedes Maroto-Valer, Chunshan Song,
23 and Yee Soong, New York: Kluwer Academic/Plenum Publishers, 2002.
- 24 “A Database of Carbon Sequestration R&D Projects in the U.S.” (co-authored with Robert L. Kane, DOE),
25 presented at the 5th Electric Utilities Environmental Conference: Air Quality, Global Climate
26 Change, Renewable Energy & Emergency Response, Tucson, Arizona, January 22-25, 2002.
- 27 “Carbon Sequestration: An Option for Mitigating Global Climate Change” (co-authored with Robert L.
28 Kane, DOE), published in *Chemical Engineering Progress*, June 2001, pp. 44–52.
- 29 “Opportunities for Advancements in Chemical Processes in Carbon Sequestration and Climate Change
30 Mitigation” (co-authored with Robert L. Kane, DOE), presented at the American Chemical Society
31 221st Annual Meeting, San Diego California, April 4, 2001.
- 32 “Carbon Sequestration: A Third Pathway for Mitigating Global Climate Change” (co-authored with Robert
33 L. Kane, DOE), presented at the Electric Utilities Environmental Conference, Tucson, Arizona,
34 January 8-12, 2001.
- 35 “CO₂ Sequestration: Expanding Our Options for Mitigating Global Climate Change” (co-authored with
36 Robert L. Kane, DOE), presented at the 93rd Annual Meeting and Exhibition of the Air & Waste
37 Management Association, Salt Lake City, Utah, June 2000.
- 38 “Environmental Benefits of Fossil Energy Technologies and Importance for Future Carbon Mitigation
39 Costs” (co-authored with Robert L. Kane, DOE), presented at Combustion Canada '99: Combustion
40 and Global Climate Change, Canada’s Challenges and Solutions, Calgary, Alberta, Canada, May
41 26-28, 1999.
- 42 “CO₂ Sequestration: Opportunities and Challenges” (co-authored with Robert L. Kane, DOE, and Howard J.
43 Herzog, MIT Energy Laboratory), presented at Combustion Canada '99: Combustion and Global
44 Climate Change, Canada’s Challenges and Solutions, Calgary, Alberta, Canada, May 26-28, 1999.

- 1 “Climate Challenge Program: Lessons Learned and Prospects for the Future” (co-authored with Daniel R.
2 Cleverdon, Cadmus Group Inc.), presented at Combustion Canada '99: Combustion and Global
3 Climate Change, Canada's Challenges and Solutions, Calgary, Alberta, Canada, May 26-28, 1999.
- 4 “Coal Mine Methane: Opportunities for Low-Cost Zero-GHG Power” (co-authored with Paul Teske,
5 MCNIC Oil & Gas Co.), presented at Combustion Canada '99: Combustion and Global Climate
6 Change, Canada's Challenges and Solutions, Calgary, Alberta, Canada, May 26-28, 1999.
- 7 “Buyer vs. Seller Liability in International Emissions Trading,” presented at the CCAP International
8 Emissions Trading Dialog Group, Toronto, Ontario, Canada, March 4, 1999.
- 9 “Fossil Energy-Related Greenhouse Gas Control Strategies and Associated Environmental Benefits” (co-
10 authored with Robert L. Kane, DOE), presented at the Electric Utilities Environmental Conference:
11 Science, Regulations & Impacts of SO₂, CO₂, O₃, NO_x & Mercury, Tucson AZ, January 11-13,
12 1999.
- 13 “Western Utilities' Outlook for Greenhouse Gas Emissions and Options for Achieving Reductions” (co-
14 authored with Dr. Prabhu Dayal, Tucson Electric Power Co.), presented at the Electric Utilities
15 Environmental Conference: Science, Regulations & Impacts of SO₂, CO₂, O₃, NO_x & Mercury,
16 Tucson AZ, January 11-13, 1999.
- 17 “Coal Mine Methane Capture in Southwestern Virginia” (co-authored with Paul Teske, MCNIC Oil & Gas
18 Co.), presented at the Air & Waste Management Association's Second International Specialty
19 Conference on Global Climate Change, Crystal City VA, October 13-16, 1999.
- 20 “Global Climate Change: The Road to Kyoto,” (co-authored with C.V. Mathai, Arizona Public Service Co.,
21 and Nikhil Desai), published in EM Magazine, a publication of the Air & Waste Management
22 Association, November 1997.
- 23 “Managing the Climate Change Risks in a Restructuring Electric Utility Industry” (co-authored with Robert
24 L. Kane, DOE), presented at the International Climate Change Conference & Technologies
25 Exhibition, Baltimore MD, June 12-13, 1997.
- 26 “Voluntary Programs to Reduce GHG Emissions: Cross-National Perspectives” (co-authored with Robert L.
27 Kane, DOE), presented at the 90th Annual Meeting and Exhibition of the Air & Waste Management
28 Association, Toronto, Ontario, Canada, June 8-13, 1997.
- 29 “Coal Mine Methane: New Market Opportunities for Power and Gas Providers,” presented at the USEPA
30 conference “Deregulation and New Coalbed Methane Opportunities,” Pittsburgh, PA, April 22,
31 1997.
- 32 “Interactions Between Greenhouse Gas Policies and Acid Rain Control Strategies” (co-authored with Robert
33 L. Kane and Larry Mansueti, DOE), presented at the Air & Waste Management Association's Acid
34 Rain and Electric Utilities II Conference, Scottsdale, AZ, January 21-22, 1997.
- 35 “Climate Change, Voluntary Programs, and Risk Management in a Restructuring Industry” (co-authored
36 with Robert L. Kane, DOE), presented at the International Association for Energy Economics 11th
37 Annual North American Conference, Boston, Massachusetts, October 28, 1996.
- 38 “United States Strategy for Mitigating Global Climate Change” (co-authored with Robert L. Kane, DOE),
39 presented at the Third International Conference on Carbon Dioxide Removal, Boston,
40 Massachusetts, September 9, 1996.
- 41 “Climate Challenge: Relating Electric Utility Voluntary Actions to National Goals” (co-authored with
42 Robert L. Kane, DOE), presented at the 89th Annual Meeting and Exhibition of the Air & Waste
43 Management Association, Nashville, Tenn., June 23-28, 1996.

- 1 “Meeting the Climate Change Challenge: Climate-Related Activities of the U.S. Department of Energy's
2 Office of Fossil Energy” (co-authored with Robert L. Kane, DOE, and Steven Reich, ICF),
3 presented at the 18th IAEE International Conference, Washington DC, July 5-8, 1995.
- 4 “Trends in Greenhouse Gas Emissions in the U.S. and Potential Future Outlook” (co-authored with Robert
5 L. Kane, DOE, and Steven Winkelman, ICF), presented at the 88th Annual Meeting and Exhibition
6 of the Air & Waste Management Association, San Antonio, Texas, June 18-23, 1995.
- 7 “The Challenge of Climate Change: A Progress Report on the Potential for Voluntary Industry-
8 Government Partnerships to Reduce Greenhouse Gas Emissions” (co-authored with Robert L.
9 Kane, DOE, and Nikhil Desai, ICF), presented at the 88th Annual Meeting and Exhibition of the Air
10 & Waste Management Association, San Antonio, Texas, June 18-23, 1995.
- 11 “Further Opportunities for Coal Combustion Byproducts to Reduce Greenhouse Gas Emissions” (co-
12 authored with Samuel S. Tyson, ACAA, and Steven Winkelman, ICF), presented at the CCB
13 Management and Use Workshop, Memphis, Tennessee, April 17-19, 1995.
- 14 “Climate Change and New Opportunities for Coal Combustion Byproducts” (co-authored with Samuel S.
15 Tyson, ACAA), presented at the 11th International Symposium on Use & Management of Coal
16 Combustion Byproducts, Orlando, Florida, January 15-19, 1995.
- 17 “Full Consideration of Externalities” (co-authored with David Kathan, ICF), presented to the NARUC -
18 DOE Fifth National Integrated Resource Planning Conference, May 1994.
- 19 “Greenhouse Gas Emission Reduction Options and Strategies” (co-authored with Robert L. Kane, DOE),
20 presented to the Air & Waste Management Association International Specialty Conference on
21 Global Climate Change: Science, Policy, and Mitigation Strategies, Phoenix, Arizona, April 1994.
- 22 “The Dynamic Energy & Greenhouse Emission Evaluation System (DEGREES)” (co-authored with Ira H.
23 Shavel, et. al., ICF), presented to the 15th Annual North American Conference, International
24 Association for Energy Economics, Seattle, Washington, October 1993.
- 25 “Carbon Taxes and Carbon Limits Are Not the Same” (co-authored with Ira H. Shavel, David J. Doyle, and
26 Jerry L. Golden (TVA)), presented to the 15th Annual North American Conference, International
27 Association for Energy Economics, Seattle, Washington, October 1993.
- 28 “Impacts of Including Externalities in National Electric Utility Planning” (co-authored with David Kathan,
29 ICF), presented to the 15th Annual North American Conference, International Association for
30 Energy Economics, Seattle, Washington, October 1993.
- 31 “Marketing Gas to Future Electricity Producers More Than Writing Purchase Orders” (co-authored with B.
32 Venkateshwara, ICF), published in *Natural Gas*, July 1988.
- 33 “New Competition for the Railroads,” published in *The Journal of Commerce*, May 1, 1986.
- 34 “Lower Sulfur Coals as a Means of Reducing Sulfur Dioxide Emissions,” presented to the First International
35 Conference on Acid Rain: Regulatory Aspects and Engineering Solutions, published in *Power*
36 *Magazine*, Washington, D.C., March 1984.
- 37 “Forecasting Employment Impacts of Acid Rain Control Programs,” presented to Resources for the Future
38 Symposium, Washington, D.C., December 1983.
- 39 “Adequacy of Low-Sulfur Coal Supplies for Meeting Acid Rain Requirements,” presented to the Air
40 Pollution Control Association, 76th Annual Meeting and Exhibition, Atlanta, Georgia, June 1983.
- 41 “The Outlook for Coal in the Next Twenty Years” (co-authored with C. Hoff Stauffer, Jr., ICF), presented to
42 the Electric Power Research Institute Fuels Supply Seminar, Memphis, Tennessee, December 1981,
43 published in *Selected Papers on Fuel Forecasting and Analysis*, EPRI EA-3015, May 1983.

- 1 “Relationship of Coal and Oil Prices” (co-authored with C. Hoff Stauffer, Jr., ICF), December 1981,
2 published in *Selected Papers on Fuel Forecasting and Analysis*, EPRI EA-3015, May 1983.
- 3 “Effects of Resource Depletion on Future Coal Prices,” presented to the Electric Power Research Institute
4 Fuels Supply Seminar, St. Louis, Missouri, October 1982, published in *Proceedings: Fuel Supply*
5 *Seminars*, EPRI EA-2994, March 1983.
- 6 “Coal Market Forecasts, the Clean Air Act, and Effects on Western Coal Production,” presented to the
7 Western Interstate Energy Board, Santa Fe, New Mexico, May 1982.
- 8 “National and Regional Coal Reserves Information for Planning and Policy: The Problems,” presented to
9 the Electric Power Research Institute Workshop on Applied Coal Geoscience and the Electric
10 Utilities, Austin, Texas, November 1981.
- 11 “Coal Supply, Demand, and Transportation,” presented to the Coal Week/Energy Bureau Conference on
12 Coal Transportation, Arlington, Virginia, October 1980.

13 SELECTED REPORTS

- 14 “Prospects for Participation of Methane Sectors in Emissions Trading Programs in California,” prepared for
15 the Center for Clean Air Policy, October 14, 2005.
16 [http://www.climatechange.ca.gov/documents/2005-10-](http://www.climatechange.ca.gov/documents/2005-10-14_CCAP_REPORTS/CCAP_REPORT_METHANE.PDF)
17 [14_CCAP_REPORTS/CCAP_REPORT_METHANE.PDF](http://www.climatechange.ca.gov/documents/2005-10-14_CCAP_REPORTS/CCAP_REPORT_METHANE.PDF)
- 18 “Mortality Reductions from Use of Low-Cost Coal-Fueled Power: An Analytical Framework” (co-authored
19 with Ralph L. Keeney, Research Professor, Duke University Fuqua School of Business), prepared
20 for the Center for Energy and Economic Development, *et al.*, December 2002.
- 21 “Suitability of Methane Sources for Emissions Trading,” prepared for the Center for Clean Air Policy,
22 publication forthcoming.
- 23 “Climate Challenge Program Report” (co-authored with Princeton Economic Research, Inc.), U.S.
24 Department of Energy Publication DOE/FE-0355, December 1996.
25 <http://www.eere.energy.gov/climatechallenge/progressreport/titlpg.htm>.
- 26 “Increased Fly Ash Use Under the Climate Challenge Program: A Summary of Participation Accords
27 Between the Electric Utilities and the U.S. Department of Energy,” prepared for American Coal Ash
28 Association, January, 1996.
- 29 “Economic Impacts of Climate Change Policies on TVA,” submitted to the Tennessee Valley Authority, June
30 1993.
- 31 “Coal Combustion Waste Management Study”, submitted to Department of Energy, Office of Fossil Energy,
32 February, 1993.
- 33 “Screening Analysis of H.R. 2663: ‘CO₂ Offsets Policy Efficiency Act of 1991’”, submitted to Department
34 of Energy, Office of Fossil Energy, January 1992.
- 35 “Assessment of Greenhouse Gas Emissions Policies of the Electric Utility Industry: Costs, Impacts, and
36 Opportunities,” submitted to the Edison Electric Institute, January 1992.
- 37 “Low Sulfur Coal Markets: Past and Future,” submitted to the Alliance for Clean Energy, October 1987.
- 38 “Analysis of Issues Associated with Railroad Control of Coal,” submitted to Rocky Mountain Energy, May
39 1986.
- 40 “Analysis of Cost-Effective, Phased-In Reductions of Sulfur Dioxide Emissions,” submitted to the Alliance
41 for Clean Energy, February 1984.

- 1 "The Effect on Producer Surplus of Increasing Coal Prices in Various Western Coal-Producing Regions,"
 2 submitted to the Department of Justice, February 1982.
- 3 "Potential Impacts of Overleasing and Underleasing of Federal Coal," submitted to the U.S. Department of
 4 Energy, August 1981.
- 5 "An Examination of Lognormality of Coal Seam Thickness," September 1980.
- 6 "Coal and Electric Utilities Model Documentation," submitted to the Environmental Protection Agency,
 7 May 1980.
- 8 "Concepts and Issues in Discounted Cash Flow Analysis for Estimating Fair Market Value for Federal
 9 Coal," submitted to the Department of Interior, April 1980.
- 10 "Coal Resource Information, Volume 3: Case Studies in Evaluating the Adequacy of Information,"
 11 submitted to the Electric Power Research Institute, EPRI EA-673 Vol. 3, March 1980.
- 12 "The Potential Energy and Economic Impacts of Coal Slurry Pipelines," submitted to the Department of
 13 Energy, January 1980.
- 14 "Observations on Fair Market Value for Federal Coal Leases," submitted to the Fair Market Value Task
 15 Force, Department of Interior, December 1979.
- 16 "The Demand for Western Coal and Its Sensitivity to Key Uncertainties," submitted to the Departments of
 17 Interior and Energy, September 1978.
- 18 "Economic Considerations in Industrial Boiler Fuel Choice," submitted to the Congressional Budget Office,
 19 June 1978.
- 20 "Energy and Economic Impacts of H.R. 13950 (Surface Mining Control and Reclamation Act of 1976),"
 21 submitted to the Council on Environmental Quality and U.S. EPA, September 1977.

22 **EXPERT TESTIMONY**

- 23 *Pre-Filed Rebuttal Testimony on behalf of Otter Tail Power Company and others, regarding the price*
 24 *volatility of natural gas prices and the attendant effects on household income and public health, and*
 25 *on the potential contribution of demand-side management programs, before the Minnesota Public*
 26 *Utilities Commission, Case No. OAH No. 12-2500-17037-2, MPUC Dkt No. CN-05-619, and OAH*
 27 *No. 12-2500-17038-2, MPUC Dkt No. TR-05-1275, "In the Matter of the Application to the*
 28 *Minnesota Public Utilities Commission for a Route Permit for the Big Stone Transmission Project*
 29 *in Western Minnesota," December 1, 2006, December 8, 2006, November 13, 2007, and January*
 30 *16, 2008.*
- 31 *Pre-Filed Rebuttal Testimony and oral cross-examination on behalf of Otter Tail Power Company, regarding*
 32 *the price volatility of natural gas prices and the attendant effects on household income and public*
 33 *health, before the South Dakota Public Utilities Commission, Case No. EL05-022, "In the Matter of*
 34 *the Application by Otter Tail Power Company on Behalf of the Big Stone II Co-Owners for an*
 35 *Energy Conversion Facility Siting Permit for the Construction of the Big Stone II Project," June*
 36 *2006. <http://www.state.sd.us/puc/commission/dockets/electric/2005/el05-022/rebtestimonyklein.pdf>*
 37 *and [http://www.state.sd.us/puc/commission/dockets/electric/2005/el05-](http://www.state.sd.us/puc/commission/dockets/electric/2005/el05-022/rebtestimonyyuggerudex31a.pdf)*
 38 *[022/rebtestimonyyuggerudex31a.pdf](http://www.state.sd.us/puc/commission/dockets/electric/2005/el05-022/rebtestimonyyuggerudex31a.pdf).*
- 39 *Expert Report and oral testimony on behalf of Hill & Associates, Inc., regarding intellectual property claims*
 40 *concerning coal market forecasting models, before the American Arbitration Association, Case No.*
 41 *16 168Y 00681 05, May 2005.*

- 1 Pre-Filed Rebuttal Testimony of behalf of the Center for Energy and Economic Development, regarding the
 2 human costs associated with the higher costs of replacement power, before the Public Utilities
 3 Commission of the State of California, Docket No. A.02-05-046, "Application of Southern
 4 California Edison Company (U 338-E) Regarding the Future Disposition of the Mohave Generating
 5 Station," May 2003.
- 6 Supplemental Declaration on behalf of the UMWA Health and Retirement Funds analyzing low-volatile
 7 metallurgical coal markets and market power potential, before the U.S. District Court for the
 8 District of Columbia, Joseph P. Connors, Sr. et al. v. Island Creek Corp, Drummond Coal Co., et al.,
 9 C.A. Nos. 87-1210-SSH and 87-1973-SSH, October 23, 1995.
- 10 Declaration and Deposition on behalf of UMWA Health and Retirement Funds regarding relationships
 11 between contribution rates to the Funds and coal market prices, and changes in U.S. coal industry
 12 structure, before the U.S. District Court for the District of Columbia, In re: United Mine Workers of
 13 America Employee Benefit Plans Litigation, Master File No. MDL 886, May-October, 1994.
- 14 Declaration on behalf of UMWA Health and Retirement Funds regarding relationships between contribution
 15 rates to the Funds and coal market prices, and changes in U.S. coal industry structure, before the
 16 U.S. District Court for the District of Columbia, Joseph P. Connors, Sr. et al. v. Island Creek Corp,
 17 Drummond Coal Co., et al., C.A. Nos. 87-1210-SSH and 87-1973-SSH, March 16, 1994.
- 18 Testimony on behalf of the UMWA Health and Retirement Funds regarding trends in coal production, union
 19 market shares, and sensitivity to changes in union costs, before the U.S. District Court, Western
 20 District of Virginia, Lena Pearl McGlothlin et al. v. Joseph P. Connors et al., Civil Action No. 92-
 21 0022-A, April 1, 1992.
- 22 Declaration and Deposition on behalf of the UMWA Health and Retirement Funds regarding past trends and
 23 forecasts of coal production, productivity, and labor-hours for specific companies and for all
 24 UMWA mines, in the U.S. District Court for the District of Columbia, In Re: United Mine Workers
 25 of America Employee Benefit Plans Litigation, Multidistrict Litigation No. 886 CA. No.
 26 88-0969-TH, February-March 1992.
- 27 Affidavits on behalf of Whitney Benefits Inc. relating to federal coal leasing, western coal markets, and
 28 royalty rates, before the United States Claims Court, Whitney Benefits Inc. and Peter Kiewit Sons'
 29 Co. v. United States of America, No. 499-83L, February-March, 1992.
- 30 Deposition on behalf of Chugach Alaska Corporation and subsidiaries regarding methodology and findings
 31 of coal property valuation, before the U.S. Bankruptcy Court for the District of Alaska, Case Nos.
 32 91-00207-3-DMD through 91-00211-3-DMD, August 27, 1991.
- 33 Declarations on behalf of the UMWA Health and Retirement Funds regarding trends in coal markets, mining
 34 productivity, and union status, before the U.S. District Court for the District of Columbia, Civil
 35 Actions Nos. 89-1744 and 90-0674, March 1990 - January 1992.
- 36 Deposition on behalf of Kansas City Southern Industries relating to markets for coal transportation and to
 37 the competitive viability of coal slurry pipelines, ETSI Pipeline Project et al. v. Burlington
 38 Northern, Inc. et al., Civil Action Number B-84-979-CA, U.S. District Court for the Eastern District
 39 of Texas, Beaumont Division, November 29-30, 1988.
- 40 Testimony and Verified Statements before the Interstate Commerce Commission on behalf of Consolidated
 41 Rail Corporation, relating to railroad market dominance issues, I.C.C. No. 37931S, August-
 42 November 1987.
- 43 Testimony before the Commission on Fair Market Value Policy for Federal Coal Leasing, regarding
 44 valuation concepts for federal coal leasing, September 7, 1983.

- 1 Testimony and Verified Statement of behalf of Consolidated Edison Company of New York, Inc. before the
 2 State of New York Department of Environmental Conservation, regarding low sulfur coal reserves
 3 and production, UPA #20-81-0020 (Ravenswood Coal Conversion) and UPA #20-81-0009 (Arthur
 4 Kill Coal Conversion), January-February 1983.
- 5 Testimony and Deposition on behalf of Mead Corporation regarding metallurgical coal markets in the U.S.,
 6 Mead Corporation v. Occidental Petroleum Corporation, Civil Action No. C-3-78-268, U.S. District
 7 Court for the Southern District of Ohio, November 1978.
- 8 Testimony before the U.S. Subcommittee on Public Lands and Resources of the Committee on Energy and
 9 Natural Resources, related to energy and economic impacts of the Surface Mining Control and
 10 Reclamation Act of 1976, May 11, 1977.

11 **EMPLOYMENT HISTORY**

12	Twenty-First Strategies, LLC	President	1995-present
13	ICF Resources Incorporated	Senior Consultant	1995-1997
14		Senior VP & Director	1988-1995
15	ICF Incorporated	Vice President	1980-1988
16		Associate—Project Manager	1975-1980
17	City of Palo Alto, California	Operations Analyst	1974-1975
18	Federal Energy Administration,	Data Analyst	1974
19	Office of Data Policy		
20	Atlanta (GA) Board of Education	Systems Programmer	1970-1973

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