STATE OF CONNECTICUT

SITING COUNCIL

Docket 370A: The Connecticut Light and Power Company application for a Certificate of Environmental Compatibility and Public Need for (1) The Greater Springfield Reliability Project consisting of a new 345-kV electric transmission line and associated facilities from the North Bloomfield Substation in Bloomfield to the Connecticut/Massachusetts border, together with associated improvements to the North Bloomfield Substation, and potentially including portions of a new 345-kV electric transmission line between Ludlow and Agawam, Massachusetts that would be located in the Towns of Suffield and Enfield, Connecticut; and (2) the Manchester Substation to Meekville Junction Circuit Separation Project in Manchester, Connecticut. **Docket 370B:** NRG Energy, Inc. application pursuant to C.G.S. § 16-50*l*(a)(3) for consideration of a 530 MW combined cycle generating plant in Meriden, Connecticut	**DOCKET 370** July 7, 2009

Resumes of CL&P Witnesses Filing Direct Testimony
and Potential Additional Witnesses

1. William H. Bailey, Ph.D.
2. Donald D. Biondi
3. Robert E. Carberry
4. John C. Case
5. Kenneth Collison
6. Tony Gregory Coggan
7. Julia Frayer
8. James M. Hogan, P.E.
9. Timothy F. Laskowski
10. Louise F. Mango
11. Scott E. Newland, P.E
12. Allen William Scarfone, P.E.
13. Maria Fusco Scheller
14. Paul M. Williams, P.E.

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William H. Bailey, Ph.D.

Principal Scientist
Director, Center for Exposure Assessment & Dose Reconstruction

Professional Profile

Dr. William H. Bailey is a Principal Scientist in Exponent's Health Sciences practice. Dr. Bailey specializes in applying state-of-the-art assessment methods to environmental and occupational health issues. His 30 years of training and experience include laboratory and epidemiologic research, health risk assessment, and comprehensive exposure analysis. Dr. Bailey has investigated exposures to alternating current, direct current, and radiofrequency electromagnetic fields, 'stray voltage', and electrical shock, as well as to a variety of chemical agents and air pollutants. He is particularly well known for his research on potential health effects of electromagnetic fields and has served as an advisor to numerous state, federal, and international agencies. Currently, he is involved in research on EMF exposure guidelines and respiratory exposures to ultrafine- and nanoparticles. Dr. Bailey is a visiting scientist at the Cornell University Medical College and has lectured at Rutgers University, the University of Texas (San Antonio), and the Harvard School of Public Health. He was formerly Head of the Laboratory of Neuropharmacology and Environmental Toxicology at the New York State Institute for Basic Research, Staten Island, New York, and an Assistant Professor and NIH postdoctoral fellow in Neurochemistry at The Rockefeller University in New York.

Academic Credentials and Professional Honors

Ph.D., Neuropsychology, City University of New York, 1975
M.B.A., University of Chicago, 1969
B.A., Dartmouth College, 1966

Sigma Xi; The Institute of Electrical and Electronics Engineers/International Committee on Electromagnetic Safety (Subcommitee 3, Safety Levels with Respect to Human Exposure to Fields (0 to –3 kHz) and Subcommitte 4, Safety Levels with Respect to Human Exposure to Radiofrequency Fields (3 kHz to 3 GHz); Elected member of the Committee on Man and Radiation (COMAR) of the IEEE Engineering in Medicine and Biology Society, 1998–2001

Publications

Kavet R, Bailey WH, Bracken TD, Patterson RM. Recent advances in research relevant to electric and magnetic field exposure guidelines. Bioelectromagnetics 2008; 29:499–526.

Bailey WH, Wagner M. IARC evaluation of ELF magnetic fields: Public understanding of the 0.4μT exposure metric. J Exposure Sci Environ Epidemiol 2008; 18:233–235.

Bailey WH, Erdreich L. Accounting for human variability and sensitivity in setting standards for electromagnetic fields. Health Phys 2007; 92:649–657.

Bailey WH, Nyenhuis JA. Thresholds for 60-Hz magnetic field stimulation of peripheral nerves in human subjects. Bioelectromagnetics 2005; 26:462–468.

Bracken TD, Senior RS, Bailey WH. DC electric fields from corona-generated space charge near AC transmission lines. IEEE Transactions on Power Delivery 2005; 20:1692–1702.

Bailey WH. Dealing with uncertainty in formulating occupational and public exposure limits. Health Phys 2002; 83:402–408.

Bailey WH. Health effects relevant to the setting of EMF exposure limits. Health Phys 2002; 83:376–386.

Kavet R, Stuchly MA, Bailey WH, Bracken TD. Evaluation of biological effects, dosimetric models, and exposure assessment related to ELF electric- and magnetic-field guidelines. Applied Occupational and Environmental Hygiene 2001; 16:1118–1138.

Bailey WH. ICNIRP recommendation for limiting public exposure to 4 Hz–1 kHz electric and magnetic fields. Health Phys 1999; 77:97–98.

Bailey WH. Principles of risk assessment with application to current EMF risk communication issues. In: EMF Risk Perception and Communication. Repacholi MH, Muc AM (eds), World Health Organization, Geneva, 1999.

De Santo RS, Bailey WH. Environmental justice tools and assessment practices. Proceedings, American Public Transit Association, 1999.

Bailey WH, Su SH, Bracken TD. Probabilistic approach to ranking sources of uncertainty in ELF magnetic field exposure limits. Health Phys 1999; 77:282–290.

Bailey WH. Field parameters. Proceedings, EMF Engineering Review Symposium, Status and Summary of EMF Engineering Research. Bracken TD and Montgomery JH (eds), Oak Ridge National Laboratory, Oak Ridge, TN, April 28–29, 1998.

Bailey WH. Policy implications. Proceedings, EMF Engineering Review Symposium, Status and Summary of EMF Engineering Research. Bracken TD and Montgomery JH (eds), Oak Ridge National Laboratory, Oak Ridge, TN, April 28–29, 1998.

Bailey WH. Probabilistic approaches to deriving risk-based exposure guidelines: Application to extremely low frequency magnetic fields. In: Non-Ionising Radiation. Dennis JA and Stather JW (eds), Special Issue of Radiation Protection Dosimetry 1997; 72:327–336.

Bailey WH, Su SH, Bracken TD, Kavet R. Summary and evaluation of guidelines for occupational exposure to power frequency electric and magnetic fields. Health Phys 1997; 73:433–453.

Bracken TD, Senior RS, Rankin RF, Bailey WH, Kavet R. Magnetic field exposures in the electric utility industry relevant to occupational guideline levels. Appl Occupat Environ Hyg 1997; 12:756–768.

Blondin J-P, Nguyen D-H, Sbeghen J, Goulet D, Cardinal C, Maruvada P-S, Plante M, and Bailey WH. Human perception of electric fields and ion currents associated with high voltage DC transmission lines. Bioelectromagnetics 1996; 17:230–241.

Bailey WH, Charry JM. Acute exposure of rats to air ions: Effects on the regional concentration and utilization of serotonin in brain. Bioelectromagnetics 1987; 8:173–181.

Bailey WH, Charry JM. Measurement of neurotransmitter release and utilization in selected brain regions of rats exposed to dc electric fields and atmospheric space charge. Proceedings, 23rd Hanford Life Sciences Symposium, Interaction of Biological Systems with Static and ELF Electric and Magnetic Fields, 1987.

Pavildes C, Aoki C, Chen J-S, Bailey WH, Winson J. Differential glucose utilization in the parafascicular region during slow-wave sleep, the still-alert state and locomotion. Brain Res 1987; 423:399–402.

Bailey WH, Charry JM. Behavioral monitoring of rats during exposure to air ions and DC electric fields. Bioelectromagnetics 1986; 7:329–339.

Charry JM, Shapiro MH, Bailey WH, Weiss JM. Ion-exposure chambers for small animals. Bioelectromagnetics 1986; 7:1–11.

Charry JM, Bailey WH. Regional turnover of norepinephrine and dopamine in rat brain following acute exposure to air ions. Bioelectromagnetics 1985; 6:415–425.

Bracken TD, Bailey WH, Charry JM. Evaluation of the DC electrical environment in proximity to VDTs. J Environ Sci Health Part A 1985; 20:745–780.

Gross SS, Levi R, Bailey WH, Chenouda AA. Histamine modulation of cardiac sympathetic responses: A physiological role. Fed Proc 1984; 43:458.

Gross SS, Guo ZG, Levi R, Bailey WH, Chenouda AA. 1984. Release of histamine by sympathetic nerve stimulation in the guinea pig heart and modulation of adrenergic responses. Circulation Res 1984; 54:516–526.

Dahl D, Bailey WH, Winson J. Effect of norepinephrine depletion of hippocampus on neuronal transmission from perforant pathway through dentate gyrus. J Neurophysiol 1983; 49:123–135.

Guo ZG, Gross SS, Levi R, Bailey WH. Histamine: Modulation of norepinephrine release from sympathetic nerves in guinea pig heart. Fed Proc 1983; 42:907.

Bailey WH. Biological effects of air ions on serotonin metabolism: Fact and fancy. pp. 90–120. In: Conference on Environmental Ions and Related Biological Effects. Charry JM (ed), American Institute of Medical Climatology, Philadelphia, PA, 1982.

Weiss JM, Goodman PA, Losito BG, Corrigan S, Charry JM, Bailey WH. Behavioral depression produced by an uncontrollable stressor: Relationship to norepinephrine, dopamine, and serotonin levels in various regions of rat brain. Brain Res Rev 1981; 3:167–205.

Bailey WH. Ion-exchange chromatography of creatine kinase isoenzymes: A method with improved specificity and sensitivity. Biochem Med 1980; 24:300–313.

Bailey WH, Weiss JM. Evaluation of a 'memory deficit' in vasopressin-deficient rats. Brain Res 1979; 162:174–178.

Bailey WH, Weiss JM. Effect of ACTH 4-10 on passive avoidance of rats lacking vasopressin (Brattleboro strain). Hormones and Behavior 1978; 10:22–29.

Pohorecky LA, Newman B, Sun J, Bailey WH. Acute and chronic ethanol injection and serotonin metabolism in rat brain. J Pharmacol Exper Therap 1978; 204:424–432.

Koh SD, Vernon M, Bailey WH. Free-recall learning of word lists by prelingual deaf subjects. J Verbal Learning and Verbal Behavior 1971; 10:542–574.

Book Chapters

Bailey WH. Principles of risk assessment and their limitations. In: Risk Perception, Risk Communication and its Application to EMF Exposure. Matthes R, Bernhardt JH, and Repacholi MH (eds), International Commission on Non-Ionizing Radiation Protection, Oberschleißheim, Germany, 1998.

Bailey WH. Biological responses to air ions: Is there a role for serotonin? pp. 151–160. In: Air Ions: Physical and Biological Aspects. Charry JM and Kavet R (eds), CRC Press, Boca Raton, FL, 1987.

Weiss JM, Bailey WH, Goodman PA, Hoffman LJ, Ambrose MJ, Salman S, Charry JM. A model for neurochemical study of depression. pp. 195–223. In: Behavioral Models and the Analysis of Drug Action. Spiegelstein MY and Levy A (eds), Elsevier Scientific, Amsterdam, 1982.

Bailey WH. Mnemonic significance of neurohypophyseal peptides. pp. 787–804. In: Changing Concepts of the Nervous System. Morrison AR and Strick PL (eds), Academic Press, New York, NY, 1981.

Bailey WH, Weiss, JM. Avoidance conditioning and endocrine function in Brattleboro rats. Pp 371–395. In: Endogenous Peptides and Learning and Memory Process. Martinez JL, Jensen RA, Messing RB, Rigter H, and McGaugh JL (eds), Academic Press, New York, NY, 1981.

Weiss JM, Glazer H, Pohorecky LA, Bailey WH, Schneider L. Coping behavior and stress-induced behavioral depression: Studies of the role of brain catecholamines. pp. 125–160. In: The Psychobiology of the Depressive Disorders: Implications for the Effects of Stress. Depue R (ed), Academic Press, New York, NY, 1979.

Technical Reports

Johnson GB, Bracken TD, Bailey WH. Charging and transport of aerosols near AC transmission lines: A literature review. EPRI, Palo Alto, CA, 2003.

Bailey WH. Probabilistic approach to ranking sources of uncertainty in ELF magnetic-field exposure limits. In: Evaluation of Occupational Magnetic Exposure Guidelines, Interim Report, EPRI Report TR-111501, 1998.

Bailey WH, Weil DE, Stewart JR. HVDC Power Transmission Environmental Issues Review. Oak Ridge National Laboratory, Oak Ridge, TN, 1997.

Bracken TD, Bailey WH, Su SH, Senior RS, Rankin RF. Evaluation of occupational magnetic-field exposure guidelines; Interim Report. EPRI Report TR-108113, 1997.

Bailey WH. Melatonin responses to EMF. Proceedings, Health Implications of EMF Neural Effects Workshop, Report TR-104327s, EPRI, 1994.

Bailey WH. Recent neurobiological and behavioral research: Overview of the New York State powerlines project. In: Power-Frequency Electric and Magnetic Field Research, EPRI, 1989.

Bailey WH, Bissell M, Dorn CR, Hoppel WA, Sheppard AR, Stebbings, JH. Comments of the MEQB Science Advisors on Electrical Environment Outside the Right of Way of CU-TR-1, Report 5. Science Advisor Reports to the Minnesota Environmental Quality Board, 1986.

Bailey WH, Bissell M, Brambl RM, Dorn CR, Hoppel WA, Sheppard AR, Stebbings JH. A health and safety evaluation of the +/- 400 KV powerline. Science Advisor's Report to the Minnesota Environmental Quality Board, 1982.

Charry JM, Bailey WH, Weiss JM. Critical annotated bibliographical review of air ion effects on biology and behavior. Rockefeller University, New York, NY, 1982.

Bailey WH. Avoidance behavior in rats with hereditary hypothalamic diabetes insipidus. Dissertation, City University of New York, 1975.

Selected Invited Presentations

Bailey WH, Erdreich LS. Human sensitivity and variability in response to electromagnetic fields: Implications for standard setting. International Workshop on EMF Dosimetry and Biophysical Aspects Relevant to Setting Exposure Guidelines. International Commission on Non-Ionizing Radiation Protection, Berlin, March 2006.

Bailey WH. Research-based approach to setting electric and magnetic field exposure guidelines (0-3000 Hz). IEEE Committee on Electromagnetic Safety, December 2005.

Bailey WH. Conference Keynote Presentation. Research supporting 50/60 Hz electric and magnetic field exposure guidelines. Canadian Radiation Protection Association, Annual Conference, Winnipeg, June 2005.

Bailey WH. Scientific methodology for assessing public health issues: A case study of EMF. Canadian Radiation Protection Association, Annual Conference, Public Information for Teachers, Winnipeg, June 2005.

Bailey WH. Assessment of potential environmental effects of electromagnetic fields from submarine cables. Connecticut Academy of Science and Engineering, Long Island Sound Bottomlands Symposium: Study of Benthic Habitats, July 2004.

De Santo RS, Coe M, Bailey WH. Environmental justice assessment and the use of GIS tools and methods. National Association of Environmental Professionals, 27th Annual Conference, Dearborn, MI, June 2002.

Bailey WH. Applications to enhance safety: Research to understand and control potential risks. Human Factors and Safety Research, Volpe National Transportation Systems Center/Dutch Ministry of Transport, Cambridge, MA, November 2000.

Bailey WH. EMF health effects review. EMF Exposure Guideline Workshop, Brussels Belgium, June 2000.

Bailey WH. Dealing with uncertainty when formulating guidelines. EMF Exposure Guideline Workshop, Brussels Belgium, June 2000.

Bailey WH. Field parameters: Policy implications. EMF Engineering Review Symposium, Status and Summary of EMF Engineering Research, Charleston, SC, April 1998.

Bailey WH. Principles of risk assessment: Application to current issues. Symposium on EMF Risk Perception and Communication, World Health Organization, Ottawa, Canada, August 1998.

Bailey WH. Current guidelines for occupational exposure to power frequency magnetic fields. EPRI EMF Seminar, New Research Horizons, March 1997.

Bailey WH. Methods to assess potential health risks of cell telephone electromagnetic fields. IBC Conference—Cell Telephones: Is there a Health Risk? Washington, DC, June 1997.

Bailey WH. Principles of risk assessment and their limitations. Symposium on Risk Perception, Risk Communication and its Application to EMF Exposure, International Commission on Non-Ionizing Radiation Protection, Vienna, Austria, October 1997.

Bailey WH. Probabilistic approach for setting guidelines to limit induction effects. IEEE Standards Coordinating Committee 28: Non-Ionizing Radiation, Subcommittee 3 (0–3 kHz), June 1997.

Bailey WH. Power frequency field exposure guidelines. IEEE Standards Coordinating Committee 28: Non-Ionizing Radiation, Subcommittee 3 (0–3 kHz), June 1996.

Bailey WH. Epidemiology and experimental studies. American Industrial Hygiene Conference, Washington, DC, May 1996.

Bailey WH. Review of 60 Hz epidemiology studies. EMF Workshop, Canadian Radiation Protection Association, Ontario, Canada, June 1993.

Bailey WH. Biological and health research on electric and magnetic fields. American Industrial Hygiene Association, Fredrickton, New Brunswick, Canada, October 1992.

Bailey WH. Electromagnetic fields and health. Institute of Electrical and Electronics Engineers, Bethlehem, PA, January 1992.

Bailey WH, Weiss JM. Psychological factors in experimental heart pathology. Visiting Scholar Presentation, National Heart Lung and Blood Institute, March 1977.

Presentations

Bailey WH. Clarifying the neurological basis for ELF guidelines. Workshop on Practical Implementation of ELF and RF Guidelines. The Bioelectromagnetics Society 29th Annual Meeting, Kanazawa, Japan, June 2007.

Sun B, Urban B, Bailey W. AERMOD simulation of near-field dispersion of natural gas plume from accidental pipeline rupture. Air and Waste Management Association: Health Environments: Rebirth and Renewal, New Orleans, LA, June 2006.

Bailey WH, Johnson G, Bracken TD. Method for measuring charge on aerosol particles near AC transmission lines. Joint Meeting of The Biolectromagnetics Society and The European BioElectromagnetics Association, Dublin Ireland, June 2005.

Bailey WH, Bracken TD, Senior RS. Long-term monitoring of static electric field and space charge near AC transmission Lines. The Bioelectromagnetics Society, 26th Annual Meeting, Washington, DC, June 2004.

Bailey WH, Erdreich L, Waller L, Mariano K. Childhood leukemia in relation to 25-Hz and 60-Hz magnetic fields along the Washington DC—Boston rail line. Society for Epidemiologic Research, 35th Annual Meeting, Palm Desert CA, June 2002. American Journal of Epidemiology 2002; 155:S38.

Erdreich L, Klauenberg BJ, Bailey WH, Murphy MR. Comparing radiofrequency standards around the world. Health Physics Society 43rd Annual Meeting, Minneapolis, MN, July 1998.

Bracken TD, Senior RS, Rankin RF, Bailey WH, Kavet R. Relevance of occupational guidelines to utility worker magnetic-field exposures. Second World Congress for Electricity and Magnetism in Biology and Medicine, Bologna, Italy, June 1997.

Weil DE, Erdreich LS, Bailey WH. Are 60-Hz magnetic fields cancer causing agents? Mechanisms and Prevention of Environmentally Caused Cancers, The Lovelace Institutes 1995 Annual Symposium, La Fonda, Santa Fe, NM, October 1995.

Bailey WH. Neurobiological research on extremely-low-frequency electric and magnetic fields: A review to guide future research. Sixteenth Annual Meeting of the Bioelectromagnetics Society, Copenhagen, Denmark, June 1994.

Blondin J-P, Nguyen D-H, Sbeghen J, Maruvada PS, Plante M, Bailey WH, Goulet D. The perception of DC electric fields and ion currents in human observers. Annual Meeting of the Canadian Psychological Association, Penticton, British Columbia, Canada, June 1994.

Erdreich LS, Bailey WH, Weil DE. Science, standards and public policy challenges for ELF fields. American Public Health Association 122nd Annual Meeting, Washington, DC, October 1994.

Bailey WH, Charry JM. Particle deposition on simulated VDT operators: Influence of DC electric fields. 10th Annual Meeting of the Bioelectromagnetics Society, June 1988.

Charry JM, Bailey WH. Contribution of charge on VDTs and simulated VDT operators to DC electric fields at facial surfaces. 10th Annual Meeting of the Bioelectromagnetics Society, June 1988.

Bailey WH, Charry, JM. Dosimetric response of rats to small air ions: Importance of relative humidity. EPRI/DOE Contractors Review, November 1986. Charry JM, Bailey WH, Bracken TD (eds). DC electric fields, air ions and respirable particulate levels in proximity to VDTs. International Conference on VDTs and Health, Stockholm, Sweden, June 12–15 1986.

Charry JM, Bailey WH. Air ion and DC field strengths at 10^4 ions/cm^3 in the Rockefeller University Small Animal Exposure Chambers. EPRI/DOE Contractors Review, November 1985.

Charry JM, Bailey WH. DC Electrical environment in proximity to VDTs. 7th Annual Meeting of the Bioelectromagnetics Society, June 1985.

Bailey WH, Collins RL, Lahita RG. Cerebral lateralization: Association with serum antibodies to DNA in selected bred mouse lines. Society for Neuroscience, 1985.

Kavet R, Bailey WH, Charry JM. Respiratory neuroendocrine cells: A plausible site for air ion effects. Seventh Annual Meeting of The Bioelectromagnetics Society, June 1985.

Bailey WH, Charry JM. Measurement of neurotransmitter release and utilization in selected brain regions of rats exposed to DC electric fields and atmospheric space charge. 23rd Hanford Life Sciences Symposium, Richland, WA, October 1984.

Bailey WH, Charry JM, Weiss JM, Cardle K, Shapiro M. Regional analysis of biogenic amine turnover in rat brain after exposure to electrically charged air molecules (air ions). Society for Neuroscience, 1983.

Bailey WH. Biological effects of air ions: Fact and fancy. American Institute of Medical Climatology Conference on Environmental Ions and Related Biological Effects, October 1982.

Goodman PA, Weiss JM, Hoffman LJ, Ambrose MJ, Bailey WH, Charry, JM. Reversal of behavioral depression by infusion of an A2 adrenergic agonist into the locus coeruleus. Society for Neuroscience, November 1982.

Charry JM, Bailey WH. Biochemical and behavioral effects of small air ions. Electric Power Research Institute Workshop, April 1981.

Bailey WH, Alsonso DR, Weiss JM, Chin S. Predictability: A psychologic/ behavioral variable affecting stress-induced myocardial pathology in the rat. Society for Neuroscience, November 1980.

Salman SL, Weiss JM, Bailey WH, Joh TH. Relationship between endogenous brain tyrosine hydroxylase and social behavior of rats. Society of Neuroscience, November 1980.

Bailey WH, Maclusky S. Appearance of creatine kinase isoenzymes in rat plasma following myocardial injury produced by isoproterenol. Fed Assoc Soc Exp Biol, April 1978.

Bailey WH, Maclusky S. Appearance of creatine kinase isoenzymes in rat plasma following myocardial injury by isoproterenol. Fed Proc 1978; 37:889.

Bailey WH, Weiss JM. Effect of ACTH 4-10 on passive avoidance of rats lacking vasopressin (Brattleboro strain). Eastern Psychological Association, April 1976.

Prior Experience

President, Bailey Research Associates, Inc., 1991–2000
Vice President, Environmental Research Information, Inc., 1987–1990
Head of Laboratory of Environmental Toxicology and Neuropharmacology, New York State Institute for Basic Research, 1983–1987
Assistant Professor, The Rockefeller University, 1976–1983

Academic Appointment

- Visiting Fellow, Department of Pharmacology, Cornell University Medical College, New York, NY, 1986–present

Prior Academic Appointments

- Visiting Scientist, The Jackson Laboratory, Bar Harbor, ME, 1984–1985
- Head, Laboratory of Neuropharmacology and Environmental Toxicology, NYS Institute for Basic Research in Developmental Disabilities, Staten Island, NY, 1983–1987
- Assistant Professor, The Rockefeller University, New York, NY, 1976–1983
- Postdoctoral Fellow, Neurochemistry, The Rockefeller University, New York, NY, 1974–1976
- Dissertation Research, The Rockefeller University, New York, NY, 1972–1974
- CUNY Research Fellow, Dept. of Psychology, Queens College, City University of New York, Flushing, NY, 1969–1971
- Clinical Research Assistant, Department of Psychiatry, University of Chicago; Psychiatric Psychosomatic Inst., Michael Reese Hospital, and Illinois State Psychiatric Inst, Chicago, IL, 1968–1969

Teaching Appointments

- Lecturer, University of Texas Health Science Center, Center for Environmental Radiation Toxicology, San Antonio, TX, 1998
- Lecturer, Harvard School of Public Health, Office of Continuing Education, Boston, MA, 1995, 1997
- Lecturer, Rutgers University, Office of Continuing Education, New Brunswick, NJ, 1991–1995
- Adjunct Assistant Professor, Queens College, CUNY, Flushing, NY, 1978
- Lecturer, Queens College, CUNY, Flushing, NY, 1969–1974

Editorship

- Associate Editor, Non-Ionizing Radiation, *Health Physics*, 1996–present

Advisory Positions

- Canadian National Collaborating Centre for Environmental Health, reviewer of Centre reports, 2008
- Island Regulatory and Appeals Commission, province of Prince Edward Island, Canada, 2008
- ZonMw – Netherlands Organization for Health Research and Development, 2007-2008, reviewer for National Programme on EMF and Health
- National Institute of Environmental Health Sciences/ National Institutes of Health, Review Committee, Neurotoxicology, Superfund Hazardous Substances Basic Research and Training Program, 2004
- National Institute of Environmental Health Sciences, Review Committee Role of Air Pollutants in Cardiovascular Disease, 2004
- Working Group on Non-Ionizing Radiation, Static and Extremely Low-Frequency Electromagnetic Fields, International Agency for Research on Cancer, 2000–2002
- Working Group, EMF Risk Perception and Communication, World Health Organization, 1998–2005
- Member, International Committee on Electromagnetic Safety, Subcommittee 3 - Safety Levels with Respect to Human Exposure to Fields (0 to 3 kHz) and Subcommitee 4 - Safety Levels with Respect to Human Exposure (3kHz to 3GHz) Institute of Electrical and Electronics Engineers (IEEE), 1996–present
- Invited participant, National Institute of Environmental Health Sciences EMF Science Review Symposium: Clinical and In Vivo Laboratory Findings, 1998
- Working Group, EMF Risk Perception and Communication, International Commission on Non-Ionizing Radiation Protection, 1997
- U.S. Department of Energy, RAPID EMF Engineering Review, 1997
- Oak Ridge National Laboratory, 1996
- American Arbitration Association International Center for Dispute Resolution, 1995–1996
- U.S. Department of Energy, 1995
- National Institute for Occupational Safety and Health, 1994–1995
- Federal Rail Administration, 1993–1996
- U.S. Forest Service, 1993
- New York State Department of Environmental Conservation, 1993
- National Science Foundation
- National Institutes of Health, Special Study Section—Electromagnetics, 1991–1993

- Maryland Public Service Commission and Maryland Department of Natural Resources, Scientific Advisor on health issues pertaining to HVAC Transmission Lines, 1988–1989
- Scientific advisor on biological aspects of electromagnetic fields, Electric Power Research Institute, Palo Alto, CA, 1985–1989
- U.S. Public Health Service, NIMH: Psychopharmacology and Neuropsychology Review Committee, 1984
- Consultant on biochemical analysis, Colgan Institute of Nutritional Science, Carlsbad, CA, 1982–1983
- Behavioral Medicine Abstracts, Editor, animal behavior and physiology, 1981–1983
- Consultant on biological and behavioral effects of high-voltage DC transmission lines, Vermont Department of Public Service, Montpelier, VT, 1981–1982
- Scientific advisory committee on health and safety effects of a high-voltage DC transmission line, Minnesota Environmental Quality Board, St. Paul, MN, 1981–1982
- Consultant on biochemical diagnostics, Biokinetix Corp., Stamford, CT, 1978–1980

Professional Affiliations

- The Health Physics Society (Affiliate of the International Radiation Protection Society)
- Society for Risk Analysis
- International Society of Exposure Analysis
- New York Academy of Sciences
- American Association for the Advancement of Science
- Air and Waste Management Association
- Society for Neuroscience/International Brain Research Organization
- Bioelectromagnetics Society
- The Institute of Electrical and Electronics Engineers/Engineering in Medicine and Biology Society
- Conseil International des Grands Reseaux Electriques

Donald D. Biondi
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EDUCATION:

Postgraduate work towards MS in Urban Planning
Southern Connecticut State University

Postgraduate work towards MFA
Rhode Island School of Design

Bachelor of Landscape Architecture
Rhode Island School of Design

Bachelor of Fine Arts
Rhode Island School of Design

Undergraduate work in Pre-Med
Allegheny College

PROFESSIONAL QUALIFICATIONS:

Licensed Professional Landscape Architect, Rhode Island No. 50

President's Award, Northeast Utilities - for establishing profitable, environmentally sustainable earth removal projects

Senior Officer's Award, Northeast Utilities - for work at Millstone Point

HUD National Award for Design Excellence

WORK EXPERIENCE:

1978 - Present Northeast Utilities Service Company - Berlin, Connecticut
Current responsibilities include planning with Project Managers to obtain transmission and substation siting approvals and major permits, and for ensuring that the conditions of those approvals are satisfied. Previous responsibilities include site selection, site planning, obtaining regulatory approvals and landscape design for office complexes, generation facilities, substation and transmission facilities in Connecticut and Western Massachusetts. Team Leader of four individuals with responsibility to manage Northeast Utilities System land consisting of approximately 20,000 acres. Experience includes:

Electric Transmission Line Projects
As part of team, obtained regulatory approvals for projects including Bethel-Norwalk, Middletown-Norwalk, Manchester-North Bloomfield, North Bloomfield-Canton transmission projects.

Electric Substation Projects
Site selection, planning, regulatory approvals, including expert witness testimony for new substations in Connecticut and Massachusetts.

Land Planning and Management

- development analysis, including subdivision and site planning for properties to be sold or held for future use
- presentation of plans to federal, state and local regulatory agencies

- preparation and implementation of management plans for undeveloped properties for wildlife management, forestry, recreation and agriculture
- supervision and preparation of plans, specifications, cost estimates, bid packages, bid evaluation, construction supervision and grounds maintenance specifications
- preparation and implementation of plans for recreation facilities at hydroelectric generating properties

WORK EXPERIENCE (con't):

Grumman Ecosystems Corporation - Bethpage, New York
As Proposal Manager, contacted private industry, federal agencies and state/county authorities to propose environmental studies. As Project Manager, directed staffs of up to 60 professionals conducting studies in accordance with personally prepared contracts. Wrote proposals on diverse programs. Developed environmental portion of proposals to collect, separate and distribute solid waste to three plants (incinerator, pulp mill and power station) for Dade County, Florida and Atlanta, Georgia.

Castellucci, Galli Associates Architects and Engineers - Providence, Rhode Island
Project Manager responsible for all projects involving landscape architecture, planning and environmental impact. Conducted numerous seminars for public groups affected by highway relocation. Coordinated work of consultants and conducted meetings with officials in DOT, FHWA and the EPA. Composed over 30 overlay maps to document and analyze information. Supervised construction of topo model used in presentations.

Landscape Architecture Department
New Haven Redevelopment Agency - New Haven, Connecticut
Worked as a designer and conducted site planning and landscape design for low income, elderly and luxury housing in and around New Haven. Was responsible for development of 11 major parks and playgrounds in New Haven from design through construction supervision. Planned and designed elementary and high school facilities.

PROFESSIONAL EXPERIENCE:

More than 30 years experience in conducting multi-disciplinary utility, industrial, highway, land use, land management and environmental projects.

Excellent record of working individually and on project teams to complete high quality projects on time and within budget.

Demonstrated ability to compile technical data for successful regulatory permit applications, public presentations and environmental impact statements.

Well established record of successful public presentations and expert testimony regarding environmental effects of projects.

PROJECT EXAMPLES:

Development Plans

- Northeast Utilities Headquarters - more than two million s.f. office and support buildings on 125 acre site; phasing, alternatives, costs, regulatory approvals
- Millstone Nuclear Power Station - 500 acre site with three nuclear power plants and several hundred thousand s.f. of office space and support buildings; designed consistent with Town and State Coastal Management Criteria.

PROJECT EXAMPLES (con't):

- Connecticut Yankee Emergency Operations Facility - 15,000 s.f. building on five acre site; site selection, site planning, regulatory approvals and landscaping
- Northeast Utilities Training and Construction Headquarters - development plan and regulatory approvals for 20 acre site
- Connecticut Light and Power Company Western Region Headquarters Renovation - building and site renovation of 130,000 s.f. on 12 acre site; site plan, regulatory approvals and landscaping
- Western Massachusetts Electric Company Hadley Service Center - new 100,000 s.f. building 16 acre site; site plan, regulatory approvals and landscaping
- Connecticut Light and Power Company Simsbury Service Center Expansion - 100,000 s.f. building addition on 60 acre site; site plan, regulatory approvals and landscaping
- Western Massachusetts Electric Company Northfield Mountain Pumped Storage Hydroelectric Generating Facility - site plan and landscaping for Visitors' Center and surrounding recreation areas.
- Holyoke Dam Relicensing - as part of project team, consulted with public, agencies and non-governmental organizations and developed plans for recreation; land and shoreline management and invasive species management plans; won license in competition with City-sponsored coalition.

Land Management Activities

- Conduct Forest Management and Hunting Control Programs
- Wildlife Management Areas
- Two Sand and Gravel Operations.

River Studies

- As Project Manager, conducted studies for U.S. Army Corps of Engineers involving nine rivers in the southeastern U.S.; more than 600 miles of rivers were studied by boat, aerial photographs, US Coast Guard maps and other documents to determine navigability, potential for development and conservation and environmental impacts.

Highway Projects

- Conducted corridor study, route design and selection and environmental impact assessment for 25 mile highway improvement and relocation project in Rhode Island. This was the first large scale highway project in New England to consider environmental determinants in location and design, as well as to invite and encourage public participation.

March, 2009

Robert E. Carberry
Manager – Project Manager, NEEWS Siting and Permitting
Northeast Utilities Service Company
Hartford, Connecticut

Education:

Bachelor of Science in Electric Power Engineering, June, 1972, Rensselaer Polytechnic Institute, Troy, NY

Master of Engineering in Electric Power Engineering, June 1973, Rensselaer Polytechnic Institute, NY

Management Development Program, Hartford Graduate Center, 1989

Experience:

June 1973 to March 1974 - Bechtel Associates Professional Corp., electrical design of Midland nuclear plant including load flow and voltage studies.

March 1974 to March 1975 - NUSCO, Protection Engineering Section. Performed relay settings and assisted Transmission Line Engineering.

March 1975 to March 1984 - NUSCO, Transmission Line Engineering. Standards, investigations and studies for permanent and temporary grounding, radio and audible noise, electrical/biological effects of AC fields, special insulation, thermal rating studies and research projects, high phase order, HVDC, compact line design, insulated shield wires, and lightning performance.

March 1984 to April 1985 - NUSCO, Substation Project Engineering. Project conceptual development and management plus associated studies and standards activities.

April 1985 to March 1988 - NUSCO, Substation Project Engineering Manager.

March 1988 to November 1992 - NUSCO, Manager of Substation Engineering and Design.

December 1992 to June 1997 - NUSCO, Manager of Transmission Line and Civil Engineering.

June 1997 to October 2000 - NUSCO, Manager of T&D Asset Strategy.

October 2000 to September 2001 - NUSCo, Manager of Transmission Engineering.

September 2001 to March 2003 - NUSCO, Project Manager – Bethel to Norwalk Transmission Project.

March 2003 to October 2004 - NUSCO, Project Director – Bethel to Norwalk Transmission Project.

October 2004 to January 2008 – NUSCO, Manager – Transmission Siting and Permitting.

February 2008 to Present – NUSCO, Project Manager, NEEWS Siting and Permitting

NU's EMF expert 1975- present and leader of the NU EMF Task Force established in 1990.

Other Experiences:

Adjunct Faculty Member, University of Hartford, College of Engineering, January to May, 1987. Conducted portions of course in Power Systems Analysis.

T&D Emergency plan assignment as First Deputy to the Director, Electric, a liaison position with the CT Office of Emergency Management, 1985 to 2002.

Member of Advisory Committee serving the Connecticut Interagency EMF Task Force, 1991 to present.

Professional Engineering Registration: Connecticut and Massachusetts

Industry and Professional Society Activities/Senior Member, IEEE (1983)

IEEE Power Engineering Society, Transmission and Distribution Committee memberships.

1) Corona and Field Effects (C&FE) Subcommittee, Member 1976 to 1987, Vice Chairman 1983 to 1985.

2) C&FE Working Groups on AC Fields and Audible Noise, 1976 to 1987.

3) Chairman of C&FE Working Group on Design and Environmental Considerations, 1977 to 1985.

4) Secretary and Vice Chairman of Administrative Subcommittee's Coordinating Group on Environment, Safety and Public Affairs, 1981 to 1984.

IEEE Power Engineering Society, Substations Committee memberships

1) Substations Committee, member 1987 to 1995

2) Environmental Subcommittee and Associated Working Groups, member 1985 to 1995.

3) Various Working Groups of the Distribution Substations Subcommittee and the Gas Insulated Substations Subcommittee, member 1985 to 1995.

Edison Electric Institute - Chairman of the Electric Light and Power group delegation to the American National Standards Committee C63 on Electromagnetic Compatibility, 1980 to 1985.

Electric Power Research Institute - Industry advisor on project RP1591, Assessment of AC Transmission Line Field Effects, 1982 to 1984. NU representative on Transmission Line Business Unit Council, October, 1995 to December, 1996, and on EMF/RF Area Council, 2005-present.

International Electrotechnical Commission, CISPR C - Member of an advisory group assisting the Technical Advisor to the U.S. National Committee of the IEC on matters pertaining to interferences from overhead power lines, 1980 to 1988.

Edison Electric Institute - EMF Task Force, 1990 to present: EMF Steering Committee 1995 to 2003.

Professional Recognitions:

IEEE PES Working Group Recognition and/or Prize Paper Awards

- AC Fields Working Group (1992)
- Working Group on Design and Location of Substations for Community Acceptance (1992)
- "A Survey of Methods for Calculating Transmission Line Conductor Surface Voltage Gradients," 1980
- "Corona and Field Effects of AC Overhead Transmission Lines: Information for Decision Makers," 1986

JOHN C. CASE

42 Warren Glen
Burlington, CT 06013

H: (860) 673-2447
W: (860) 665-2026

PROFESSIONAL EXPERIENCE

Project Manager – NEEWS Engineering 2007 - Present
Northeast Utilities Service Company - Hartford, CT

Responsibility for oversight and management of all aspects of engineering on the New England East West family of projects. These projects involve significant reliability upgrades in the Southern New England area, totaling an estimated $1.49 billion. This position involves the coordination of the System Planning and Engineering functions to establish the most cost-effective solutions for the project needs, establishing the base estimate for all projects, review of all siting and engineering documents, management and coordination of the engineering effort between in-house and external engineering resources; transmission business and engineering responsibilities in the procurement effort and final design oversight responsibility.

Project Manager – Transmission Projects 2006 - 2007
Northeast Utilities Service Company - Hartford, CT

Overall management responsibility over all aspects of assigned transmission projects, including engineering, risk analysis and mitigation, siting and permitting, budget, contracting and closeout. Projects ranged in magnitude from $500,000 substation upgrades to $5,000,000 transmission line projects.

Construction Manager – Transmission Construction Test and Maintenance 2003 - 2006
Connecticut Light and Power Company - Hartford, CT

Responsibility for Owner's oversight and management of the construction effort on portions of the Bethel – Norwalk project including contractor coordination, site safety, compliance to specifications and contracts, outage clearance tag holder and change order negotiation. This was a $350,000,000 project to construct a 20+ mile transmission line in Southwest Connecticut. This project involved 345-kV and 115-kV XLPE underground cable, 345-kV HPFF cable, 3 intermediate 345-kV transition stations and two significant 345-kV GIS substation expansions. Segments under my direct responsibility included the following:

- Norwalk S/S – Civil site work and 115-kV transmission line relocations
- Norwalk S/S – upgrade replacements to 115-kV substation yard
- Plumtree S/S – Civil and Electrical construction of a 345-kV GIS substation and 345-kV XLPE line terminals.
- Hoyts Hill, Archers Lane and Norwalk Jct transition stations - Civil and Electrical construction of 345-kV XLPE and HPFF transition stations.
- Plumtree – Norwalk 345-kV line – All aspects of 345-kV and 115-kV overhead transmission line construction.

JOHN C. CASE

Project Engineer 1990 - 2003
Northeast Utilities Service Company - Hartford, CT

Project Engineer on a variety of construction projects involving all tasks associated with engineering, design, estimating, securing regulatory approvals, and drafting construction specifications.

Major projects include:

- Bethel – Norwalk 345-kV line – Lead Project Engineer responsible for all aspects of engineering through project siting approval.
  - Edision Electrical Institute Award
- NEON / NU Fiber optic backbone system – Lead Project Engineer in CT and MA for 245 miles of fiber optic cable installation, up to 122 fibers
  - Chairman's Award Nominee
- North Bloomfield – Agawam - Reconductor 18 miles of 115-kV double-circuit transmission line on an emergency basis
  - President's Award Winner
- Devon Station Generation - Connect emergency gas turbine generators to system
  - World Construction Record
- Developed pole-top extension to cost-effectively uprate 345-kV structures
  - Spot Recognition Award

Committees and Responsibilities held:

- Qualified Clearance Holder
- Transmission Standards Committees - Structures and Ratings Committees
- Dynamic Thermal Ratings Committee
- Develop structural alternatives to reduce magnetic fields
- Computer analyses (ETADS) of towers and design modifications

EDUCATION

Master of Business Administration May, 1998
University of Connecticut - West Hartford, CT
Bachelor of Science degree in Civil/Environmental Engineering May, 1990
Clarkson University - Potsdam, NY

HONORS AND ACTIVITIES

- Certified Engineer-in-Training in Connecticut
- Northeast Utilities Retail Business Group President's Award, 1998
- NU SPOT Recognition Awards 1993 and 1998
- Delta Sigma Phi National Fraternity

KENNETH COLLISON **ICF INTERNATIONAL**
Vice President

EDUCATION

2002 MBA, Management and Consulting, Massachusetts Institute of Technology, Cambridge, MA
2001 M.S., Technology and Policy, Massachusetts Institute of Technology, Cambridge, MA
1989 B.S., Electrical and Electronic Engineering, University of Science and Technology – Ghana

EXPERIENCE OVERVIEW

Mr. Kenneth Collison joined ICF Consulting in July 2002 and currently leads ICF's Transmission and Ancillary Services Group within the Wholesale Power Practice. Mr. Collison's expertise is in transmission studies, power system reliability studies, critical infrastructure protection, transmission and ancillary services valuation, generation analysis, utility restructuring, and strategic studies. Mr. Collison has developed full AC non-linear power flow models for detailed power system engineering studies including power system reliability assessment, contingency analysis and total transfer capability analysis for the networks of several power pools in the US. In several power markets, Mr. Collison has led studies to determine the impact of major proposed transmission projects on the ability of the market operators to reliably meet system demand. Mr. Collison led a study to assess the benefits of a new transmission line, proposed by Kelson Transmission, which will connect non-ERCOT areas in east Texas to the Houston zone of ERCOT. Mr. Collison filed testimony before the Public Utilities Commission of Texas and testified in support of Kelson Transmission's application for a Certificate of Convenience and Necessity to construct the new transmission line. Mr. Collison was also the transmission lead during ICF's study of the costs and benefits of the GridFlorida RTO, a study that examined in detail the cost of implementing an independent system operator for the Florida market and the benefits in reduced cost to consumers over a 12-year timeframe. Similarly, he provided transmission expertise during ICF's analysis of the benefits of the Midwest ISO's Day-2 market, which determined the benefits of the transition of the Midwest ISO to a fully competitive market with centralized commitment and dispatch. In addition, Mr. Collison has managed several security constrained optimal power flow studies using linear optimization-based power flow simulation models to determine the economic dispatch of units within system stability and transmission limits. He has prepared congestion forecasts and determined the related congestion revenue and costs for the interconnected transmission networks in the US. Mr. Collison also specializes in risk-based and readiness reliability assessment within the framework of the mandatory NERC reliability standards. Prior to joining ICF Consulting, Mr. Collison worked as a Research Associate at the Massachusetts Institute of Technology (MIT) Laboratory for Energy and the Environment, studying innovative methods to manage congestion and optimize inter-regional transactions in the US electricity markets. He also worked as an Electrical Engineer with Kaiser Aluminum. Mr. Collison holds a Master of Business Administration degree and a Master of Science degree in Technology and Policy from MIT, and a Bachelor of Science degree in Power Systems Engineering from the University of Science and Technology – Ghana.

RELEVANT EXPERIENCE

Wholesale Power Market Analysis: Mr. Collison has performed studies for several clients in the power generation sector that required a detailed analysis of the power markets. For these clients Mr. Collison assessed generation facility dispatch, forecast energy price and estimated gross revenues. In many cases Mr. Collison has used the GE Energy MAPS model to develop a least cost economic model of the US power market, while enforcing transmission and stability limits to forecast hourly dispatch and locational prices and to assess the impact of transmission constraints on the facilities.

Asset Valuation and Market Studies: Mr. Collison has led studies focusing on the valuation of generation assets in several markets. Using fundamentals analysis, these studies have included forecasts of energy and capacity prices and assessments of facility dispatch. Further, facility performance was assessed under alternative scenarios to assess the impact of key market drivers – fuel prices, demand, allowance

prices, air regulatory polices, resources additions or retirements, and other parameters – on the facility revenue. Many of these studies have been used to support project financings.

Transmission Analysis: Mr. Collison's transmission analysis effort includes interconnection feasibility studies, power deliverability assessments, congestion forecasts, FTR price forecasts, reliability studies, and transfer capability assessments.

- Interconnection Feasibility Studies: For planned generation facilities Mr. Collison has managed detailed power flow studies to determine the transmission facility additions and upgrades that would be necessary for interconnection and operation. Using the PSLF and PowerWorld power flow models, seasonal snapshots of the power system are examined with and without the planned facility to determine the incremental effect of dispatch from the facility on the transmission grid. The system is examined under both normal and emergency conditions to ensure that likely operating scenarios are properly accounted for. Transmission facility thermal and voltage limit violations due to the facility dispatch are noted, and the cost of upgrades to alleviate the violations is estimated. Clients have used the results to determine appropriate interconnection substations for their facilities.
- Power Deliverability Assessments: Mr. Collison has helped clients assess the ability of their units to deliver power to particular load centers subject to transmission facility operating limits. Mr. Collison develops models similar to those used in the interconnection feasibility studies and simulates different levels of power transfer from the source (generation facility) to the sink (load center). Transmission facility thermal and voltage limit violations due to the transactions are noted, and the cost of upgrades to alleviate the violations is estimated. Based on such analyses, clients are able to determine favorable markets and assess the feasibility of proposed power contracts.
- Congestion and FTR Price Forecasts: Mr. Collison has assessed congestion risk for clients by forecasting congestion in the power markets and, if required, forecasting FTR prices. Mr. Collison uses hourly nodal models of the power markets to simulate dispatch and power flows in the transmission network. These models have detailed representation of generation and transmission facilities in the market, and transmission facility thermal and stability limits are strictly enforced. A forecast is prepared of the congested facilities, the number of hours of congestion, and the price impact. The FTR price is estimated from the difference between congestion components of the energy prices.
- Reliability Studies: Mr. Collison has analyzed many power networks to assess the impact of planned upgrades or additions on system reliability. Many of these studies have demonstrated the benefits and supported the implementation of new transmission projects. Mr. Collison led a team to prepare seasonal snapshot model of the northeast US power market to support a client's major transmission project. The models were prepared to reflect normal and emergency operation of the transmission network in the future. Generation facility additions and retirements, demand growth, and demand response were incorporated and transmission thermal and stability limits were strictly enforced. The analysis showed that the new project alleviated thermal and voltage violations and improved the ability of the system to serve the increased demand reliably.
- Transfer Capability Assessment: Mr. Collison leads the effort to estimate the power transfer capability between load zones, utilities, or power markets for ICF internal use and for clients. This is critical in properly capturing trade between markets.

Renewable Market Analysis: Mr. Collison has helped clients to assess sites for wind generation vis-à-vis the accessibility of transmission and the ability to deliver the power to load centers. He has also worked with clients to determine the ability of proposed cleaner generation facilities to displace dispatch from existing "dirtier" facilities and thus reduce overall emission of pollutants.

Regulatory Proceedings: Mr. Collison has assisted in the preparation of testimony for state proceedings. These include siting of power generation and transmission facilities; utility cost of service proceedings; market structure; tariff rates; and air quality improvements. Mr. Collison filed testimony before the Public Utilities Commission of Texas and testified in support of Kelson Transmission's application for a Certificate of Convenience and Necessity to construct a new transmission line that will connect non-ERCOT areas in east Texas to the Houston zone of ERCOT. The new line would enable generation in the non-ERCOT areas in east Texas to access the Houston zone of ERCOT, potentially providing relatively cheaper generation to the ERCOT market.

Cost Benefit Studies: Mr. Collison has led and performed studies to estimate the costs and benefits of proposed projects and programs to help clients understand the value of these projects and programs relative to the cost. Mr. Collison's recent analysis has included cost-benefit studies for market restructuring programs and proposed transmission line projects.

- *Analysis of the Benefits of the Midwest ISO's Day-2 Market:* Mr. Collison was the transmission lead in the study to determine the benefits of the transition of the Midwest ISO to a fully competitive market with centralized commitment and dispatch. This analysis involved detailed modeling of the US Eastern Interconnect with a focus on the Midwest ISO footprint under security constrained unit commitment and economic dispatch conditions. ICF coordinated with dozens of stakeholders to collect data reflecting the operation of the Midwest ISO system. Using the data, ICF calibrated its model to a recent operating year and estimated the benefits of the market transition by comparing an actual Midwest ISO Day-2 operation to a simulated Midwest ISO Day-1 operation. Additionally, ICF estimated the maximum benefits achievable from an optimal Day-2 operation to reflect the potential to increase savings to the Midwest ISO consumers from incremental operational improvements to current Day-2 operations.
- *GridFlorida RTO Cost Benefit Analysis:* Mr. Collison provided transmission expertise to utilities in the Florida power market in determining the costs and benefits of restructuring the multi-utility control area operation to a centrally coordinated and dispatched market. Mr. Collison's contribution included model calibration to a base year, then modeling least cost economic dispatch subject to transmission line and system stability limits going forward under both current and RTO operation. Based on the results of the study the incumbent utilities and the Florida Reliability Coordinating Council (FRCC) will assess the viability of a transition to an RTO structure.
- *Benefits of Transmission Lines:* Mr. Collison has led studies to assess the economic benefits of proposed transmission projects in several power markets. Mr. Collison conducted a study for Pepco Holdings, Inc. to determine the economic benefits of the Mid-Atlantic Pathway Project and supported the application of Potomac Electric Power Company and Delmarva Power & Light Company for a Certificate of Public Convenience and Necessity before the Public Service Commission of Maryland. In Texas, Mr. Collison assessed the benefits of a large transmission project that would interconnect the Houston load zone with generation in a non-ERCOT section of Texas. The project would enable the importation of significant amounts of power into the Houston load pocket. Mr. Collison is supporting Kelson's filing before the Public Utility Commission of Texas for a Certificate of Convenience and Necessity. Mr. Collison is also leading a study for Northeast Utilities and National Grid to demonstrate the need for the New England East West Solutions (NEEWS) transmission projects. These projects have been proposed to address some of the major transmission constraints and reliability concerns in New England. The analysis includes an assessment of the reliability and economic benefits of the projects relative to non-transmission alternatives, to determine if the non-transmission resources can displace or defer the projects. Mr. Collison is providing testimony to support the filing for certificates of need.

SELECTED PUBLICATIONS AND PRESENTATIONS

Austria R., K. Collison, V. Banunarayanan, P. Gilmartin, R. Tapia. "Technical Assessment of the Impact of the NYRI Line on System Reliability and Congestion." January 2009.

Rose J., K. Collison, K. Kumaraswamy. "Addendum to the Independent Assessment of Midwest ISO Operational Benefits". May 2007.

Rose J., C. McCarthy, K. Collison, H. Parmar. "Independent Assessment of Midwest ISO Operational Benefits". February 2007.

Ofori-Atta K., J. Rose, C. McCarthy, H. Parmar, K. Collison, E. Roseman, S. Muthiah, M. Scheller. "Cost-Benefit Study of the Proposed GridFlorida RTO." December 2005.

Ofori-Atta K., K. Collison. "Modeling and Forecasting Operating Reserve Prices in LMP Markets." Presented at EUCI Ancillary Services Conference, October 2003.

Collison K. "A Practical Approach to Optimal Pricing and Implementation of Inter-regional Transactions in Electricity Markets Under Restructuring." June 2001.

Yoon, YT, M.D. Ilic and K.K.Collison. "Efficient Implementation of Inter-regional Transactions." January 2001, pp 36.

Yoon, YT, J.R. Arce, K.K.Collison and MD Ilic. "Implementation of Cluster-based Congestion Management Systems." May 2000, pp 21. Presented at ICPSOP 2000 – Restructuring The Power Industry For The Year 2000 And Beyond in July 2000.

Yoon, YT, K.K.Collison, J.R. Arce and MD Ilic, Congestion Management System Methods: Comparison on the 118 Bus System, July 2000, pp 21. Presented at 32nd Annual North America Power Symposium (NAPS 2000), Waterloo, Ontario, Canada in October 2000.

Yoon, YT, MD Ilic, K.K.Collison, and J.R. Arce, Practical Implementation of Congestion Cluster Pricing Method, August 2000, pp 30.

TESTIMONY

- Direct Testimony of Kenneth K. Collison on Behalf of Potomac Electric Power Company and Delmarva Power & Light Company, Before the Public Service Commission of Maryland, In the Matter of the Application of Potomac Electric Power Company and Delmarva Power and Light Company for a Determination of Need Under a Certificate of Public Convenience and Necessity for the Mid-Atlantic Pathway Project in Maryland and the Construction of an Extra High Voltage Transmission Line from Calvert County, Maryland to the Western Shore of the Chesapeake Bay, and the Construction of an Extra High Voltage Transmission Line from the Maryland Eastern Shore of the Chesapeake Bay to a New Substation in Vienna, Maryland, and to the Maryland State Line Bordering Delaware and Jointly Filed in Case Nos. 6526 and 6984, February 25, 2009.
- Testimony of Kenneth K. Collison for the Narragansett Electric Company d/b/a National Grid (Rhode Island Reliability Project), Before the State of Rhode Island Public Utilities Commission, Notice of Designation to Render an Advisory Opinion to the Energy Facility Siting Board Regarding the Need and Cost-justification for the Narragansett Electric d/b/a National Grid's proposal to construct and alter major energy facilities, the "Rhode Island Reliability Project", RIPUC Docket No. 4029, February 20, 2009.
- Prepared Testimony of Kenneth K. Collison on Behalf of Communities Against Regional Interconnect (CARI), Before the State of New York Public Service Commission, In the Matter of New York Regional Interconnect, Case No. 06-T-0650, January 9, 2009.
- Supplemental Direct Testimony of Kenneth K. Collison for Kelson Transmission Company, LLC, Before the State Office of Administrative Hearings, Application of Kelson Transmission Company, LLC for a Certificate of Convenience and Necessity for the Amended Proposed Canal to Deweyville 345 kV Transmission Line Within Chambers, Hardin, Jasper, Jefferson, Liberty, Newton and Orange Counties, SOAH Docket No. 473-08-3341, PUC Docket No. 34611, (Public Utilities Commission of Texas), June 18, 2008.

EMPLOYMENT HISTORY

ICF Consulting	Vice President	2009
ICF Consulting	Principal	2008
ICF Consulting	Senior Manager	2007
ICF Consulting	Project Manager	2005-2006
ICF Consulting	Senior Associate	2002-2004
MIT CEEPR	Research Assistant	2001-2002
MIT Energy Laboratory	Research Assistant	1999-2001
Kaiser Aluminum	Electrical Engineer	1990-1999

Tony Gregory Coggan

Truescape – 3D Visualizations

INTRODUCTION

1.1 My name is Tony Gregory Coggan. I am the Vice President of International Development for the firm Truescape Limited based in Christchurch New Zealand (Truescape).

1.2 I am a computer simulation specialist and I have 8 years experience working in the 3D photo and video simulations industry, and have completed a wide range of different visualisation projects from photo-simulations for simple projects to full computer generated 3D video simulations for complex projects across New Zealand, Australia and North America.

EXPERIENCE & EXPERTISE

1.3 I have 17yrs experience working in the Cadastral Land Surveying field for Davis Ogilvie and Partners, a Christchurch, New Zealand based consultancy where I was responsible for introducing the CAD (Computer Aided Design) based drafting practices to the company.

1.4 I have been working with Truescape Ltd since April 2001 where I have played an integral role in developing the methodologies behind the accurate simulation techniques used by clients throughout North America and Oceania Regions.

1.5 I am acknowledged as one of New Zealand's leading Expert Witnesses in the field of accurate 3D visualization technologies and have appeared on more than 30 occasions before Planning Tribunals and Environment Court Hearings in an Expert Witness Capacity.

1.6 I have played an integral role in the development of New Zealand's "Best practice Guidelines" at the request of New Zealand's Institute of Landscape Architects (NZILA) Education Foundation that sets out a series of policies and guidelines for the development of best practice 3D visualization techniques.

1.7 I have delivered numerous presentations on the subject of "best practice 3D visualization techniques" at forums such as New Zealand's Resource Management Law Association, Australian Wind Energy Association, New Zealand Wind Energy Association and the World Wind Energy Association Annual Conferences.

STATE OF CONNECTICUT

SITING COUNCIL

The Connecticut Light and Power Company application for Certificates of Environmental Compatibility and Public Need for (1) The Greater Springfield Reliability Project consisting of a new 345-kV electric transmission line and associated facilities from the North Bloomfield Substation in Bloomfield to the Connecticut/Massachusetts border, together with associated improvements to the North Bloomfield Substation, and potentially including portions of a new 345-kV electric transmission line between Ludlow and Agawam, Massachusetts that would be located in the Towns of Suffield and Enfield, Connecticut; and (2) and the Manchester Substation to Meekville Junction Circuit Separation Project in Manchester, Connecticut.	:	Docket No. 370: CT Valley Electric Transmission Project and
NRG Energy, Inc. application pursuant to C.G.S. § 16-50*l*(a)(3)	:	Docket No. 370B
	:	**July 7, 2009**

CURRICULUM VITAE FOR JULIA FRAYER

Julia Frayer is a Managing Director with London Economics International LLC, specializing in economic analysis and evaluation of infrastructure assets, such as power plants, natural gas-related infrastructure, electricity transmission and distribution systems, and utilities, as well as market design and expert economic advisory services for today's deregulated power markets. She has worked extensively in the US, Canada, Europe, and Asia in valuing electricity generation and wires assets, water and wastewater networks, as well as gas transportation assets, and in advising on market rules and institutional best practices.

Julia manages LEI's quantitative financial and business practice area, and also specializes in market and organizational design issues related to electricity. Sample projects include cost of capital estimation; rate-setting analysis; short- and long-term forecasting of wholesale power prices; valuation of generators and vertically-integrated utilities; assessment of provider-of-last resort portfolios and contracts; advice on and design of energy sales agreements; and advisory on structuring request for proposals and sale processes for energy assets and derivative contracts. As part of these analyses, Julia and her team of economists and consultants have developed and applied proprietary real-options based valuation tools, portfolio risk analytics, models of strategic bidding behavior, and sophisticated power system simulation tools. Over the last few years, Julia has led over a dozen power system modeling exercises in the US and Canada, supporting the project development and financing ventures of a number of generation projects and conducting economic assessments of transmission and distribution network investments. Recent projects have required market analysis and forecasting in New York, New England, PJM, California, the Maritimes, the Midwest, Texas, the Southwest, Pacific Northwest, Alberta and Ontario.

Julia also leads many of the firm's regulatory economics projects, spanning such diverse issues as cost-benefit analysis, market power mitigation, tariff ratemaking, auction design (including competitive solicitations for procurement), wholesale market rules design, and competitive market efficiency benchmarking. In the realm of cost-benefit analysis, she has dealt with environmental siting issues and has designed ranking techniques that reflect the uncertainty and delay for new projects in reaching commercial operation. She has also worked on LEI's projects involving strategic advisory to governments, regulators, and other stakeholders regarding the structure of market institutions, such as ISOs, power exchanges, transmission system operators, etc. These engagements involved substantial stakeholder consultation and required tailored advice to the client on operational issues, funding questions, marketing protocols, and organizational/governance structures.

In 2003, Julia co-led the LEI project team that designed an economic valuation framework for the California ISO for assessing the economics of transmission investment. The economic-based transmission evaluation framework provide an integrated approach for considering difficult valuation questions related to the complex interactions between transmission expansion and generation, the value added of market power mitigation from transmission expansion, and the incremental value the real option to delay investment in the cost-benefit analysis. The approach also innovatively departed from traditional scenario-based analyses to consider the implications of market uncertainty endogenously within the modeling.

In the area of economic benefit analysis and New England power markets, over the course of 2006-2007, Julia led the Connecticut Department of Public Utility Control ("DPUC") project for competitive procurement of incremental capacity to reduce Federally Mandated Congestion Charges. In response to an integrated, all-source Request for Proposals that LEI helped design, this project involved comprehensive economic benefit evaluation of various projects, from traditional supply side recourses (like CCGT and peakers) to demand side resources (such as Energy efficiency and demand response). Julia managed the entire LEI team, which consisted of at least four and sometimes as many as eight consultants, as well as four other subcontractors

providing input on technical issues related to transmission, project risk, accounting standards. LEI was responsible for all aspects of the bid evaluation including the cost-benefit appraisal of the contracts-for-differences structure, which was settled against multiple ISO-New England ("ISO-NE") markets, and valuation of energy call options (an optional feature of the bid package). Julia served as the main client interface for the DPUC, with the Chairman of the DPUC being highly active in the engagement as well as with representatives from most of the major departments within the DPUC.

Julia is currently managing a project with the Maine Public Utilities Commission ("MPUC"), where LEI is tasked to advise the MPUC with its RFP of long-term contracts for capacity and energy resources. As part of this project, Julia prepared a report advising on resource adequacy in the state and the implications for Maine given future infrastructure investments. Julia then advised the MPUC about the design of the statutorily required RFP and associated contracts. She is currently working with MPUC staff on evaluation of proposals. She is also currently advising the Utah State Commission as part of the independent monitor of the PacifiCorp RFP for renewable capacity. She is also advising on several merger and acquisition cases, especially as it relates to market power issues. She filed testimony at FERC on the proposed Exelon-NRG merger, and is also advising parties to the FERC proceedings related to the California crisis.

Prior to joining LEI, Julia was working as an Investment Banker with Merrill Lynch in New York. At Merrill Lynch, she specialized in the financial sector, working closely with specialty finance companies, re-insurance firms, asset management and regional depository institutions, in both mergers and acquisitions and strategic financing areas.

EDUCATION:

Graduate School of Arts & Sciences, Boston University, M.A. in Economics
College of Arts & Sciences, Boston University, B.A., Summa Cum Laude, in Economics and International Relations, member of Phi Beta Kappa

SAMPLE OF RELATED PROJECT EXPERIENCE:

- ***RFP design for Maine:*** In 2008, Julia assisted the Maine Public Utility Commission in preparing an RFP and contract for Maine's RFP for long-term contracting of supply resources. LEI's tasks currently include support of the Commission staff in evaluating the bids received and negotiating the contracts
- ***Monitor for PacifiCorp's Renewable Solicitation Process***: Julia is part of a consortium that is serving as the Independent Monitor for PacifiCorp's renewable solicitation process for the 2008R-1 solicitation process for additional renewable power supplies. The Independent Monitor will report to the Utah Public Service Commission. This process includes review and assessment of the solicitation process, documents, and modeling methodologies; valuation of the bidder pre-approved process; development of review criteria, monitoring, auditing, and validation of bid evaluation process; bid evaluation; contract negotiation. Final report and testimony will be filed with state commission, after PacifiCorp finalizes contracts in 2009
- ***Market power implications from merger***: Julia is scheduled to provide expert testimony at the hearings of the Pennsylvania Public Utility Commission on the potential implications of the proposed Exelon-PSEG merger on spot market prices, as well as on default service markets in PJM

- ***Cost-benefit of proposed EDF acquisition of a share of Constellation's nuclear business:*** Julia is assisting the Maryland Public Service Commission in considering the proposed transaction of EDF and Constellation

- ***Economic analysis of transmission investment:*** Julia supervised the preparation of detailed twenty-year market analysis for the valuation of several proposed DC-based transmission investment in New York and New England. Julia and her LEI team provided extensive analytical support for the transmission system investors in front of regulators, lenders, and potential counterparties

- ***Advice on performance-based ratemaking:*** Julia recently advised the Coalition of Large Distributors in Ontario on 3rd generation Incentive Regulation Mechanism proceedings of the Ontario Energy Board. The work involves expert testimony filed with the Board with detailed analysis of the theory behind the various components of PBR system, including inflation and efficiency gains factors, treatment of capital expenditures among others. The analysis was supplemented with comparison of actual factors and indices and determination of the more robust and appropriate indices for the Ontario's distribution industry, including total factor productivity analysis for the sector

- ***Market assessment related to the value of RECs in New England:*** for a major Canadian utility, Julia is currently leading a team undertaking a comprehensive market assessment of the New England REC markets, and specifically the Massachusetts and Connecticut markets, under three different scenarios, the status quo, with the utility's resource commercialization schedule, and assuming sporadic participation by the utility

- ***Multi-market price forecast and analysis in New England for large Canadian consortium:*** Julia led a team that developed a multi-zonal market price forecast in New England, which was then used to support the analysis involving the acquisition of a generation portfolio. In addition to the Competitive Base Case, four distinct sensitivities were modeled. Sensitivities were developed on the Competitive Base Case, which aimed to assess how a selected set of market drivers impact electricity prices

- ***Analysis of revenue flows for 1,000MW pumped storage hydro-facility in New York, New England and PJM:*** Julia is currently leading a team providing extensive economic modeling of energy, capacity, ancillary service and real options valuations for a potential pump-storage facility in three different North American markets (New England, New York, and PJM)

- ***Long-term, multi-market energy price forecasting:*** Julia headed the analysis of long-term price forecasts and energy market dynamics for many of the regions in the US and Canada, including New England, Pacific Northwest, California, Alberta, Southwest Power Pool, SERC, the Midwest US (ECAR, MAIN, and MAPP), Maritimes, Ontario, New England, and PJM. In this practice area, she manages a team of economists that use a variety of modeling tools to forecast one-year to fifteen-year wholesale energy, capacity (where relevant), and market-based ancillary services price forecasts. As part of the modeling effort, LEI proprietary dispatch simulation model, POOLMod, as well as other tools that have been developed by LEI, such as CUSTOMBid, ConjectureMod, ViTAL, and LEI's real options spark-spread module. This type of modeling effort required detailed investigation of the micro and macro-economic issues facing these regional markets: demand profiling, growth forecasting, reserve margin and new entry activity assessment. Such analyses are used by clients in establishing market values for assets they have targeted to acquire, consideration of portfolio risk and exposure, and assessments of procurement opportunities. This same modeling has supported regulatory analysis of utility acquisitions and planning strategies, consideration on the impact of market rules and as "reservation prices" for sale processes

- ***Consideration of strategy for procuring long term capacity:*** In 2008 - early 2009, Julia advised a major utility in Canada on its upcoming call for tenders strategy for procuring firm capacity over a long term horizon from neighboring jurisdictions. Julia is in the process of evaluating the opportunity for purchasing capacity from interconnected jurisdictions and devising a procurement that would efficiently overcome seams issues and market design issues that attach different counting and valuation methods for capacity across jurisdictions

- ***Development of an Electric Resource Adequacy Plan in Maine:*** as the team leader of this project, Julia assisted the Maine Public Utilities Commission in developing an electric resource adequacy plan to aid MPUC in the development of a strategy for the pursuit of the long-term contracts. LEI submitted a report that builds up a set of recommendations for a long-term investment strategy based on an analysis of the current supply-demand situation, a review of the existing wholesale market rules for energy and the Forward Capacity Market, an examination of historical price trends, and review of the investment needs assessments prepared by the utilities and ISO-NE, as well as relevant sub-regional planning studies

- ***Kentucky Public Service Commission (US) / Regulatory Reform:*** to satisfy the requirements of a recently passed statutory mandate, Julia and the LEI team conducted a broad-based analysis of current practices and the potential for reform within Kentucky's electricity industry in four areas: (i) energy efficiency and demand side management; (ii) use of renewables; (iii) full cost accounting; and (iv) tariffs. Reported results to the state's regulatory commission, including a full set of recommendations in each of the four areas for overcoming existing impediments to legislative objectives for improvements in the industry's overall efficiency and reductions in its environmental impact

- ***Testimony for NRG Energy, Inc.:*** LEI was engaged by NRG Energy, Inc. to provide testimony in opposition to the proposed acquisition of NRG by Exelon Corp (Exelon). LEI performed a preliminary Herfindahl-Hirschman Index (HHI) test for market power for all regions affected, and a Delivered Price Test (DPT), including a more detailed HHI test, for the PJM East and ComEd regions. In addition, LEI examined Exelon's post-merger optimal bidding strategies using our proprietary model of strategic, known as CUSTOMBid. LEI also assessed the impact of changes in the parent company Exelon's cost of capital on the activities of the company's two regulated subsidiaries: ComEd and PECO. LEI estimated the impact on customer costs from potential debt downgrades following the merger, and assessed the effectiveness of Exelon's proposed ring-fencing measures

- ***Electricity Generation Assets Portfolio Valuation for Distressed Debt Investment Fund:*** using LEI's proprietary simulation model of electricity wholesale markets in ISO New England, LEI forecast future cash flows for a portfolio of electricity generation assets and applied the net present value analysis to evaluate the portfolio's economic value under different potential future market conditions. This analysis supported the investment fund's decision to acquire and hold the generation portfolio's distressed debt

- ***Preparation of testimony in support of market-based rate authority and triennial filings requirements (various clients):*** over the course of 2007 and 2008, LEI prepared over a dozen MBR filings for various markets coming under the FERC's triennial schedule as established in Order 697

- ***Case studies on balancing market mechanisms in several US wholesale markets (SPP, ERCOT and MISO):*** under Julia's management, analysis was conducted which included the restructuring and evolution of balancing mechanisms, functional aspects of the balancing markets, market facts and key statistics, and recent development. A comparison among these

markets and Japan's wholesale market JEPX was also conducted. Lastly, Julia and her team discussed the implications of balancing market mechanisms for Japan

- ***White paper analysis for stakeholders in response to Alberta Department of Energy's regulations on market power:*** in response to government proposed policies on what defined a "fair, efficient, and openly competitive" market, LEI prepared a detailed white paper and market analysis on the proposed market power tests to be added regulation, and specifically demonstrating the adverse effects of the 20% hard cap market share limit proposed by Department of Energy (DOE). White paper was filed as testimony with the DOE in their consultation on Section 6 of the Electric Utilities Act

- ***Analysis of the New England market and market power implications for generation company acquisition:*** Julia led a team that assisted a major Canadian renewable power company in its economic valuation of a New England based renewable company, prior to acquisition. Work involved due diligence, analyzing the revenue potential of the potential acquiree's assets over the 2009-18 period across all major ISO-NE product markets, and separately analyzed the market power implications of the acquisition in preparation of a potential FERC application, including analysis of market power issues in ancillary services market

- ***Designing procurement process for CT DPUC to reduce costs of congestion for CT ratepayers:*** Julia has evaluated measures needed to reduce Federally Mandated Congestion Charges (FMCC) in Connecticut. Together with the LEI team she also performed an economic evaluation of the New England and Connecticut energy markets using LEI proprietary production cost model, POOLMod. Julia testified at the DPUC regarding the RFP process, RFP documentation, and contract template. Julia also testified on evaluation of project bids in comparison to anticipated market outcome

- ***Filings in support of market-based rate authorization:*** In the matter of Hawk Nest Hydro LLC acquisition of Hawk Nest-Glen Ferris Hydroelectric Project, Julia and the team have prepared the MBR Authorization for the FERC filing (Docket No. ER06-1446-000). In addition, Julia has written the report that served as an Addendum to the market power analyses that were filed with FERC in Docket No. ER05-665-001, on behalf of Barrick Goldstrike Mines. The objective of this Addendum was to address the items requested by FERC in the deficiency letter issued on June 23, 2005 in this docket. In 2005, Julia also prepared analysis for MBRs on behalf of Brascan Power: Bear Swamp Power Company LLC, Carr Street Generating Station L.P., Erie Boulevard Hydropower L.P., Brascan Power St. Lawrence River LLC, and Piney and Deep Creek LLC

- ***Market power testimony in February 2006, on behalf of Oklahoma Municipal Power Authority protesting Westar Energy, Inc.'s proposed acquisition of the 300 MW Spring Creek power plant:*** Julia concluded that the mitigation offer, as it was proposed, was inadequate in size and scope due to the potential for strategic behavior and generation market power abuses. She argued that "if competitive harm created by the acquisition was to be reversed, transmission capacity upgrades were need to create sufficient competition to defeat the strategic bidding opportunities that Westar will obtain with its acquisition of the Spring Creek plant." (Docket No. EC06-48-000)

- ***Testimony at FERC on market power issues:*** on behalf of intervener in proposed Exelon-PSEG merger per Section 203 of the Federal Power Act. In May 2005 Julia provided direct and supplemental testimony outlining key considerations relating to the potential for adverse competitive effects in light of the proposed merger and recommended additional mitigation

measures to cure horizontal market power concerns through independent analysis of merger's impact on wholesale energy and capacity markets in PJM

- ***Monitoring of 5,500 MW RFP for energy services for standard offer contract issued by Connecticut-based utility:*** The Department of Public Utility Control of Connecticut retained the services of LEI to assist the DPUC in monitoring the power procurement processes for Connecticut Light & Power's (CL&P) Transitional Standard Offer auction in November 2004 for services in 2005 and 2006, and once again selected LEI in September 2005 to monitor the November 2005 auction for services in 2006. Julia led LEI's team in providing advisory services to the DPUC, including guidance on communications protocols, design of sales contract agreement (between CL&P and winning bidders), and also valuation of final bids vis-à-vis the forward market alternatives available to the utility. In November 2004 and 2005, Julia filed an affidavit after completion of the procurement process which the Commissioners used to approve the process and the contracts between CL&P and the winning bidders

- ***Joint Triennial Updated Market Power Analysis:*** LEI filed with FERC in September 2004 on behalf of Mystic I, LLC, Mystic Development, LLC, and Fore River Development, LLC. (Docket Nos. ER04-657-002, et al.)

- ***Economical advisory on market power mitigation tests:*** for a large US-based utility in the Southwestern part of the US, consulting on market design features related to a proposed nodal market, including most significantly the market power analysis framework. LEI proposed strategy and is assisting in the development of an implementation framework for the local market, including prepared reports for the market design team and state commission. In addition, the approach will be proposed for federal review at FERC

- ***Analysis of market power proposal and ancillary service market redesign for Alberta based utility:*** Julia led a team that provided a comprehensive analysis of the proposed market power mitigation measures for Alberta's electricity market for a major utility. Julia and her team looked at various scenarios and presented the likely outcomes given various generation portfolio configurations under each proposal and whether these mitigation measures will result in the desired results. Led by Julia, the LEI staff made a case that more rigorous and robust approaches are needed than the proposed measures. Additionally, Julia's team conducted a comparative analysis of the procurement processes and compensation schemes of the different ancillary services products in eight markets, namely: New York, New England, Pennsylvania-New Jersey-Maryland, Texas, UK, Alberta, Australia, and Ontario. The results of this analysis were used to support the client in the Alberta's stakeholder process to redesign a system operator's procurement process

- ***Expert testimony on market power related issues in Texas:*** in September 2005, Julia's proposal for pricing safeguards in the wholesale market, referred to as the Peaker Entry Test, was submitted to the Public Utility Commission of Texas as an alternate to the Commission staff's proposal initially under Project No. 24255 which was later moved to and renamed by the PUCT a Project No. 31972. In April 2006, the PUCT adopted a variant of this proposal for use as pricing safeguards – the Scarcity Pricing Mechanism (as specified in the above mentioned project). Under Project No. 29042 in September 2005 Julia looked at the Pivotal Supplier Test and supplied a critique of the PUCT staff's initial market power mitigation proposal. In June 2005, Julia participated on panel discussing market monitoring issues, as well as market power safeguards for wholesale electricity markets. In 2004, she also provided testimony on pricing safeguards proceeding, which looked at alternative market power testing procedures for market power, analyzed implications on investment, and discussed efficiency consequences of certain bidding behavior. She also prepared and filed

comment testimony and quantitative analysis on questions of market definition and market integration for the Public Utility Commission review in Project No. 29042. In November 2005, by the PUCT decision, both, Project Nos. 24255 and 29042 were rolled into Project No. 31972

- ***Testimony at Pennsylvania Public Utility Commission on market power issues:*** on behalf of intervener in proposed Exelon-PSEG merger

- ***Advisory to the Alberta Department of Energy on market power safeguards for the Alberta electricity sector:*** as part of the LEI team, Julia managed the theoretical analysis and quantitative simulation modeling in the design and testing of recommended new regulatory regime. Analysis and recommendations presented to stakeholders in the spring of 2005

- ***Comments on OEB's consultation paper on benchmarking of distribution companies***: Julia provided comments on the benchmarking methodology suggested by OEB consultants, looking at the analytical aspects of defining and benchmarking the performance of multiple utilities across long period of time. The critique provided details on how each criterion affects the benchmarking study and what are the remedies available to improve the results

- ***Review of uniform transmission rate methodology for OEB:*** Julia led a team that reviewed industry best practices in other jurisdictions and the current situation in Ontario to advise OEB on the appropriateness of the uniform transmission rate, as well as on the feasibility of moving to long-run zonally-differentiated marginal cost pricing. As part of this process, LEI undertook a comprehensive stakeholder review

- ***Determination of reasonable rates and subsidy payments for a water business in Germany, as part of US cross-border lease transaction:*** managed an economic valuation and forecasting exercise in support of a combined $1 billion plus transaction involving several wastewater and freshwater systems (treatment facilities and collection and distribution networks) in Germany. As part of the economic analysis, forecast reasonable rates for the water and wastewater businesses based on true cost recovery principles. In addition, provided industry expertise in the design of a subsidy mechanism, to overcome certain legal obstacles in local jurisdiction's laws with respect to return on investment vis-à-vis fair market value.

- ***Evaluation of a structured financial agreement (swap) or service contract with respect to district heating network in Austria:*** directed the economic analysis of the financial instrument which involved the quasi-securitization of the income streams of a district heating distribution business in Austria; supported the legal counsel in the due diligence process and contributed to the design of the transition structure with respect to the financial arrangement; analysis and final opinion provided backing for a US cross-border lease

- ***Valuation of international transmission project:*** using a real options application involving locational price spreads, designed specifically for this engagement, Julia and her team of economists quantified the congestion rents expected to be earned by the developer of an international transmission line in North America and thus evaluated the private benefits to the transmission owner; financial model constructed for developer to use in analyzing economics of the project on an on-going basis, in order to win Board approval and negotiate risk-sharing contract terms with co-sponsor

- ***Market analysis for investor seeking to complete due diligence in preparation for multi-million dollar investment in generation portfolio in Ontario:*** Julia is leading a team that is preparing a market study of the Ontario electricity market for a major potential investor in

Ontario's generation assets. This report contains an overview of the Ontario electricity market, including a description of market evolution, a summary of key institutions, regulatory and policy initiatives that have molded the market landscape, and a long term projection for the market going forward

- ***Support to California Energy Commission ("CEC") on data confidentiality issues with respect to their 2005 IEPR process, including expert testimony at the Energy Commission and in Superior Court:*** Julia served as the CEC staff's independent expert witness on issues related to data confidentiality within the context of the state IOUs' competitive procurement process for energy. Julia worked alongside Energy Commission staff, advocating the release of the aggregated supply-demand data from the California IOUs' Long Term Resource Plans in the Integrated Energy Policy Report (IEPR) process. In an Order dated September 7, 2005, the California Energy Commission denied the Investor Owned Utilities' confidentiality appeals and upheld the Energy Commission staff's proposal to release the aggregated data. Julia testified on the shortcomings of the experimental analysis conducted by the one of the IOUs' experts on the potential outcomes of the aggregated data release on negotiated transactions and auctions. In addition, Julia testified on the potential benefits arising from the release of the aggregated data for the IOUs' long-term competitive procurement processes due to the positive investment signals resulting from this information release, as well as reduced risk for bidders and more competitive bidding. Julia also authored rebuttal testimony on issues relating to the availability of detailed transaction data in the FERC Electronic Quarterly Reports and monthly historical output from hydroelectric plants on EIA Form 906, and discussed the applicability of auction theory to the IOUs' long-term procurement processes. Her testimony also addressed issues of market power potential and collusion among bidders in procurement processes

- ***Valued transmission rights between Midwest and Ontario:*** LEI conducted an indicative valuation of a proposed new transmission line, known as the International Transmission Line. LEI forecasted the revenues associated with the project and combined this revenue forecast with the estimated costs of the project to arrive at an estimate of the net present value of the project and return on investment

- ***Valuation of Midwest, New England, and PJM generation assets:*** Julia evaluated potential value of assets available under various regional auctions for a dominant IPP player. Julia worked with the client in composing a bid proposal by assessing market risks posed by various factors, such as fuel price shifts, merchant plant construction scenarios, site conversion potential, and transmission constraints and through extensive production cost modeling

- ***Expert witness on economic issues of in Resource Adequacy and Procurement Proceedings at the California Public Utility Commission (the CPUC) proceedings:*** Julia served as an expert witness on economic issues related to pricing, investment signaling and data confidentiality in Resource Adequacy and Procurement Proceedings at the California Public Utility Commission in November-December 2005 on behalf of the California Energy Commission. Julia authored direct and rebuttal testimony on these issues and testified in San Francisco in late November 2005

- ***Analyzed and assisted in the negotiation of supply options for a large industrial customer in South Eastern US:*** LEI was engaged by a large industrial customer to help review power purchasing options at one of its Southeastern facilities over the next three years. LEI assessed the probability of a supply interruption over the next three years due to the state of the transmission system in this region. LEI also assessed the facility's options for purchasing power for this load in the wholesale market

- ***Expert testimony before the Quebec regulator (Regie) on econometric analysis of the elasticity of demand for transmission services between Canadian provinces and US markets in the Northeast:*** in the context of a transmission rate case and consideration of alternative transmission rate designs, Julia led the economic analysis for an IPP investigating the impact on trade from increased transmission costs, involving multi-factor regression analysis of nodal electricity prices, price spreads across markets, and interchange flows (imports and exports) across borders. Julia also considered the impact of the elasticity of demand for transmission services between Canadian provinces and US markets in the Northeast for maximizing revenues in rate setting

- ***Support to California Energy Commission ("CEC") on regulatory and market design changes:*** LEI was contracted by CEC to study the capacity products that have been traded in other jurisdictions, and more broadly examine trading platforms that may be useful models for California if a voluntary trading mechanism was implemented to assist market participants in trading capacity to achieve compliance with Resource Adequacy Requirements. Additionally, LEI produced a report to cover the functional requirements for a bulletin board posting and trading platform for bringing buyers and sellers together and allow trading of the various capacity products supported by RAR in California, such as System RA Capacity and Local RA Capacity, and possibly some form of Import RA Capacity. LEI also covered the functional requirements for a tracking system, including title tracking, certification of transactions, and, possibly, compliance filing

- ***Support to CEC on long-term planning and procurement policymaking:*** LEI is providing feasibility analysis for the potential application of "To Expiration Value at Risk" (TeVaR) analytical methods to long-term electric utility portfolio analysis and planning and procurement policymaking activities of CEC

- ***Market analysis and forecasting for IPP developer in Ontario in response to Ministry of Energy's RFEI for 2,500 MW of clean energy:*** Julia directed the quantitative analysis and wholesale electricity price forecasting completed for an IPP. Projections were used to justify project sponsorship of a small gas-fired plant in front of the IPP's Board of Directors and led to project submission to RFEI. In addition, Julia and her team of economists designed a risk model for the client to evaluate the contract payment risks vis-à-vis actual dispatch

- ***Economic support of generation acquisition by investment funds in PJM:*** Julia led a due diligence team and assisted in the exclusivity negotiations with respect to an acquisition of a 400+ MW coal fired plant in the PJM market by a group of private investors. Julia's role included management of LEI's economic appraisal, coordination of preliminary technical due diligence, negotiations with third parties on possible of-take arrangements, and oversight over financial modeling

- ***Transmission assessment for CAISO:*** Julia led LEI's advisory services to the California Independent System Operator, where she and her team devised an innovative approach for evaluating the economics, environmental, and siting costs and benefits of transmission (and generation investment). Building upon the traditional economic framework for cost-benefit analysis, the LEI team devised an approach to quantitative value the expected net benefits from various infrastructure projects, taking into account market uncertainties as well as the classic deregulated market coordination problem of planning for transmission give uncertain generation investment and vice versa. A scoring technique for environmental permitting and siting issues was also developed, in order to quantify the potential impact of the proposed project on the local environment and economy, as well as to measure the impact of such factors on the project timetable and eventual net benefits to society. Real option techniques were also considered in this engagement to assess the potential value of uncertainty and the

benefits for delaying various investment strategies. The methodology was also expanded to handle the potential to evaluate numerous competing projects, in recognition of the fact that transmission and generation investments (and other potential investments) could be both complements and substitutes

- ***Support a Canadian ISO develop an effective competitive procurement process for the sale of dispatch rights associated with key generation assets:*** LEI provided advice on the selection of the type of sale process for strip contracts associated with key generation assets; the choices considered included a sealed-bid option (i.e., a bank mediated private sale) or some type of open auction process based on both theoretical (economic) and practical (implementation) considerations
- ***Assessment of POLR obligations for asset acquisition:*** As part of a team performing pre-acquisition due diligence, LEI developed energy market forecasts for PJM, as well as plant performance forecasts for individual assets owned by a PJM utility. LEI estimated provider of last resort exposure, reviewed evolution of supply and tariff arrangements, performed valuation modeling, and contributed to development of an overall bid for the assets

PUBLICATIONS AND SPEAKING ENGAGEMENTS

Frayer, Julia; Neeman, Zvika; and Wittenstein, Matthew "Applications of Information Policy Principles from Auction Theory in the Deregulated Electricity Market" *32nd IAEE International Conference*, San Francisco, California, June 21-24, 2009

Frayer, Julia "Prepared Presentation of Julia Frayer for Market Monitoring and Surveillance in the context of Market Design." Panelist, *PUCT Workshop for Project #28500*, Austin, Texas, June 10, 2005.

Frayer, Julia "Written Statement of Julia Frayer for the January 27th 2005 Technical Conference in Docket RM04-7-000" Panelist, *FERC Technical Conference*, Washington D.C., January 27, 2005.

Frayer, Julia "Competitive procurement options for Ontario's LDCs" Speaker, *APPrO 2004 Conference*, Toronto, Ontario (Canada), November 24, 2004.

Frayer, Julia, Nazli Uludere, and Sam Lovick "Beyond market shares and cost plus pricing: designing a horizontal market power mitigation framework for today's electricity markets." *Electricity Journal,* November 2004.

Frayer, Julia "The World Changed on August 14th: the (Second) Great Northeast blackout." Chairman of Panel Session, *Electric Power Conference* 2004, Baltimore, Maryland, March 30, 2004.

Frayer, Julia "Alternative to LMP pricing for transmission: a case study of the ICRP approach used by National Grid Company in the UK." Speaker, *Electric Power Conference* 2004, Baltimore, Maryland, March 31, 2004.

Frayer, Julia "Big ticket leasing - what next for the future?" Panelist, *Big Ticket Leasing 2003*, London (United Kingdom), March 12, 2003.

Frayer, Julia "Evaluating the Electron Highway" Speaker, *IPPSO 2001 Conference*, Richmond Hill, Ontario (Canada), November 28, 2001.

Frayer, Julia and Nazli Uludere "What is it worth? Application of real options theory to the valuation of generation assets" *Electricity Journal,* November 2001.

Goulding, A.J., Julia Frayer, Jeffrey Waller "*X Marks the Spot*: How UK Utilities Have Fared Under Performance-Based Ratemaking" *Public Utilities Fortnightly,* July 15, 2001.

Frayer, Julia "How much is it worth? Applying real options valuation framework to generation assets" Speaker, *Electric Power 2001*, Baltimore, Maryland, March 22, 2001.

Goulding, A.J., Julia Frayer, Nazli Z. Uludere "Dancing with Goliath: Prospects after the Breakup of Ontario Hydro" *Public Utilities Fortnightly*, March 1, 2001.

Frayer, Julia and William Chapman "Improving price forecasting in wholesale power markets through the application of models of strategic bidding" Speaker, *EPRI International Pricing Conference 2000*, Washington, D.C., July 28, 2000.

James M. Hogan, P.E.

Expertise
- Structural Design
- Foundation Design
- Rigid Bus Structural Analysis
- Transmission Line Design

Education
- B.S. in Civil Engineering, University of Missouri Kansas City, 1984
- M.S. in Civil Engineering, University of Missouri, 1999

Organizations
- American Society of Civil Engineers
- Missouri Society of Professional Engineers
- National Society of Professional Engineers

Registration
- Professional Engineer Missouri, Ohio, Kentucky, Washington, California, Minnesota, Nevada, Kansas, Georgia, Oklahoma, Alabama, Connecticut

Total Years of Experience
26

Years With Burns & McDonnell
26

SUMMARY OF QUALIFICATIONS | Mr. Hogan is the Director of Engineering in the Transmission & Distribution Division with overall responsibility for day-to-day operations of design engineering functions. He overseas the following departments in the division: Substation, Overhead Transmission, Underground Transmission, Civil/Structural, SCADA/Communications, and CADD. His responsibilities include developing specifications, coordinating training programs, and reporting the staffing status.

Mr. Hogan is a civil engineer specializing in civil/structural design for electrical substations and transmission lines. Mr. Hogan's structure design experience includes sag/tension calculation, generating structure loading diagrams, structural steel design, and reviewing erection and fabrication drawings. In the area of foundation design, he has design experience with drilled shafts, spread footings, slabs, mats and pile foundations. He has site development experience for substation yards and oil containment systems. Mr. Hogan is also involved in performing quality control reviews of design calculations, specifications, contracts and drawings.

In addition to his other responsibilities, Mr. Hogan has been involved with the Middletown – Norwalk 345-kV Transmission Project for Northeast Utilities since 2002. Mr. Hogan was the Project Manager on the initial phase of the project which was completed in 2005 that included route studies, preliminary engineering and cost estimates. This project consists of 70 miles of 345-kV transmission line, three new substations and modifications at two existing substations. The transmission line design evaluated both overhead and underground options that are being routed through rural, suburban and urban areas in southwest Connecticut. Burns & McDonnell assisted in the development of the application for submission to the Connecticut Siting Council. In addition to his work on developing the application, Mr. Hogan supported the application hearing process by providing expert testimony and technical support as required.

At the completion of the siting process for the Middletown – Norwalk Project in 2005, Mr. Hogan assumed the role of Engineering Manager and Assistant Program Manager in the Kansas City office for this project. He was responsible for managing the overall design effort that included 45 miles of 345 and 115-kV overhead transmission lines, 24 miles of 345-kV XLPE underground transmission lines, and two new substations and modifications of two existing substations. Burns & McDonnell provided the detailed design for the transmission lines and existing substations; and developed engineer, procure and construct (EPC) packages for the new substations.

Mr. Hogan has an extensive background in transmission and distribution projects. The following are some of the projects he has worked on:

Start Date
1979

Deepwater–Calpine, Reliant Energy/CenterPoint
Houston, Texas, 2001
Project manager and transmission engineer on a 345-kV plant tie circuit that connected the Deepwater Substation to the Calpine Channel Energy Center. The line is located at the Lyondell-Citgo Refinery in Houston, Texas and crossed over petrochemical process equipment and storage facilities. A double circuit line was designed using tubular steel structures that also included an ADSS communication line between the substations. Structures as high as 214' were required to maintain the 100' ground clearance requirement of the refinery. FAA applications were filed and required aircraft warning lights to be installed on one of the structures. Extensive coordination was required with the LCR, Calpine and Reliant/HL&P.

Valley-Rainbow 500-kV Interconnect Study, San Diego Gas & Electric
Riverside and San Diego Counties, California, 1999—2000
Project manager and transmission engineer on a feasibility study for the Valley-Rainbow 500-kV transmission line. The study developed several line route options that addressed biological, cultural, archeological, and land use issues. The length of the line routes ranged from 29 to 40 miles. The terrain along the line included both mountainous and flat lands, which contained some developed areas. Schedules were developed for both a June 2004 completion and a later completion date that included no at risk expenditures. Cost estimates that included cash flow were developed for each of the line routes. A narrative was developed that detailed the subsequent work required to complete the environmental and design phases beginning with the completion of the feasibility study through the completion of construction.

Falcon Ridge Line Reroute, City of Lenexa, Kansas
Lenexa, Kansas, 1999—2000
Project manager and transmission engineer on a 345-kV transmission line relocation project that involves a reroute around a golf course in Lenexa, KS. This project has involved extensive coordination with the City, local utility, golf course owner, subdivision developer and adjacent property owners. The new line is replacing the existing wood H-frame structures with tubular steel structures on a narrow right of way. Drilled shaft foundations were used for the new structures.

Hamakua Cogen Line & Substation, Hawaii Electric Light Co (HELCO)
Haina, Hawaii, 1999
Lead civil/structural and transmission engineer for a new 69-kV substation and a 69-kV wood transmission line that tied into an existing Hawaii Electric Light Company (HELCO) transmission line. Design of the substation and transmission line was based on HELCO design standards and drawings generated using HELCO standards. The substation portion required the design of site grading, standard steel structure drawings, loading diagrams for line termination structures, and foundations. Extensive effort was required on coordinating easements and transmission line centerlines.

Beverly–CoGen No. 2, Archer-Daniel-Midland Co.
Cedar Rapids, Iowa, 1998
Transmission engineer on two miles of 69-kV transmission line for the Archer-Daniel-Midland Co in Cedar Rapids, IA. This line replaced an existing 69-kV single circuit line with a 69-kV double circuit transmission line with underbuild for distribution and communication circuits. Tubular steel structures were used for the heavy angle structures and wood poles for the tangents and light angles. Coordination with local municipalities to determine future road improvements along the right of way was required. Structure loading diagrams were generated to procure the tubular steel structures. Coordination and contract administration services were also being provided.

Crissinger–Tangy, Ohio Edison
Delaware, Ohio, 1997
Project manager and transmission engineer on a design build project for a 138-kV underground transmission line. This project required an existing 138-kV overhead line with OPGW to be relocated to an underground line for a quarter of a mile to make way for an airport runway expansion project in Delaware, OH. Coordination with the FAA to secure permits for the riser structures and construction equipment was required. The cutover from the existing overhead lines to the new underground circuits had to be staged because the fiber optic line could not have an interruption of service.

Alpha Substation, Tennessee Valley Authority
Chatsworth, Georgia, 1996
Lead civil/structural engineer for a design build project for a 115/230-kV substation. This project required the interface with the construction contractor to provide foundations designs for an aggressive schedule. Structure loading diagrams were generated for the line termination structures and drilled shaft foundations were designed for most of the equipment structures. Structural support required to procure a maintenance building with an overhead crane system, design building foundation and coordinate the potable water source and septic system. Field inspection was performed to assure TVA that foundation construction was in accordance with the quality control documents.

Various Substations, Mid American Energy
Iowa, 1992—1995
Lead civil/structural engineer for three new 161/13-kV substations and additions being made at other substations. These projects have required the design of site grading, standard steel structure drawings, loading diagrams for deadend structures, foundations and oil containment systems, which Mr. Hogan is coordinating. He is also responsible for the quality control of the civil and structural aspects of these projects.

Various Substations, Cincinnati Gas and Electric
Ohio and Kentucky, 1990—1992
Lead civil/structural engineer for design of 69-kV capacitor bank additions at

four sites, a new 69/13.8 kV substation, a transformer and switchgear addition at two sites and an expansion of a 138 kV substation. These projects have required the design of grading, steel structures, foundations and oil containment, which Mr. Hogan has been coordinating along with performing quality control.

Various Substations, Kansas City, Kansas Board of Public Utilities
Kansas City, Kansas, 1992
Project manager for providing standard oil containment systems to be used for new and existing facilities throughout their system.

Cascade Creek Substation, Rochester Public Utility District
Rochester, Minnesota, 1990
Lead structural engineer for upgrading an existing 115-kV substation to 161-kV. Special structures had to be designed to accommodate the upgrade with minimal down time. Responsible for coordinating foundation design, steel structure design and quality control.

South Prong, Bennettsville & Dalzell Substations, Santee Cooper
South Carolina, 1988—1990
Project coordinator and structural engineer for a 69/230-kV substation, 69-kV substation and 69 kV switching station. Responsible for coordinating projects and foundation and structural design.

Highline, Midway & Coachella Valley Substations, Irby Construction Co.
Imperial Valley, California, 1987—1990
Structural engineer for three 230/92-kV and three 92/12-kV substations. Responsible for structure loading diagrams and foundation design. Substations were designed to withstand seismic loadings.

Orangecrest & Springs Substations, City of Riverside, California
Riverside, California, 1988—1990
Structural engineer for two 69/12.5-kV substations. Responsible for structural steel and foundation design in a highly seismic area.

Various Substations, Ohio Edison
Ohio, 1989—1990
Structural engineer for nine substation projects ranging from 12.5 to 138-kV. Responsible for the structural steel coordination, foundation design and analyzing the bus work.

N.W. 68th & Holdredge Substation, Lincoln Electric System
Lincoln, Nebraska, 1990
Structural engineer for 345/115-kV substation. Responsible for structural steel design for 345 kV equipment supports, foundation design, and complete structural design of a reinforced masonry control building with basement.

Horse Gap Substation, Blue Ridge Electric Membership Corp.

Lenoir, North Carolina 1986—1987
Structural engineer for 230/100-kV substation. Responsible for structure loading diagrams, structural steel review and foundation design.

Cedar Rapids & CoGen Substations, Archer Daniel Midland Co.
Cedar Rapids, Iowa and Decatur, Illinois, 1986
Structural engineer for substation at cogeneration facilities. Responsible for substation structure design that included multi bay deadends and equipment supports.

General Motors Substation, Kansas City, Kansas Board of Public Utilities
Kansas City, Kansas, 1986
Structural engineer and inspector for a 161/13.8-kV substation to feed new General Motors assembly plant. Responsible for foundation design and review of structural steel drawings. Field inspection was performed for foundation construction, structure erection and the installation of the grounding grid.

Transformer Storage Facility, Corn Belt Power Cooperative
Humboldt, Iowa, 1985
Structural engineer for PCB storage and oil containment facility. Responsible for building foundation design and design of oil containment support structure.

Various Substations, U.S. Navy, Puget Sound Naval Shipyard
Bremerton, Washington, 1984
Structural engineer for two substations. Responsible for equipment layout, foundation design and reviewing drawings.

Setab – Holcomb, Sunflower Electric Cooperative
Garden City, Kansas, 1982
Field inspector on a 50 mile segment of transmission line in western Kansas. Responsible for inspecting foundations, checking lattice steel tower for correct assembly and torque, and monitoring the daily progress of crews.

Mr. Hogan assisted in foundation and structural steel design for airplane hanger support facilities at Kelly Air Force Base and McConnell Air Force Base. He also designed the foundation and containment basin for PCB storage and oil containment facility for the Corn Belt Power Cooperative in Humbolt, Iowa.

Mr. Hogan acquired engineering experience while participating in a work study program with Burns & McDonnell as he worked toward his bachelors' degree. He wrote and revised computer design programs and aided the engineers with design calculations and contract administration.

Timothy F. Laskowski

CAREER SUMMARY

- Managed all the power flow, stability and short circuit studies for the New England East West Solution. Worked closely with ISO-NE and National Grid in ensuring that an integrated solution to solve problems was obtained and approved. Worked closely with other disciplines with Northeast Utilities in defining a feasible engineering solution.
- Performed and managed transmission planning studies for Connecticut and Western Massachusetts
- Managed the development of PTI transmission products PSS/E, MUST and TPLAN. While managing PSS/E it became the most widely used program of its type. The average PSS/E developer has been on the team for more than 12 years because of my dedication to a team philosophy and ability to work with them collaboratively. Provided customer training in the use of the PSS/E program and provided support in engineering use of the PSS/E program. This required strong interpersonal communications skills.
- Primary sales person for the PSS/E program. PSS/E sales were sufficient to cover all yearly costs; contributing to overall company profitability.
- Developer of several different portions of the PSS/E program. This required team interaction as the contributing developments often overlapped.
- Writer of the application guide describing engineering behind the PSS/E program. This was another major contribution to the success of the program and along with code development shows that I was a significant technical contributor.

TECHNICAL SUMMARY

- Proficient in all aspects of PTI's Power System Simulator for Engineering, PSS/E
- Experienced in use of PTI's Managing and Utilizing System Transmission, MUST
- Able to program in FORTRAN and PSS/E 's IPLAN languages
- Experienced in the Use of Microsoft Windows NT, XP, 2000 Operating Systems
- Experienced with Microsoft Office Tools

PROFESSIONAL EXPERIENCE

Northeast Utilities — Berlin, CT

Transmission Planning Product Manager — *2004-2009*

My initial responsibilities at this position was to coordinate the development of all transmission planning studies for the Eastern Connecticut, Middletown and Manchester-Barbour Hill areas of Connecticut. Besides overseeing others, I was also responsible for developing other projects. My responsibility was then refocused at the lead engineer and manager of the New England East West Solution (NEEWS). This major set of projects expanded my role to also include Western Massachusetts. The tasks at this level were:

- Manage others in the development of various transmission reliability solutions
- Perform analysis using PTI transmission products PSS/E and MUST
- Developed all the alternatives for the Interstate and Central Connecticut Reliability Projects for NEEWS
- Work with substation engineering, transmission line design and protection to design solutions
- Interface with ISO-NE and other transmission owners to obtain ISO-NE approvals
- Provide input into the various regulatory processes for the projects

Transmission Planning Senior Engineer *2003-2004*

My responsibilities at this position were to perform studies and define alternatives that address various transmission reliability problems. Once a feasible engineering solution was obtained, my duties involved first obtaining the various ISO-NE approvals and to contribute to the various regulatory filings required. Because of my experience with Siemens PTI tools, I contributed to developing the expertise of others in the department in their use. The specific tasks performed at this level were:

- Perform analysis using PTI transmission products PSS/E and MUST
- Work with substation engineering, transmission line design and protection to design solutions
- Interface with ISO-NE and other transmission owners to obtain ISO-NE approvals
- Obtained approvals for the Killings and Barbour Hill

Power Technologies, Inc. Schenectady, NY
Assistant Vice President of Software Solutions *2001-2003*

On of my primary responsibilities at this position was to coordinate the development of PTI's primary transmission planning tools. I successfully coordinated the combined efforts of various working groups so the products appeared as coming from the same company and have common data exchange for ease of use. While doing this I continued to coordinate the profitable running of the PSS/E software. The specific tasks were:

- Defined enhancements for the PTI transmission products PSS/E, MUST and TPLAN
- Provided significant input into the development path of MUST and TPLAN
- Managed the developers contributing to these products
- Continued to provide customer engineering support on PSS/E
- Continued to contribute to development and testing of PSS/E
- Expanded these products in the role of sales, setting prices, writing proposals and negotiating with clients

Manager of Customer Support *2000-2002*

My new additional role in this position was the supervising of staff who was not engineers or computer developers. This also involved coordinating staff who previously reported to specific product managers. I was successful in transferring incoming disruptions of service requests from developers so they could be more productive. At the same time I continued to expand the PSS/E market and keep it profitable. Specific tasks were:

- Managed the first line support individuals for all PTI software products
- Managed the production and delivery personnel for all PTI software products
- Defined enhancements/new product options for the PSS/E program
- Provided engineering support for PSS/IE
- Contributed to development, documentation and development of PSS/E

PSS/E Product Manager/Senior Consultant *1990-2000*

At this time in my career I was given full responsibility for the operation of PSS/E. I successfully managed all aspects of the program so that it became the de-facto standard in the industry. This was accomplished while maintaining profitability. Specific tasks during this period were:

- Coordinated engineers, developers, computer analysts and computer operating specialists
- Handled many sales situation
- Created new program sections
- Performed software demonstrations
- Provided customer support
- Chose development path
- Established prices for PSS/E on various computer platforms.

- Continued to develop and teach PSS/E classes
- Co-authored the PSS/E Application Guide
- Investigated problems with software
- Developed software
- Wrote proposals
- Negotiated contracts
- served on consulting services review committee
- Provided final testing of software before release

Senior Engineer *1981-1990*

At this time I was assigned to the software staff and the PSS/E program. I successfully handled all assignments and continued to perform some studies for clients. Specific tasks included:

- Continued to perform power flow and stability studies
- Performed PSS/E sales demonstrations
- Wrote many dynamic models and other solution functions
- Provided *customer* support
- Wrote initial PSS/E training course and presented the course several times
- Performed testing on PSS/E software

Analytical Engineer *1973-1980*

In this position I was assigned various studies to perform for various domestic and international clients. I performed these studies well and the last year was given an assignment that resulted in my living in Brazil. The specific tasks include:

- Performed power flow studies using PSS/E
- Performed dynamic simulation and load rejection studies using PSS/E
- Performed reliability studies
- Performed shaft impact torque studies using PSS/E
- Performed generator implosion studies

Western Mass Electric Co. *Holyoke, MA*
Summer Intern 1972

- Performed distribution load flow studies and fuse coordination

EDUCATION

Master of Science, Electrical Engineering
Worcester Polytechnic Institute
Worcester, Massachusetts
June 1973 Graduate
Power System Analysis Emphasis

Bachelor of Science, Electrical Engineering
Worcester Polytechnic Institute
Worcester, Massachusetts
June 1972 Cum Laude Graduate
Humanities Minor

Power Technologies, Inc. Courses
Power System Dynamics
Automatic Generation and Control
Transmission Line Theory
Electrical Machines
Utility Economics and Financing
Reliability Techniques

LOUISE F. MANGO

EDUCATION

MBA, State University of New York at Buffalo
M.S., Natural Resource Planning, Michigan State University
B.S., Botany & Economics, Duke University

SUMMARY OF EXPERIENCE

Ms. Mango has 27 years of experience in conducting environmental analyses, as well as in performing a wide range of environmental studies for clients in both the public and private sectors. She specializes in environmental planning and permitting, and has prepared and managed feasibility studies, multidisciplinary technical analyses, environmental impact evaluations, and regulatory applications for projects such as brownfield redevelopment sites, natural gas/oil pipelines, wetland mitigation electric transmission lines (overhead and underground), highways, urban redevelopments, and infrastructure facilities.

In Connecticut, Ms. Mango has recently performed a range of environmental services for two 345-kV transmission lines in southwestern Connecticut (including the 69-mile Middletown to Norwalk Project), a feasibility study of a DC cable project between Norwalk, Connecticut and Glen Cove, Long Island; and an 8.7-mile underground 115-kV system between Norwalk and Stamford. She also served as the on-site environmental monitor for the Connecticut Siting Council (CSC) on two of these projects, providing weekly site inspections and monitoring reports to verify compliance with environmental permit and certificate conditions.

In addition, Ms. Mango was the natural gas transmission pipeline companies' representative to the 2002-2003 Governor's Task Force on Long Island Sound, and completed the environmental analyses (under subcontract to Acres International) for the CSC's 1996 *Life Cycle Cost Study for Overhead and Underground Electric Transmission Lines*. In addition, she has completed environmental analyses, pursuant to the Connecticut Environmental Policy Act (CEPA), for urban redevelopment initiatives in Bridgeport, Norwalk, West Haven, and Waterbury.

She brings to her work a unique combination of environmental management proficiency and hands-on expertise in a wide range of environmental programs, including wetland studies, stormwater permitting, cultural resource analyses, coastal zone consistency review, biological studies, land use/socioeconomic evaluations, construction oversight and monitoring, and hazardous materials management. Ms. Mango has supervised the preparation of environmental documents for submission to the Federal Energy Regulatory Commission (FERC), as well as various environmental studies for major energy project planning, permitting, construction, and mitigation.

Ms. Mango has provided environmental input to numerous federal, state, and local permit applications, and has served as the project manager for scores of Environmental Impact Statements (EISs), Environmental Assessments (EAs) and Environmental Reports (ERs). She has assisted clients in submitting applications for U.S. Army Corps of Engineers (ACOE) Section 10/404 permits, state coastal zone consistency and water resource management agencies approvals (Section 401 water quality certifications, storm water management permits), and cultural resource approvals (from State Historic Preservation Offices and the Advisory Council on Historic Preservation). In addition, she has supervised the preparation and implementation of various special mitigation and monitoring plans, including CSC development and management (D & M) plans; wetland survey and multi-year (post-construction) monitoring plans; Spill Prevention, Control, and Countermeasure (SPCC) plans; cultural resource surveys and data recovery/public education plans; endangered species surveys and mitigation plans; visual impact mitigation programs; invasive species (vegetation) control plans; erosion/sediment control and revegetation plans; and right-of-way (ROW) management plans.

Representative Project Experience:

Greater Springfield Reliability Project, Connecticut and Massachusetts. On behalf of the Connecticut Light and Power Company (CL&P), assisted in initial Project environmental and alternatives analyses, as well as in the preparation and review of environmental portions of Municipal Consultation Filings and Applications to the CSC and to the Massachusetts Energy Facilities Siting Board.

CSC Environmental Inspector, Middletown – Norwalk Electric Transmission Project, United Illuminating Company Underground Portion, CT. Working under the direction of the CSC, conducted weekly inspections of electric transmission line construction sites to assess compliance with Connecticut environmental requirements, including the *2002 Connecticut Soil and Erosion Control Guidelines*. Work spanned almost two years and included site inspections throughout the route of the underground transmission line in Bridgeport and Stratford, as well as the preparation of weekly compliance reports (accompanied by photographic documentation) to the CSC and to the involved municipalities.

CSC and Stormwater Environmental Inspector, Glenbrook Cables Project, CT. For this 8.9-mile underground transmission cable project in Stratford, Darien, and Norwalk, performed environmental inspections on behalf of the CSC as well as for the engineering firm responsible for the project. Work included inspection for compliance with stormwater pollution control requirements, as well as with federal and state permit conditions. Provide weekly inspectors report, accompanied by photographs. Routinely work with engineering staff and contractor representatives to maintain compliance. Inspections were conducted over a 2.5-year period.

Municipal Consultation Filing / CSC Application / Testimony / Findings of Fact / Permit Applications for Glenbrook to Norwalk 115-kV Cable Transmission Project, CT: Provided consulting services to CL&P and subsequently to Burns & McDonnell, Inc. on the preparation of municipal consultation filing and application to the CSC for the construction and operation of a new 115-kV underground cable system, aligned within congested urban areas, to serve the Norwalk-Stamford section of electric grid. Conducted and reviewed environmental analyses; attended open houses concerning the project; and prepared sections of the CSC application. After submission of the CSC application, prepared responses to interrogatory questions; drafted pre-filed testimony; served as an expert witness during the CSC hearings; and assisted in the preparation of CL&P's Finding of Fact and brief. In addition to the CSC process, coordinated with other involved agencies, and compiled data for permit application submissions to the ACOE and the Connecticut Department of Environmental Protection (CTDEP).

Task Force on Long Island Sound, Hartford, CT: Served as interstate natural gas transmission industry representative to Governor Rowland's Task Force. Participated in Task Force meetings and discussions, and assisted in the preparation of a final assessment report (issued June 2003) concerning Long Island Sound's resources and energy infrastructure development.

Environmental Life Cycle Cost Study, CT: Under subcontract to Acres International for the CSC, prepared environmental portions of life cycle cost and environmental externalities study of construction and operation of 115-kV electric transmission lines (overhead vs. underground). Consulted with representatives of major Connecticut electric transmission utilities; reviewed representative environmental conditions along major transmission corridors in different geographic regions of Connecticut; and researched availability and effectiveness of environmental externality and life cycle costing models in general. In conjunction with transmission engineers, prepared a concise report that evaluated costs and benefits of different transmission line configurations and recommended methods for better incorporating environmental costs into utility project planning and evaluation.

Municipal Consultation Filing, CSC Application, and Permitting for Middletown to Norwalk 345-kV Transmission Project, CT: Provided consulting services to CL&P and The United Illuminating Company (UI) during the preparation of a municipal consultation filing and then an application to the CSC for the construction and operation of a new 69-mile 345-kV transmission line to serve southwest Connecticut. Performed environmental analyses and compiled environmental and other sections of the CSC application. Provided expert

witness testimony and assisted in the preparation of project applications for other state and federal permits, including those from the ACOE and CTDEP Office of Long Island Sound Programs (OLISP) for crossings of the coastal resources in lower Fairfield County, including the Housatonic, Pequonnock, and Saugatuck rivers. Worked with CL&P and UI legal counsel to prepare portions of the Findings of Fact in the case.

Yankee Gas Services Meriden Pipeline Project CSC D & M Plan, CT: In 2002, coordinated the preparation of a D&M Plan for Yankee Gas's 4-mile natural gas pipeline in the communities of Southington, Berlin, and Meriden, Connecticut. The D&M Plan was required by the CSC, as a condition of that agency's approval of the pipeline project. Successfully completed the D&M Plan in accordance with Yankee Gas's schedule, which required the preparation of and CSC approval of the Plan within less than 90 days. Attended a CSC hearing concerning the pipeline project and coordinated with Yankee Gas's engineering personnel.

South Norwalk Electric Works (SNEW) Electric Substation CSC Application, CT: As part of a team headed by Northeast Generating Services (NGS) Company, conducted environmental studies and coordinated the preparation of submissions to the CSC for a new electric substation. Performed analyses of energy options, reviewed alternative sites for the substation, and evaluated different site configurations and types of substation equipment. Identified and assessed environmental impacts, coordinating the input of local and state officials. Worked closely with NGS engineers and SNEW representatives, as well as with local officials regarding pre-filed project materials. SNEW subsequently put project on hold pending resolution of overall electric energy issues in southwestern Connecticut.

Norwalk Center Environmental Impact Evaluation (EIE) –Norwalk, CT: For the planned redevelopment of the Norwalk Center urban core in Norwalk, Connecticut, worked for a local planning and design firm to prepare an Environmental Impact Evaluation (EIE) pursuant to CEPA. Tasks included field reconnaissance, building inventory, land use evaluation, environmental resource assessment, consultations with municipal officials and review of City plans for the Norwalk Center area, and preparation of EIE report sections.

Reed-Putnam Environmental Assessment (EA) – South Norwalk, CT: Conducted field investigations, technical research, and land use studies as part of the preparation of an EA, pursuant to CEPA, which was required to obtain state funding assistance for the planned redevelopment of the Reed-Putnam District, located adjacent to the Maritime Museum in South Norwalk. Worked with a local planning and design firm to prepare the EA on schedule and within budget.

Steel Point EIE and Water Dependent User Permitting – Bridgeport, CT: As part of the planned redevelopment of a 50+-acre waterfront site in Bridgeport, Connecticut, assisted in the preparation of an EIE pursuant to CEPA. Conducted field reconnaissance of the planned redevelopment site, 15 acres of which was formerly occupied by a coal-fired power plant. Also provided assistance regarding the relocation of water dependent users from the Steel Point site to other suitable waterfront locations in the Bridgeport coastal zone.

Cartech Site Redevelopment EA and Permitting, Bridgeport, CT: As part of the City of Bridgeport's plans to redevelop a 40+-acre brownfield site adjacent to Bridgeport Harbor, conducted biological and coastal zone analyses, prepared an EA pursuant to CEPA, and compiled technical environmental information in support of permit applications to the CTDEP and to the ACOE. Assessed coastal habitat mitigation/compensation site options and developed conceptual off-site tidal wetland / intertidal flat compensation plan.

Bethel – Norwalk 345 kV Transmission Project, CT: For the 345 kV transmission line between Bethel and Norwalk, worked for CL&P (2001 – 2003) on the preparation and support of select portions of an application to the CSC. Assessed project need and prepared descriptions of effects of project on New England power grid and on provision of new capacity to southwestern Connecticut. Conducted analyses of consistency of project with local land use plans, provided technical input on environmental matters during testimony before the CSC and assisted in preparation of Findings of Fact and project brief.

NYSDOT Threatened and Endangered Species Studies, Long Island and Eastern NY: Project director for 6-year on-call contract to the New York State Department of Transportation (NYSDOT) for threatened and

endangered species surveys of various proposed transportation development projects in Suffolk, Nassau, and Orange counties. Developed and implemented multiple season field survey plans for each project, coordinated with representatives of NYSDOT and other involved agencies. Species evaluated included plants, wildlife, fisheries, and mussels.

Millennium Pipeline Project, NY: For this 188-mile interstate natural gas pipeline project traversing New York State's Southern Tier and Hudson River Valleys, served as a management and environmental consultant to the Vice President and Construction Manager. Over a four-year period, provided assistance prior to, during, and after natural gas pipeline installation. Reviewed and assisted in the development of environmental field studies, construction plans, and mitigation assessments. Coordinated with the project team to update Environmental Construction Standards to reflect the conditions of federal and state permits and approvals. Worked with construction engineers to prepare detailed plans and contingency approaches for 13 horizontal directional drills of major rivers and wetland complexes; assisted in the design of a variance approval process to facilitate agency approvals of construction modifications; and prepared various detailed plans, such as for the pipeline installation and restoration across the Appalachian Trail and the black dirt (peat) areas of Orange County.

Environmental Field Studies and Plans, P & MK Electric Transmission Line, NY: For a major regional electric utility in the Hudson River valley, conducted detailed environmental field studies (e.g., land use, endangered species, wetlands, streams), assisted in preparation of permit applications (e.g., ACOE Section 404 permit, stormwater management permit, cultural resource approvals) and, working with engineering and ROW experts, prepared an EM & CP to identify proposed construction and mitigation procedures for transmission line work. Unique plans for construction included use of helicopters to transport construction equipment and supplies to remote areas of the Catskill Mountains, as well as special field studies, monitoring, and construction timing restrictions to avoid impacts to an endangered species of rattlesnake.

DC Electric Cable Project, Pre-CSC Application, Long Island Sound, Norwalk, CT – Long Island, NY: In 2001, for Northeast Utilities, worked with Norwegian DC cable experts to conduct a feasibility study of routing options for a proposed buried DC cable that was designed to link Norwalk with Long Island, and thus to increase the electric power transmission options in both Connecticut and New York. Evaluated options for cable burial and routing, conducted environmental studies, assessed coastal zone consistency, and compiled environmental and construction documentation in preparation for submission of an application to state regulators.

Millennium Pipeline Project Oversight Review, NY: As part of a team comprised of both pipeline construction experts and environmental specialists, in 1999 and again in 2005-2006, conducted independent reviews of permit applications, environmental data, engineering plans, material procurement scenarios, and budgeted costs for the planned construction of the original Millennium Project, a 400-mile natural gas pipeline that was proposed for location across Lake Erie and the Southern Tier of New York. For the 1999 project sponsors, prepared a confidential report that detailed the results of the review. After project was delayed and then modified to include a phased construction schedule, re-hired (2005) by the new Millennium partnership to conduct studies of the 190-mile Phase I portion of the project. Work involved additional project oversight, including analyses of potential environmental issues, FERC resource reports, construction plans, contractor management options, and budgeting.

Independent Spent Fuel Storage Facility Installation (ISFSI) Project, Millstone Power Plant, CT: For the ISFSI facility proposed at the Millstone Power Plant in Waterford, Connecticut, compiled and reviewed environmental data and prepared portions of an EA for use as part of application to the CSC. Worked with project engineers to compile data and conduct analyses in accordance with strict procedures for assuring confidentiality and security.

Environmental Field Studies and Permitting for Pipelines, Dutchess and Orange Counties, NY: For two proposed natural gas pipelines, including one involving a crossing of the Hudson River, conducted stream and wetland surveys, compiled environmental data, and assisted in preparation of technical portions of applications for permits and certificates (e.g., ACOE Section 10/404, NYSPSC Article VII, coastal zone consistency

certification, 401 water quality certification). Worked with project engineers to develop an EM & CP, which specified methods for the Hudson River crossing, as well as for other stream and wetland crossings. All permits and approvals were obtained in a timely manner and the project was successfully completed on schedule.

ISFSI Project, Indian Point Energy Center, NY: As part of the planning for the ISFSI proposed at Indian Point, conducted site visits and worked with engineering / geotechnical team members to compile environmental data, including the collection of current land use and biological data concerning the ISFSI site. Prepared an expanded SEQRA Environmental Assessment Form (EAF) for use in submissions to the state and town. Worked with project engineers and Indian Point legal representatives.

Oil Pipeline Permitting, Staten Island, NY and Linden, NJ: For the planned replacement of an oil pipeline beneath the Arthur Kill (between New York and New Jersey), determined that 13 different federal and state environmental permits would be required. Conducted field investigations of project area and performed analyses required for wetlands delineations and coastal resource review. Coordinated with involved agencies and submitted a Section 10/404 permit application to the ACOE, as well as stream and wetland permit applications to the New York State Department of Environmental Conservation (NYSDEC) and New Jersey Department of Environmental Protection (NJDEP). Project also required coastal zone consistency applications and 401 water quality certifications in both states, along with cultural resources clearance.

Biological Risk Assessment, Seneca Meadows Landfill, NY: Assisted in the evaluation of potential impacts of the landfill on bald eagles and osprey located in the Motezuma National Wildlife Refuge, down-gradient of the landfill. Researched the existing database regarding the effects of landfills on bald eagles or other birds of prey. Worked with toxicologists and biological experts to identify compounds that could pose risks to the bird species and to determine appropriate chronic and acute exposure scenarios. Compiled results of the conservative risk assessment in a report that was presented to state and federal agencies. Data demonstrated that the project would have no adverse effects on the bird species.

MOVE Yacht Club – Bridgeport, CT: For a yacht club being relocated as part of the Steel Point redevelopment, worked with planners and engineers to identify a suitable relocation site along the Yellow Mill Channel. Subsequently conducted environmental field studies and analyses, and prepared permit applications to the ACOE and CTDEP OLISP for the new yacht club facilities. All permits were successfully obtained in a timely manner.

Tidal Wetlands Restoration Monitoring - Housatonic River, Milford, CT: Designed a 5-year monitoring program to evaluate the effectiveness of natural restoration of an intertidal flat affected by a release of bentonite during a pipeline construction project. Of primary concern was the effect of the bentonite on two state-listed plant species of concern that inhabited the tidal flat. Annual surveys involved multiple season sampling of plant species within a series of pre-established grids. Presented annual reports to CTDEP and The Nature Conservancy.

Scott E. Newland, P.E.

Expertise
- Program Management
- Project Management
- Underground Transmission Design
- Structural Steel Design
- Substation Foundation Design
- Site Development

Education
- B.S., Civil Engineering, University of Nebraska-Lincoln, 1999

Organizations
- American Society of Civil Engineering

Registration
- Professional Engineer – Kansas and Connecticut

Years Experience
10

Years With Other Firms
1

Start Date
June 1999

SUMMARY OF QUALIFICATIONS | Mr. Newland is a Project Manager in the Transmission & Distribution Division. He is currently the Program Manager on the New England East West Solution Project in Massachusetts and Connecticut for Northeast Utilities. The project consists of 100+ miles of 345-kV overhead transmission, 45+ miles of 115-kV overhead transmission and approximately 17 substation upgrades. He has been the project manager and lead engineer on numerous EPC projects and other program management projects.

Over the course of his career, Mr. Newland has developed the ability to manage large- scale projects. His responsibilities include staffing, cost control, scheduling, detailed design and public relations. As a Program Manager, Mr. Newland's responsibilities include the management of safety, siting and permitting, detailed design, cost control, schedule control, community relations, land acquisition, field investigations, procurement and construction inspection.

Specific projects Mr. Newland has worked on at Burns & McDonnell include:

New England East West Solution (NEEWS), Northeast Utilities Service Company
Connecticut and Massachusetts, 2007-Present
Mr. Newland is the Program Manager on the New England East West Solution Project in Massachusetts and Connecticut for Northeast Utilities. The project consists of 100+ miles of 345-kV overhead transmission, 45+ miles of 115-kV overhead transmission and approximately 17 substation upgrades. His responsibilities as a Program Manager include the management of safety, siting and permitting, detailed design, cost control, schedule control, community relations, land acquisition, field investigations, procurement and construction inspection. The NEEWS project is a multibillion -dollar project with a construction window of approximately 2.5 years.

Middletown to Norwalk 345-kV Transmission Project, Northeast Utilities Service Company
Southwest Connecticut, 2005-2007
Mr. Newland was the Project Manager and Engineering Manager for the 345-kV XLPE underground transmission portion of the Middletown to Norwalk project. Burns & McDonnell is the Program Manager on the project with full responsibilities of the detailed design, procurement, public relations, land acquisition, field investigations and construction management. The project is located in Southwest Connecticut primarily along State Route 1 and includes four utility bridges across rivers, two horizontal directional drills under rivers and two horizontal borings under two railroad crossings. The project consists of 24 miles of 345-kV XLPE and 1 mile of 115-kV XLPE.

69-kV Underground Transmission Project, Orlando Utilities Commission
St. Cloud, Florida, 2004-2006
Mr. Newland was the lead engineer for the underground transmission portion of

an EPC project for Orlando Utilities Commission. The project is a single circuit 69kV XLPE line located in downtown St. Cloud, FL. The design includes a jack & bore and a canal crossing. Mr. Newland is responsible for the overall design, procurement of the cable and accessories and construction support.

230-kV Underground Transmission Project, Silicon Valley Power, CA
Santa Clara, California, 2003-2004
Mr. Newland has been responsible for the design and management of the underground transmission portion of the EPC project for Silicon Valley Power. The project is a double circuit 230-kV XLPE underground transmission line located in San Jose and Santa Clara. The underground line is located in city streets and includes three horizontal borings. The bores cross a major highway in San Jose, the Guadalupe River and a major arterial street. Mr. Newland is responsible for the detailed design, procurement, permitting and construction support.

Substation Upgrade, Dominion Power
Eastern, Virginia, 2003-2004
Lead Civil/Structural Engineer responsible for all civil engineering issues for 230-kV design-build substation upgrade. Responsibilities of the substation upgrades consist of oil containment design, foundation design, permitting and procurement support.

Cayetano Substation, Pacific Gas & Electric
Oakland, California, 2002-2003
Lead Civil/Structural Engineer responsible for all civil engineering issues for 230-kV design-build substation. The substation is a low profile substation with extensive landscaping and eight foot concrete wall.

KUB Downtown Substation, Knoxville Utilities Board
Knoxville, Tennessee, 2000
Lead civil/structural engineer for the EPC substation located in Knoxville. Responsibilities included design of slabs on grade, spread footing foundations, and an oil containment system for a 66-13.8-kV substation connecting to the exiting downtown Knoxville network.

138-kV Brazos Substation, Brazos Electric Cooperative
Texas, 2000
Lead civil/structural engineer for a 138-kV capacitor bank addition designed/build project. Designed slab-on-grade and spread footing foundations for equipment supports. Also coordinated the civil/structural construction phase of the project.

138-kV Switchyard, Wisconsin Power and Light
Wisconsin, 2000
Lead civil/structural engineer for a new 138-kV switchyard. Responsibilities include supervision, coordination and quality control of structure and

foundation design.

161-kV Substation, General Electric Company
Decatur, Alabama, 2000
Lead civil/structural engineer for a new161-kV substation for Trico Steel in Decatur, Alabama. Designed tubular steel structures, foundations and an oil containment system In order to meet scheduled outages the design was completed in 4 weeks. Responsible for coordination and design of all civil/structural aspects of the projects.

Ash Substation, San Diego Gas & Electric
San Diego, California, 1999
Lead civil/structural engineer for the seismic structural analysis of structures in Ash Substation and Rose Canyon Substation. Also redesigned structures due to seismic failure.

Allen William Scarfone, P.E.

SUMMARY:

- Professional engineer for 27 years in the electric utility industry including 23 years of transmission planning experience for Northeast Utilities.
- Manager of the Transmission Planning Department for Northeast Utilities.
- Northeast Utilities' representative on the NEPOOL Reliability Committee, NEPOOL Transmission Committee and on various ISO-NE Regional Transmission Planning Working Groups.

EXPERIENCE:

NORTHEAST UTILITIES — Berlin, Connecticut
Transmission Planning Department - Manager — 1992 - Present

- Performs 345-kV and 115-kV transmission planning studies for Northeast Utilities' Operating Subsidiaries; Connecticut Light & Power Company, Public Service Company of New Hampshire and Western Massachusetts Electric Company.
- Develops transmission line and substation equipment reinforcement plans to comply with the North American Reliability Corporation's mandatory transmission planning standards.
- Performs and coordinates system impact studies for merchant generating plants connected to the 345-kV and 115-kV transmission systems and transmission service wheeling transactions under regional transmission tariffs.
- Develops periodic regulatory filings for agencies in Connecticut, New Hampshire, and Massachusetts and for the Federal Energy Regulatory Commission.
- Corporate witness in dockets before the New Hampshire Public Utilities Commission, Connecticut Department of Public Utility Control, Connecticut Siting Council, Massachusetts Department of Public Utilities and the Federal Energy Regulatory Commission.

Northeast Utilities' member on the NEPOOL Reliability Committee:

- Coordinates Northeast Utilities' transmission plans with regional transmission planning studies.
- Participates in reviews of regional transmission plans and regional cost allocation applications.
- Participates in reviews of regional market reliability assessments and compliance requirements.
- Participates in developing rules and procedures to implement regional transmission planning services.

Northeast Utilities' previous member on the NEPOOL Transmission Committee:

- Participated in developing rules and procedures to implement regional transmission services under the ISO-NE Transmission, Markets and Services Tariff.

Northeast Utilities' previous coordinator of open access transmission services:

- Implements FERC's open access transmission service requirements.
- Administers transmission service agreements, transmission contracts and OASIS.
- Coordinates strategic transmission initiatives before ISO-NE and FERC.

PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE — Manchester, New Hampshire
Transmission Planning Department — 1986 - 1992

- Performed 345-kV and 115-kV transmission planning and budgeting studies.
- Determined economic feasibility and cost-effectiveness of alternative transmission plans.
- Coordinated load distribution reports and distribution facility impacts on transmission plans.
- Determined 345-kV and 115-kV transmission line equipment ampacity capabilities.
- Performed system impact studies for utility-owned and merchant generating plants.

- Developed generator reactive power capability limits and voltage control schedules, from transient and steady-state stability studies, for generators connected to the 345-kV and 115-kV transmission systems.

UNITED ENGINEERS & CONSTRUCTORS, INC. Seabrook, New Hampshire
Seabrook Station Nuclear Project 1982 – 1986

- Designed electrical control schemes for electrical, mechanical and HVAC plant systems.
- Developed installation procedures for electrical equipment and cables.
- Evaluated manufactures electrical equipment design changes.
- Coordinated engineering technical support activities with on-site construction and start-up departments.

PROFESSIONAL:

Registered Professional Engineer. New Hampshire Certificate Number 6909
Member, Institute of Electrical and Electronics Engineers (IEEE)

EDUCATION:

Purdue University, West Lafayette, Indiana
B.S.E.E., 1982 Power Engineering Major

Bechtel Power Corporation, Ann Arbor, Michigan
Cooperative Engineering Program, 1979 – 1981

Power Technologies Incorporated, Schenectady, New York
Advanced Transmission Planning with Modern Network Analysis Tools, April 2000
Electric Power Systems Engineering, 1988 – 1990
Power System Planning Techniques Course, September 1986

Public Utilities Reports, Inc., Arlington, Virginia
Principles of Public Utilities Operations and Management, February 1994

EPRI and Powertech Labs Inc., Palo Alto, California and Surrey, British Columbia
Power System Analysis Course, November 1994

International Business Communications, Southborough, Massachusetts
Pricing Strategies for Power Generation, Transmission & Ancillary Services, December 1995

COMMITTEES:

Current:
NEPOOL Reliability Committee, ISO-NE/Transmission Owners Working Group.

Recent:
NEPOOL Transmission Committee, ISO-NE Southwest Connecticut Working Group, NEPOOL Open Access Transmission Service Tariff Schedule 2 Working Group, NEPOOL Transmission Service Pricing Task Force, Northeast Power Coordinating Council SS-36 Task Force, NEPOOL Transmission Task Force.

PUBLICATIONS:

Co-authored, "Dynamic Performance Studies for a $\pm$ 150 MVAr STATCOM for Northeast Utilities", Presented to IEEE, 2003.

"Short-Circuit Simulations Help Quantify Wheeling Flow", IEEE Computer Applications in Power, Volume 8, Number 2, April 1995.

MARIA FUSCO SCHELLER **ICF INTERNATIONAL**
Vice President

EDUCATION

Successfully completed all coursework in Masters Program, Virginia Polytechnical University, Department of Economics (degree pending thesis)

B.S., Economics with honors, The Pennsylvania State University, University Scholars Program, 1992

EXPERIENCE OVERVIEW

Ms. Scheller joined ICF Resources in 1994 as an Analyst and is currently serving as a Vice President of the company and Director in the Wholesale Power Market Practice.

Ms. Scheller manages work in the areas of model and software development related for products related to the power markets, and analytical projects in the area of wholesale power market assessments including regulatory support, asset valuation, due diligence, litigation, and strategic studies. This work involves review and creation of economic and technical aspects of power supply including: avoided energy supply cost determination; forward price curve analysis; plant dispatch analysis; power sector restructuring; power plant siting, evaluation of power purchase and tolling agreements; revenue forecasts and financial performance of assets in competitive and deregulating markets; expansion planning for generation companies; environmental compliance; financial impact of regulatory programs, and transmission flow and congestion analysis. While at ICF, Ms. Scheller has achieved a high degree of accomplishments and responsibilities. Ms. Scheller's focus has been broad, covering a range of economic and technology assignments. Her experience includes:

- Directing product design and development for the Integrated Planning Model (IPM®) and other analysis tools for the electrical power markets
  - Under her guidance, this model has developed from a tool used almost exclusively for public sector environmental compliance analysis into a complete and robust tool capable of analyzing all power market aspects including power pricing. The tool is now used in all public and private sector wholesale price analysis and environmental cost and compliance analysis performed by the ICF Energy Group.
  - Ms. Scheller also managed the developed the Wholesale Power Market Model (WPMM™), a commercial tool for forecasting hourly zonal power market prices, and she has conducted both on- and off-site training sessions for model users.
- Managing studies on the wholesale power marketplaces including valuation of generating assets, power marketing, due diligence, short-term volatility analysis, strategic positioning, and fuel market analysis.
  - Leading due diligence financial review for multiple power plant and portfolio transactions
  - Valuing power plant and transmission assets
  - Assessing risk for generation providers
  - Evaluating financial impact of energy efficiency programs in the electricity market
  - Analyzing power purchase agreement contract structure
  - Analyzing coal mining and transportation issues, gas market pricing issues, and oil and by-product pricing.
- Managing regulatory and litigation support projects
  - Creating regulated cost of service filing
  - Evaluating alternative structure for fuel adjustment clauses to stakeholders

  - Review of alternate demand allocation approaches under utility cost of service approaches
  - Providing support for contract disputes including power and fuel purchase agreements
  - Supporting Integrated Resource Planning
  - Evaluating Utility proposals filings for transmission and distribution upgrades to state regulatory agencies
  - Performing a detailed review of the industry financial status in the US marketplace related to implementation of mandatory national emissions reduction programs
- Establishing a framework for knowledge management including knowledge transfer and data management protocols.
- Encouraging use of database principals and design for data storage and access.
- Providing business development, sales, and marketing efforts for Wholesale Power Practice activities.

In these areas, Ms. Scheller has consistently been recognized for high quality work product and client support.

RELEVANT EXPERIENCE

Product and Development Management: Ms. Scheller currently leads ICF's Energy and Resource Practice Modeling Group. In this capacity she is in charge of development of all aspects of ICF's Integrated Planning Model including a major code redesign effort as well as maintenance of the existing code. Previously, Ms. Scheller has overseen the development of ICF Resources Wholesale Power Market Model (WPMM™) for its full life-cycle. She has developed enhanced capabilities within the model to allow users to perform analysis on individual generating units (e.g. Pro forma Module, Generation Module) and has created significant advancements in the user interface with the model. In addition, she has conducted training sessions for individual clients and organized User's Groups that have been attended by representatives from over 30 companies. Ms. Scheller has also spear-headed development efforts for additional modules to ICF's power sector tools including hourly weather station monitoring and data manipulation, portfolio risk analysis, and other key functions.

Wholesale Power Market Analysis: Ms. Scheller has performed analyses of many projects for utility and the non-utility power generation sector clients. Her work has involved dispatch assessment, energy price, capacity price and revenue forecasting. Scenario analyses, including probabilistic assessments, were performed as part of these assignments. Ms. Scheller has analyzed the US power markets wholesale and ancillary service markets often.

Regulatory Proceedings: Ms. Scheller prepared or assisted in the preparation of testimony or presentation material for several state and federal proceedings. Topics of such testimony include siting of power plant and transmission facilities; utility cost of service proceedings; tariff rates; natural gas deliverability; and fuel adjustment clauses.

Asset and Portfolio Valuation: Ms. Scheller has managed several projects focusing on the valuation of generating assets including cogeneration, steam (coal / oil-gas), turbine based, hydro, gasification, and renewables, in various marketplaces. She has also managed portfolio valuation projects. These analyses include research into the various marketplaces to gain knowledge of current market conditions and the potential for change in the market conditions. Probabilistic forecast assessments were conducted to derive expected marketplace prices for

energy and capacity prices. Unit performance was then analyzed under given scenarios in order to conduct financial analysis on the generating units.

Strategic Advisory Services: Recently, Ms. Scheller managed a project for a municipal utility which including assessment of their entire operations, staff functions, supply procurement, financial accounting, rate design, and risk management policies. The main goal of the project was to provide the 5 year business plan or road-map which the utility could use to guide forward development and ensure cost recovery. Ms. Scheller recently served as Project Director on an assignment for the Polish Power Grid Company. The overall assignment included a review of the regulatory and market risks faced by PPGC and provided options on how to evaluate and plan for these risk elements. Ms. Scheller has also provided strategic advisory services to a northeast utility to assist them in dealing with dynamic power market issues.

Transmission and Distribution Analysis: Ms. Scheller has assisted in designing an approach for use in the SUPERGEN project related to sustainable power generation and supply in the United Kingdom. The component of the analysis focuses specifically on the effect of development of intermittent power supply sources such as wind on the reliability of the power system. Further, the analysis will examine the possible evolution paths of the generation mix and the associated transmission issues. In addition to forward planning exercise, Ms. Scheller has managed several projects focusing on the impact of physical transmission constraints on the dispatch of power facilities in various markets in the US. This work has included detailed location marginal price forecasting and congestion analysis. Ms. Scheller has testified on siting issues for transmission and distribution lines.

Fuel Market Analysis: Ms. Scheller has led efforts to determine natural gas, oil, and petroleum coke price forecasts for the US markets. These forecasts include detailed review of the transportation networks and availability of supply sources.

Renewable Market Analysis: Ms. Scheller recently led a project to support the financing of two merchant wind development projects. The analysis included a detailed review of the transmission network and potential issues resulting from the development of the facilities. Further, the analysis considered the potential capacity value associated with the variability of the system. In addition, Ms. Scheller has in numerous analysis considered the impact of renewable generation portfolio standards in various power markets.

International Analysis: Ms. Scheller has led projects focused on integrated resource planning in several developing countries including Armenia, Azerbaijan, and the Republic of Georgia. Analysis included detailed review of the power grid and steam demand and supply capabilities for several of these markets with large combined heat and power needs.

PROJECT EXPERIENCE

- Assisted in the analysis of coal transportation costs via rail lines to utilities in select areas. The analysis is to be used in a coal contract dispute to be heard by the Interstate Commerce Commission.
- Involved in the preparation of ICF Resources' Energy Service. Responsibilities included collecting and analyzing data on issues such as current developments in the oil, gas and coal industries, oil production in OPEC and Non-OPEC countries, oil demand, coal mining

productivity trends, acid rain regulation, and electricity and non-utility demand for coal and gas. Analyzed the potential effects of such issues on the demand for energy.

- Assisted in the development of a model to determine the effect of delivered fuel prices on electricity system dispatch. The model was prepared to assist a rail carrier develop a strategic pricing policy and analyzed six different electric utility systems in the rail lines' area of operation.
- Assisted in developing and modifying a model to estimate the hourly marginal energy prices for utilities operating in various regions of the country. The model allows for variations in transmission capacities across regions, demand, fuel prices and transportation costs, and several other variables.
- Prepared a report on produced water treatment technologies including detailed explanations of new technologies available to petroleum producers. Broad topics discussed included characteristics of produced water, current treatment and disposal technologies, major technical and economic issues concerning produced water treatment, and opportunities for future research and development. The report also characterized the capital and operating costs of the various treatment technologies.
- Assisted in preparing a report of environmental costs that have not been traditionally reflected in oil prices. The paper included analysis of approaches used for quantifying unincluded costs (externalities), estimates of the value of unincluded costs, potentially unincluded costs and benefits, and trends that may affect unincluded costs.
- Assisted in preparing a report outlining the effects of oil imports on the domestic oil industry. This report included an analysis of the impact on imports on domestic production, employment, earnings, and exploration trends over time. The report also included analysis of the implications of foreign incentives, resource requirements, technology, and undeveloped supply locations on domestic production and refining.
- Examined trends in coal prices, sulfur content, and energy capacities for various grades of coal supplied from different locations across the nation. She developed and managed a database of coal buyers and suppliers, prices, grades, heat content, and other relevant information to assist expert staff in developing evidence to be used in testimony.
- Assisted in research to determine if proposals to expand the list of chemicals required to be reported under the Toxic Release Inventory Act (TRI) would be beneficial. Research included determining the quantity and strength of emissions from various sources.

PREVIOUS EXPERIENCE

Prior to joining ICF, Ms. Scheller assisted expert economists in analyses of public policy issues, antitrust and other commercial litigation matters. She conducted research on markets and industries using sources such as government agencies, trade associations and on-line databases, and developed and managed databases used in economic damage models. Highlights of her work experience include:

- Economic analysis of environmental damage due to illegal dumping under Section 106 of CERCLA;
- Impact analysis of proposed changes to business tax incentives in Puerto Rico;
- Impact analysis of proposed policy changes on employees in the maritime industry.

COMPUTER KNOWLEDGE

- Proficient in Microsoft Office Professional Edition. Experienced user of WordPerfect, Freelance, MapInfo, Lotus 1-2-3.
- Background using Windows NT/2000/2003 Server, Windows 9x, DOS, UNIX, CMS, VAX, LAN, and Macintosh.

- Programming in SAS, dBase, FoxPro, MSAccess Basic, SPSS, MINITAB, and Turbopascal.
- Experienced in many industry models and databases: IPM®, WIPM™, WPMM™, DARWIN, NERC ES&D, CEMS, BaseCase, NewGen, UDI, Bloomberg, SNL, and components of the the Energy Velocity Suite.

PUBLISHED PAPERS AND CONFERENCE ENGAGEMENTS

"Transmission and Capacity Pricing Constraints," presentation at conference: ENERDAT's GasFair & PowerMart, Toronto, Ontario, April 20, 1999.

"GenCo Opportunities- Developing A Successful GenCo," presentation at conference: IBC's Developing a Successful GenCo, Atlanta, Georgia, December 7, 1998.
"Using Modeling Tools for Market Price Forecasting," presentation at conference: IBC's Market Price Forecasting Conference, Baltimore, Maryland, August 26, 1998.

"Wholesale Power Markets Model," presentation at conference: Infocast's Market Price Forecasting Conference, New York, New York, August 6, 1998.

"Introduction to Short-Term Power Price Forecasting"; WPMM Advanced User Training; WPMM Introductory Session; WPMM User Group Houston, Texas, 1996.

"Using Price Forecasting Tools"; WPMM User Training; WPMM User Group, Fairfax, Virginia, 1996.

Financial Engineering in the Power Sector, Public Utilities Fortnightly: January 1, 1997, with Judah Rose and Shanthi Muthiah.

Lack of Competition in the Wholesale Marketplace for Power Generation: Does it Make a Difference, The Electricity Journal: Jan/Feb 1997, with Judah Rose and Shanthi Muthiah.

REGULATORY PRESENTATIONS AND TESTIMONY

Panel Testimony before the Maryland Public Service Commission Concerning Delmarva Power and Light's Integrated Resource Plan, with Jack Barrar representing PEPCO and Frank Graves of the Brattle Group, December 2008.

Rebuttal Testimony on behalf of Virginia Electric and Power Company before the State Corporation Commission of Virginia Case No. PUE-2008-00014, September 2008.

Direct Testimony before the Delaware Public Service Commission Concerning an Approval of Land-Based Wind Contracts, July 2008.

Testimony to the Delaware Senate Energy and Transit Committee related to Delaware House Bill 6, March 7, 2007.

Rebuttal Testimony on behalf of Excelsior Energy, Inc, MPUC Docket No. E-6472-/M-05-1993, in support of approval of the Proposed Mesaba Energy Facility Power Purchase Agreement. October 10, 2006 and November 10, 2006.

Avoided Energy Supply Costs, Vermont Public Service Commission, August 25, 2006.

Prepared intervener testimony on behalf of Excelsior Energy in the NSP IRP proceedings for submission to the Minnesota Public Utilities Commission, 2005.

Oral Testimony regarding Certificate of Need for the Warren County Transmission Expansion, Kentucky Public Service Commission, September 21, 2005.

"Analysis of an IGCC Coal Power Plant", Minnesota state house of representative committees, January 15, 2002, with Judah Rose.

Analysis Related to Merchant Plant Siting in South Carolina, Public Utilities Commission of South Carolina, Summer 2002, with Judah Rose and Kojo Ofori-Atta.

EMPLOYMENT HISTORY

ICF Resources Incorporated	Vice President	2001–Present
ICF Resources Incorporated	Principal	2000
ICF Resources Incorporated	Senior Project Manager	1999
ICF Resources Incorporated	Project Manager	1998
ICF Resources Incorporated	Senior Associate	1997
ICF Resources Incorporated	Associate	1996-1997
ICF Resources Incorporated	Analyst	1994-1996
Nathan Associates	Research Assistant	1992-1994
The Pennsylvania State University	Teaching Assistant	1991-1992

Paul M. Williams, P.E.

Expertise
- Transmission Line Design
- Distribution Design
- Analytical Reports
- Feasibility/Routing Studies
- Construction Estimates
- Power/Structure Calculations

Education
- B.S. Electrical Engineering with Physics Minor, Gonzaga University, 1999
- Courses in Civil Engineering, University of Alaska, Anchorage

Organizations
- IEEE

Registration
- Professional Engineer
  - Alaska
  - Connecticut

Years Experience
9

Years With Other Firms
7

Start Date
August 7, 2006

SUMMARY OF QUALIFICATIONS | Mr. Williams joined Burns & McDonnell as an Electrical Engineer in the Transmission and Distribution Division. He is presently serving as a Senior Electrical Engineer in the Overhead Transmission Line Department. His experience encompasses all aspects of transmission line engineering and project management, including studies and evaluations, engineering design, contract specifications, and construction support.

Previously, Mr. Williams' experience included working on the design of many distribution and transmission lines up to 345-kV, using both steel towers, wood poles, and concrete structures. He has experience with both underground and overhead transmission and distribution projects. He is proficient in the use of many design programs including AutoCAD and PLS-CADD, a software package used in the design of transmission lines. He has developed material take-offs, staking sheets, construction plans and specifications, and cost estimates for several projects. In addition, he has worked on several feasibility and routing studies for several transmission lines in both urban and rural locations.

Since joining Burns & McDonnell Mr. Williams has been involved with the following projects:

Greater Springfield Reliability Project
Northeast Utilities Services Corporation (NUSCO)
Connecticut/Massachusetts, 2007 – Present
Engineering manager for the design of new 345-kV and upgraded 115-kV transmission lines in north central Connecticut and south west Massachusetts. The project encompasses about 40 corridor miles with approximately 100 circuit miles in the Springfield, MA area. Mr. Williams provides engineering support for the transmission line routing studies, environment impacts, community relations, and transmission line siting process. He is responsible for the design of the new transmission facilities; including line modeling, developing project drawings, structure schedules, material take-offs, and cost estimates. In addition, he is responsible for managing subcontractors supporting the engineering effort, including LIDAR contractors and ground surveyors.

Seminole Indian Reservation Relocation, Florida Power & Light
Hollywood, Florida, 2006 – Present
Engineer for relocation of a 138-kV and 230-kV transmission line around the Seminole Indian Reservation. Responsibilities include structure spotting, strength evaluations, developing easement requirements, assisting with permitting, material procurement, field review of structure layouts, and technical resolution during construction.

Prior to joining Burns & McDonnell, Mr. Williams was involved with the

following projects.

Snow Load Monitoring System (SLMS), Alaska Energy Authority
Talkeetna, Alaska, 2000 – 2006
The SLMS records conductor loading and insulator inclination at specific towers along the 345-kV Alaska Intertie. The system is designed to alert dispatchers of possible unsafe conductor clearances, as well as recording and archiving historical data on line loading and weather conditions in the region. Mr. Williams is responsible for overseeing the maintenance on the SLMS. His responsibilities include troubleshooting system problems, routine maintenance, and the design and management of upgrades. Paul has also field managed the annual battery replacement and hardware and software repairs for the system. He has also designed and managed upgrades for the system, including photovoltaic power supply upgrades.

Alaska Intertie Inset Structure Layout, Alaska Energy Authority
Talkeetna, Alaska, 2004 – 2005
Because of the existing layout and climatological conditions of the 345-kV Intertie, it is susceptible to reduced ground clearances due to unbalanced snow loads. The Alaska Energy Authority requested that inset structures be evaluated as a mitigation option to eliminate potentially unsafe ground clearances. The project was broken into two parts, modeling the existing line to determine the extent of unbalanced loads required to reduce ground clearances below acceptable levels, and to layout inset structures in appropriate locations to improve ground clearance. Mr. Williams was the project engineer responsible for modeling the line, creating a practical layout of inset structures, generating construction costs estimates, and developing a report of findings. Utilizing record drawings Mr. Williams used PLS-CADD and PLS-SAPS to create a finite element model of the existing line. To improve accuracy and incorporate structure flexure resulting from unbalanced loadings, a PLS-Pole model of each tower was created and incorporated into the overall transmission line model. The finite element line model was the most detailed and sophisticated layout ever developed for a transmission line in the State of Alaska. Mr. Williams created several reports of findings that included results from modeling the unbalanced loadings, construction costs and scheduling, and evaluating the benefits and impacts of installing inset structures.

Northern Intertie 230-kV Line, Golden Valley Electric Association
Fairbanks, Alaska 1999 – 2003
The Northern Intertie is a 96 mile-long, 230-kV electric transmission line running from Healy, Alaska to Fairbanks, Alaska. The line incorporated the use of steel X-towers, Y-towers, and single shaft steel structures. Foundations were typically driven pipe pile or concrete piers. Mr. Williams used PLS-CADD extensively on this project for structure placement, conductor modeling and for strength calculations. In addition he developed structure schedules and material take-offs, designed obstruction lighting for the Tanana River crossing, and field reviewed structure staking.

- Other Representative Projects
- Eklutna 230-kV, double circuit steel pole (ML&P, Anchorage, AK)
- South Anchorage 138-kV, double circuit steel pole (CEA, Anchorage, AK)
- Pogo Mine 138-kV, wood H-structure (AMEC, Fort Greely, AK)
- N. Douglas Highway 69-kV, wood single pole (AEL&P, Juneau, AK)
- Klatt to Campbell 35-kV, UG & double circuit OH (CEA, Anchorage, AK)
- Eastend Road Relocation, 25-kV, UG/OH (HEA, Homer, AK)
- Arctic Blvd Relocation, 15-kV, underground conversion (CEA, Anchorage, AK)
- Alaska Intertie Upgrade Feasibility & Routing Study (AEA, Talkeetna, AK)
- Raptor Mitigation Study (AEL&P, Juneau, AK)
- Four Dam Pool Hydro Project Equipment Risk Analysis (4DP, Alaska)
- Sleetmute River Crossing Tower Design (AVEC, Sleetmute, AK)
- 100th Ave Road Extension Utility Conflict Report (CEA, Anchorage, AK)
- Pohnpei Facility Evaluation & Typhoon Risk Analysis (PUC, Pohnpei, Micronesia)