



KURTIS BELL, P.E.  
SENIOR PROJECT ENGINEER

#### YEARS OF EXPERIENCE

36

#### EDUCATION

- > M.S., Electrical Engineering, Rensselaer Polytechnic Institute, 1980
- > B.S., Electrical and Computer Engineering, Clarkson University, 1978

#### AREAS OF EXPERTISE

- > Pipeline electrical investigations
- > Electric power transmission line design
- > Power system studies
- > Telecommunication wireless design on power facilities

#### LICENSING

- > P.E., Electrical: California

#### SPECIAL TRAINING

- > Grounding & Electromagnetic Fields
- > Construction Claims - How to Develop Your Own Prevention Program & Resolve Costly Disputes
- > Supervisor Leadership Training
- > Joslyn High-Voltage System Overvoltage & Switching Recovery Voltage
- > Contract Administration Training - Understanding Contracts, Negotiating, Processing, Monitoring, Closing
- > General Electric High-Voltage Transmission Line Design
- > Department of Energy/Electric Power Research Institute, Biological Effects of EMF
- > EPRI/AGA, Powerline Induced AC Potentials on Natural Gas Pipelines for Complex Rights of Way Configurations

#### SEMINARS

- > Presenter, "AC Interference," NWPPA, 2005
- > Instructor, "Corona Effects and Losses," POWER Engineer's Substation Conference, September, 2002
- > Instructor, "Substation Grounding," POWER Engineer's Substation

#### EXPERIENCE SUMMARY

Mr. Bell has broad-based experience in pipeline electrical investigations, electric power transmission line design, power system studies, and telecommunication wireless design on power facilities. He has extensive experience working in the electric, gas and telecommunications utility industries, primarily associated with power system design. Prior to joining POWER, Mr. Bell worked as a senior Engineer in Enron Engineering and Construction's T&D Engineering and Construction Group for three years, managed a consulting office for Safe Engineering Services for four years, supervised design and technical system analysis departments for Pacific Gas and Electric (PG&E) for 13 years, worked as a supervisor in the Power Group at AT&T Communications for one year and worked as an engineer in the Electrical Studies Group for American Electric Power.

#### **Mirant, Bowline-Hudson Valley Pipeline AC Interference Study, New York**

Project Engineer for an AC interference and grounding investigation. The study area was a gas pipeline and power facilities corridor that has several power lines, two substations, two gas meter stations, and a power plant. The project involved the collaboration and approval of mitigation systems by the owner, Mirant, Orange & Rockland Utilities, and Columbia Gas Co.

#### **Idaho Power Company, Nampa Tap AC Interference Study, Idaho**

Studies Engineer responsible for conducting the study. Also developed a report identifying the data requirements, calculation techniques, software, results and mitigation recommendations. POWER conducted a pipeline AC interference and grounding investigation for a proposed new 230 kV transmission line, an existing 138 kV line, and three distribution lines within the same corridor. The AC interference and grounding investigation involved numerous case studies and steady state and fault conditions of an adjacent distribution gas pipeline. Safe Engineering Service's (SES) Right-of-Way (ROW) and Current Distribution, Electromagnetic interference, Grounding and Soil (CDEGS) analysis were used to conduct the studies in this investigation. The mitigation results required collaboration and approval from Idaho Power and Intermountain Gas Company, owner of the line.

#### **PECO Energy, Northeast Corridor AC Interference Studies, Pennsylvania**

Senior Project Engineer and Coordinator for the Northeast Corridor (NEC) rail line electrical interference studies. Responsible for studies in the investigation of AC interference effects on Amtrak, CSX, Norfolk Southern, and Conrail railroad involving PECO transmission projects. Also conducted back checks and supported the development of reports. PECO needed

- Conference, September, 2000
- > Instructor, "Grounding of Power Facilities," IEEE – East Bay Chapter, Pleasanton, Ca., September, 1997
- > Instructor, "AC Interference Effects & Cathodic Protection in Joint Utility Corridors," Boston, September 1996
- > Instructor, "Electromagnetic Effects in Joint Utility Corridors," Power Systems World Conference, Las Vegas, September 1996
- > Instructor, "EBMUD Mokelumne Aqueduct AC Interference Study," Northern California NACE Conference, Oakland, February 1996
- > Instructor, "Grounding and Lightning Protection," IEEE – San Francisco Chapter, May, 1987

#### *HARDWARE/SOFTWARE*

- > SKM Power Tools
- > EasyPower Power System Analysis
- > Electromagnetic Transients Program
- > Safe Engineering Service's Program - Current Distribution,
- > Electromagnetic Interference, Grounding & Soil Analysis (CDEGS)
- > FORTRAN
- > BASIC
- > AutoCAD
- > Microsoft Project

#### *AFFILIATIONS*

- > National Society of Professional Engineers (NSPE) - Member
- > IEEE - Member, PES, Working Group Chairman for Lightning
- > Performance of Transmission Lines
- > CIGRE - Member
- > National Fire Protection Agency (NFPA) - Member
- > National Association of Corrosion Engineers (NACE) - Member
- > American Society of Safety Engineers (ASSE) - Member
- > American Railway and Maintenance-of-Way Association (AREMA)- Member

#### *PUBLICATIONS*

- > Northwest Inductive Coordination Committee, 2001
- > National Association of Corrosion Engineers, 2001
- > American Water Works Association Conference, 1996
- > Industry Applications Society

transmission line upgrades and enlisted POWER to assess possible electrical interference on existing infrastructure and/or deleterious effects to other parties. The only high speed railway in the U.S., the NEC is characterized by a finely tuned complexity of circuits operating on three different frequencies and serving multiple owners. POWER performed AC interference studies (inductive and conductive) and created a 3-D model of the various electric and railway systems using the HIFREQ module of Safe Engineering Service's CDEGS software for analysis.

#### **Entergy, Plum Point 500 kV Transmission Line Interference Analysis, Arkansas**

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Lead Studies Engineer responsible for providing technical direction to engineers performing the study and for reviewing scope, analysis results and the study report. POWER performed an interference analysis to determine the effects of a planned 500 kV transmission line extension on an existing railroad line. The two-mile, double circuit line is parallel to the Burlington Northern Santa Fe railroad and connects to a new 500 kV switching station. POWER created a 3-D model of the transmission and railway systems and used the HIFREQ module of Safe Engineering Service's CDEGS software for analysis. Mitigation recommendations were provided for locations where AC interference effects resulted in voltages on the rails that were above required limits by the railroad company.

#### **Public Service Electric & Gas Company, Southern Reinforcement Project, New Jersey**

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Project Engineer overseeing all electrical studies for the Southern (N.J.) Reinforcement Project. The project involved upgrades of two transmission line segments located in right of way owned primarily by Conrail. A full AC induction study was conducted to determine the effects of the upgrade on railroad facilities and provide mitigation plans to resolve potential problems. Mr. Bell participated in presentations to Conrail and New Jersey Transit in the reporting of results for AC interference investigations. Performed back checks of calculations performed for the Gloucester to Mantua Creek 230 kV line AC interference investigation. POWER is providing design, engineering and procurement support for the project.

#### **American Transmission Company, Duplainville 138 kV Project – AC Interference Investigation, Wisconsin**

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Project Engineer for an AC interference study of an American Transmission Company 138 kV power line that is located in the same corridor as a Canadian National Railway track line system. The investigation involved a detailed study to analyze several operating scenarios of the power line and track systems under steady state and fault conditions. The total project transmission line length is approximately ten miles and the corridor length under investigation is approximately two miles. The primary concern for this investigation was to develop an agreement between the power and the railroad companies of acceptable mitigation schemes and working procedures that are reasonable and satisfy the industry guidelines for safety and manufacturer equipment specifications.

- Conference, 1995
- > Electric Power Research Institute Journal, 1992
  - > IEEE, Power Engineering Society, 1978, 1982, 1985, 1987, 1992, 1995

#### TESTIMONY

As Senior Electrical Engineer and Technical Lead for EMF issues for PG&E from 1989 to 1992, testified approximately seven times concerning 115 kV and 230 kV transmission line and substation projects throughout the PG&E territory. Testified both before the California Public Utility Commission and the California Energy Commission. As part of the certification process for the General Order 131D requirement, the CPUC required that utilities address no and low cost EMF mitigation techniques and findings.

#### **LineSoft, Entergy Skygen 115 kV Power Line Interference Study, Arkansas**

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Project Manager for a study that determined the electrical effects of a 115 kV power line on a one-mile section of parallel Union Pacific Railroad equipment and track. This new Entergy project power line runs from a Pine Bluff substation to an International Paper mill five miles away.

#### **City of Redding Power Plant Generating Unit 5 – Cathodic Protection System, California**

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Project Engineer for the design and specification of the cathodic protection system for a 10-inch gas pipeline into the power plant.

#### **Enron – Houston Pipeline Company, Bammel Electric Compression Gas Storage Facility, Texas**

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Conducted electrical studies to determine the sizing and evaluate electrical equipment in a 50,000 HP gas storage facility and the new 138 kV to 6.9 kV electric substation that was part of the upgraded facility. The substation was the primary power source to the gas storage facility. The project involved interconnection studies and coordination with the local electric utility, Houston Lighting & Power (a division of Reliant Energy). The studies included short circuit, load flow, motor starting, voltage drop, grounding and electrical interference.

#### **Parsons Brinckerhoff, Alaskan Way Viaduct Replacement, Washington**

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Senior Project Engineer responsible for developing the Electrical Stray Current Study report with the purpose of providing a project-specific guide for the identification of stray current issues and, if necessary, to minimize stray current values for the new and relocated facilities associated with the Alaskan Way Viaduct and Seawall Replacement Project. POWER was the Electrical Utility Engineer responsible for planning and designing of temporary and permanent relocations of Seattle City Light's facilities impacted by the replacement of the double-decked Alaskan Way Viaduct along Seattle's waterfront district. POWER's team worked closely with WSDOT and other consultants to evaluate roadway design alternatives and develop the final designs. Design and construction were completed over several years under multiple contracts that modified a substation and installed approximately 4,000 feet of 115 kV underground, 6,000 feet of 26 kV underground, 4,300 feet of 13.8 kV underground, and two very unusual SCFF (fluid filled) to XLPE 115 kV transition joints. Upon completion of construction, POWER was contracted by WSDOT to provide Owner's Engineer support for work on the new tunnel.

#### **American Transmission Company, Arrowhead to Weston 345 kV Transmission Line, Wisconsin**

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Project Engineer for an AC interference study of the transmission line segment that is in the same corridor as a track line system owned by DM&IR (now owned by CN Railway). The project corridor is a total length of approximately 16 miles within both the states of Minnesota and Wisconsin and involves a number of highway crossings and a few bridges. This project

used the CORRIDOR software to determine electromagnetic induction effects of the 345 kV transmission line. The project results were reported and reviewed by industry-recognized experts of AC interference impacts on railroad systems. The project involved design and construction of a new 220-mile-long, 345 kV steel pole transmission line running from southern Minnesota to central Wisconsin. POWER's project scope included field surveys, electrical studies, structure designs, line design, material specifications, construction specifications, right of way acquisition and construction monitoring services. The noteworthy project received achievement awards from the Wisconsin chapter of ASCE and from the Edison Electric Institute.

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**Eversource Energy, Bethel-Norwalk 345 kV Project, Connecticut**

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Studies Engineer responsible for performing a railroad interference study. Calculated AC interference impacts on a rail system located within a parallel corridor of the proposed line during steady state and fault conditions. Developed mitigation options to reduce interference levels to acceptable quantities and prepared final report. The project involved the construction of a 20-mile overhead/underground 345 kV transmission line, a 12-mile overhead/underground 115 kV line, three transition stations and modifications to an existing substation. POWER provided a full range of project implementation services, from preliminary engineering through construction management and inspection. This complex project was completed ahead of schedule. It also featured an incentive program for which POWER received a 100% score.

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**Minnesota Power, Great Northern 500 kV Transmission Line Project, Minnesota**

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Studies Engineer responsible for providing review of electrical effects calculations for the 500 kV and 345 kV transmission line design options. POWER is providing engineering to support the development of the Great Northern Transmission Line Project, a high profile 500 kV, approximately 220-mile transmission line between Canada and Minnesota designed to bring Canadian hydropower into the northern range of Minnesota. Minnesota Power's goals for this high profile and significant project are to: bring access to clean, affordable energy for MP customers and the region; increase industrial load growth on Minnesota's Iron Range, and strengthen system reliability for MP and the region. POWER is currently supplying the client with owner's engineering, detailed design for transmission lines and associated substations and will provide overall construction management beginning in 2016. Expected completion date is June 2020.

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**NV Energy, One Nevada 500 kV Transmission Line Preliminary Engineering, Nevada**

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Project Engineer performing the following electrical studies: insulation coordination (lightning performance and 60 Hz power frequency), clearances, corona and field calculation. Supported the development of the electrical design portion of the line criteria document. The project was a proposed new 270-mile 500 kV transmission line that would link NV Energy's northern and southern service territories to facilitate delivery of renewable resources throughout the state. POWER provided preliminary engineering including routing support, structure spotting, and tower design.

The client put the project on hold with the route and line spotting complete.

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**Central Maine Power Company, Maine Power Reliability Program, Maine**

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Studies Engineer conducting studies to support transmission line design components of the program. POWER is providing engineering services for a comprehensive upgrade of CMP's bulk power transmission system including detailed transmission line design and substation civil design support for upgrades and expansion to 345 kV and 115 kV systems. The project includes nearly 400 miles of 34.5 kV, 115 kV and 345 kV transmission lines.

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**NorthWestern Energy, Mountain States Transmission Intertie Electrical Studies, Multiple States**

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Project Engineer responsible for the development of noise, electric and magnetic fields, clearance, and lightning performance case studies and the technical reports for the Mountain States Transmission Intertie 500 kV project. The results of the calculations were published in the preliminary electrical design criteria document. The role also involved data and case study reviews for the consultant performing the Administrative EIS document. POWER performed extensive electrical system studies for development of a proposed 430-mile, 500 kV transmission line from southwest Montana to south central Idaho.

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**PECO Energy, Engineering Services, Pennsylvania**

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Project Engineer and Electrical Studies Engineer responsible for communications with PECO and railroad subcontractor LTK Engineering, conducting reviews of railroad interference studies, and participating in development and reviews of deliverables. As PECO's Engineer of Choice, POWER is engaged in designing various substation additions through 500 kV as well as upgrades for 230 kV and 138 kV lines. POWER provides equipment specification, physical design, electrical design, civil/structural design, control and relaying schematics, wiring diagrams, and control building design. POWER also provides system studies, relay settings, facility studies, preliminary studies, conceptual design, installation and testing.

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**Riverside Public Utilities, Riverside Transmission Reliability Project, California**

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Senior Project Engineer for electrical studies. Performed electrical and corona effect calculations for the siting of the 230 kV and 69 kV transmission lines. Developed write-ups for the environmental report concerning EMF and noise issues. The Riverside Transmission Reliability Project is a major upgrade to the City of Riverside's 230 kV and 69 kV electric systems. POWER is providing engineering, environmental and construction support services for the project. Scope includes conceptual and detailed engineering for the new 230-69 kV Wilderness Substation, four new double circuit 69 kV transmission line segments, and upgrades to eight existing 69 kV substations.

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**American Transmission Company, Rockdale to Middleton 345 kV Overhead & Underground Line Study, Wisconsin**

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Studies Engineer responsible for performing electric and magnetic field calculations for various structures being considered. Prepared final written report and performed interference/induction study. Generated computer models and analyzed simulation results to quantify steady state inductive impacts on a 12.47 kV distribution line located within a parallel corridor to the proposed line. POWER supported ATC during the regulatory approval process for a proposed new 345 kV transmission line. Scope included analyzing alternative potential route segments and overall routes, preparing preliminary designs, and developing cost estimates for overhead and underground alternatives. POWER developed the engineering sections of the CPCN document and prepared studies and reports addressing structure reliability, induced voltages in distribution lines, construction along major highways, and electromagnetic field and interference calculations.

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**San Diego Gas and Electric, Valley-Rainbow 500 kV Interconnect, California**

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Electrical Engineer for a study of the potential noise, corona, and electrical effects on the environment of 35 miles of new 500 kV transmission line and 52 miles of 230 kV transmission line upgrades. Responsible for evaluating 500 kV conductor selection. The electrical studies were part of the Proponent's Environmental Assessment (PEA) and permitting for the project. The studies, including the PEA, were prepared in less than nine months during the 2000/2001 California energy crisis. The PEA was filed with the California Public Utility Commission. The overall project scope included a new 35-mile 500 kV transmission line, a new substation, 52 miles of 230 kV transmission upgrades, a new 7-mile 69 kV transmission line, and five substation upgrades to bolster transmission capacity in SDG&E's fast-growing service territory. POWER completed environmental siting and permitting services and preliminary engineering.

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**ChevronTexaco/CABGOC, Malongo Terminal Lightning Protection Recommendations, Angola**

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Project Engineer for a comprehensive field survey to determine the condition of the existing power system lightning protection systems at this oil production facility. The study was a continuation of a preliminary lightning protection study conducted by POWER. Used field survey data to develop recommendations for mitigating lightning-caused power interruptions.

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**ChevronTexaco/CABGOC, Malongo Terminal Lightning Protection Study, Angola**

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Project Engineer for a preliminary study of the effects of lightning on oil refinery facilities. Evaluated the 5 kV power station, equipment and storage tank facilities. Determined the needs to protect the onshore and offshore facilities from lightning strikes.

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**Florida Gas Transmission (FGT) Phase IV AC Electrical Interference Study, Florida**

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Project Manager for the study and design of a mitigation system for FGT's

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West Leg Extension and Tampa Lateral Pipelines. These 30-inch diameter pipelines were located in a 100-mile corridor with about one third at locations parallel to several 69 kV and 230 kV transmission power lines owned by four different utilities.

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**Pacific Gas and Electric Company AC Interference Study - Los Vaqueros Relocation Project, California**

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Project Manager for an AC interference study, including mitigation design, for relocated 230 kV transmission facilities and nearby gas pipelines. Responsible for studying conductive coupling from high voltage substation and power line structures, as well as inductive interference from transmission lines.

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**East Bay Municipal Utility District, Analysis of Effects of WAPA 500 kV Transmission Line on EBMUD Aqueducts, California**

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Project Engineer for this AC mitigation design study for three aboveground aqueducts parallel to one-mile length of 500 kV transmission line (new construction). Soil conditions varied resulting in special mitigation design. Project required study of both inductive and conductive coupling of pipeline to nearby transmission line structures. Computer analysis provided for mitigation to accompany both conductive and inductive coupling. Cathodic protection design was not disturbed by special mitigation measures.

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**Wyoming-California Pipeline Company (WYCAL), Pipeline Voltage Mitigation Analysis, Wyoming**

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Project Engineer for a steady state analysis and mitigation design for a 24-mile length of 30-inch pipeline parallel to two 345 kV transmission line circuits and one 138 kV circuit. This project involved the creation of a procedure for measuring soil resistivity that is virtually immune to 60 Hz noise from nearby AC power lines. Result was much more accurate modeling of soil structures in this interference study than was possible before.

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**San Diego Gas & Electric Company, Pipeline 2000 - AC Interference Study, California**

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Project Engineer for an AC interference study involving a new 36-inch gas pipeline system installed parallel to the Tijuana-Miguel 230 kV single-circuit transmission line. The recommendation was a mitigation system installed at pipeline regulator and valve stations to provide safety and protect the pipeline from high voltages. Several soil resistivity measurements were conducted along the pipeline using Biddle and Terraplus instrumentation.