R. NEAL RICH, PE, MAE

Mr. Rich is an electrical engineer with 40 years of experience in many aspects of electric power system design, installation, operation, and maintenance. His expertise includes distribution, sub-transmission, and transmission systems upwards to 500 kV and generation and industrial plant distribution systems of 34.5 kV down to 480 VAC. Mr. Rich previously led the General Electric Company (GE) projects team in the development of substation and other large electrical EPC projects. In addition, he held leadership positions at national engineering and Engineer-Procure-Construct (EPC) firms that specialized in protection and control and acted as a sales/application engineer to support advanced relaying, metering, and communication equipment and systems. Mr. Rich has worked internationally and has been a project manager and lead engineer on many electric air and gas insulated substations and other specialized power projects such as static var compensator, cycloconverter, series compensation, harmonic filters, battery energy storage systems, microgrid, and generation projects of many technologies. His clients include large municipal and investor-owned utilities, generation and transmission cooperatives, independent power producers, large industrials, contractors, and consultants. Mr. Rich's electrical expert services focus on electrical power systems and equipment. He has authored formal expert reports and has given arbitration testimony. Mr. Rich speaks on technical subjects, professional development, and ethics in various national and regional settings.

EDUCATION

B.S., Electrical Engineering, University of Mississippi, 1981
Professional Employee Management, General Electric Company, Crotonville, NY, 1989

PROFESSIONAL LICENSES

Licensed Professional Engineer:

Arkansas (13372)
California (E012642)
Colorado (36979)
Connecticut (0027310)
Georgia (PE019529)
Hawaii (PE-11970)
Idaho (19029)
Kansas (20516)
Kentucky (19743)
Louisiana (PE.0032691)
Maine (10397)
Massachusetts (47926)
Mississippi (09525)
Nebraska (E-18107)
New Jersey (24GE03406000)
New Mexico (17716)
New York (069205)
North Carolina (031839)
North Dakota (PE-28683)
Oregon (81468PE)
South Carolina (22717)
Tennessee (124395)
Texas (96296)
Utah (6312125-2202)
Virginia (0402061133)
Washington (49768)
West Virginia (23993)
Wisconsin (37736-6)
Wyoming (10578)

PROFESSIONAL AFFILIATIONS

Institute of Electrical and Electronic Engineers (IEEE), Senior Member
IEEE Power Engineering Society
The Academy of Experts, Practising Full Member, Membership No. 4140

TECHNICAL EXPERIENCE

Representative U.S. and international technical experience includes:

- Responsible for photovoltaic (PV) power station, plant and interconnection engineering, Utility Grid Scale for 69 kV through 345 kV, 20 – 200 MW projects across the U.S.
- Responsible for PV plant high voltage substation Engineer-Procure-Construct for a 115 kV 75 MW project, and served as the overall project Engineer of Record
- Responsible for warranty administration for two photovoltaic sites, directing engineers and craft labor to remedy accepted warranty claims for equipment failures and workmanship issues
- Conceptual design of remote microgrid distribution power and communication topology and control system to serve oil and gas production wells using the most economical dispatch of natural gas generators, PV energy generation, and battery storage.
- Principal Engineer for a distribution-connected microgrid to serve a rural community for an investor-owned utility. This microgrid consisted of a PV field of sufficient size to serve the load and charge batteries, batteries with sufficient capacity to power the circuit's load for a period of eight hours, distribution interconnection, and remotely accessible grid controller. This project was performed on an EPC basis.
- Responsible for the design and installation of 500 kV through 34.5 kV utility transmission, distribution, and industrial substations and power projects in more than 25 states and several foreign countries
- Development of conceptual system designs for power systems, including bus arrangement, equipment ratings, protection philosophy, and interface with the industrial/utility sector
- Design of numerous interconnections for power and industrial plants to utility transmission grids
- Management of multi-discipline engineering and performance of direct electrical engineering for multiple gas-insulated substation projects for indoor and outdoor installations
- Management of engineering and procurement activities for several static volt-ampere reactive (var) control systems, including yard design, detailed design of a thyristor-controlled reactor (TCR) and harmonic filters, and protection and control
- Design, materials procurement, and construction of 115 and 69 kV transmission lines and 13.8 kV distribution lines
- Extensive experience in planning and development of electrical designs, both conceptual and detailed, to meet varying specifications and formats
- Development of conceptual and detailed protective relaying schemes, outdoor arrangements, raceways, grounding, cabling, and interconnections
- Performance of systems studies including short circuit, relay coordination, load flow, motor starting, power quality, and harmonics, and oversight of voltage transient, insulation coordination, flicker, and ground overvoltage studies
- Project development support of international projects for power generation barges and the condition assessment and valuation of distribution systems for national assets to be privatized

- Proposal and project support duties including equipment specification, bid evaluation, schedule administration, site inspection, start-up, and commissioning of medium and high voltage substation and other power delivery projects
- Review and negotiation of power purchase agreements and interconnection agreements

PROJECT EXPERIENCE

Mr. Rich has been a lead engineer and project manager on many electric substation and other specialized power delivery projects. His clients have included large industrial, municipal, and investor-owned utilities, generation and transmission cooperatives, and non-utility generators. Mr. Rich's range of experience is broad and extends to static var systems, series capacitors, frequency converter stations, rectiformer substations, wind farms and photovoltaic plants, battery energy storage systems, microgrids, and large and small transmission and distributions substations. Much of his protection, control design, and settings development experience relates to transmission voltages, while Mr. Rich also possesses experience at 500 kV EHV. Mr. Rich has often functioned as team lead and coordinated the work of fellow electrical engineers and those of other disciplines and specialties. Mr. Rich's breadth of experience has given him a working understanding of broad goals specifically geared to a client's objectives, capabilities, and budget. Safety and elegant simplicity are hallmarks of Mr. Rich's conceptual and detailed designs.

- Principal Engineer and Engineer of Record for the design and construction of a high voltage 115 kV – 34.5 kV substation interconnecting a 75 MW PV plant to a Utility Grid. Served as the overall project Engineer of Record and certified the project as having achieved Substantial Completion and subsequent Commercial Operation. Participated in and validated performance testing.
- Owner's Engineer for a 100 MW photovoltaic plant and 230 – 34.5 kV substation. Served as commissioning agent for the photovoltaic DC electrical installation, medium voltage AC collector system.
- Engineer with responsible charge for photovoltaic plant transmission interconnections on multiple projects in Georgia, Virginia, Arizona, and New Mexico.
- Project Engineer and Engineer of Record for the preparation of protection and control designs for a 230/115 kV substation interconnecting a 230 kV system to a 115 kV transmission network. The 230 kV ring bus connected one transmission line (and a future position) to two power transformers, which then supplied power to a five-bay 115 kV breaker-and-a-half bus. The 115 kV transmission lines provided power to oil field production loads and connected this station to a nearby generating plant and a distant small generating plant while providing power to a cryogenics plant.
- Project Engineer and Engineer of Record for special purpose power system projects, including cycloconverter, power factor improvement and reduction of harmonic current and voltage distortion, and fault current limiting.
- Engineering design for a 115 kV substation expansion and reconfiguration to accommodate the separation of generation and boiler assets. This legal separation required a physical separation of the 115 kV main bus to create a new utility point of interconnection for the generator and its step-up transformer. This reconfiguration necessitated revisions to bus differential current, tripping, and lockout circuits and modifications to breaker failure initiation inputs and other related circuits.
- Engineering for the preparation of all electrical designs, equipment purchases, and studies for a 34.5 kV system. An arc flash resistant switchgear was specified and installed for both 34.5 kV and 13.2 kV systems, which were double-ended lineups with tie breakers. Redundant 30-MVA outdoor

transformers provided the necessary voltage transformation, and all circuits entered and exited the substation in underground duct banks. This unique station also integrated relays less familiar in the U.S. to SCADA equipment in an adjacent room and then beyond to the transmission control center by fiber circuits.

- Project Electrical Engineer for the preparation of electrical designs for a 138-13.8 kV substation. The substation was a radial distribution configuration with a 138 kV circuit breaker, power transformer, distribution switchgear in the PCR building, and distribution circuit risers. A full complement of microprocessor relays was implemented with a data concentrator for interface via telephone and SCADA.
- Electrical engineering, including complete electrical design responsibility, for the largest wind farm on the Big Island of Hawaii, comprised of 14 GE 1.5 MW wind turbine generators, a 25 kV collector system, the windfarm substation, and the K'amaoa three-position 69 kV switchyard designed and built to HELCO protection design and MicroStation drafting standards. HELCO's standard line protection was implemented, as well as breaker failure protection and design of all SCADA interfaces. Designed a custom line current differential protection and telemetry system between the two yards, which provided for fully redundant hot-swap-over between fiber and licensed microwave channels.
- Electrical Engineer responsible for wind farm studies including load flow, short circuit, protective device coordination, and evaluation of costs/losses comparing 22 kV and 34.5 kV collector systems, protective device coordination, and all settings related to transmission lines, switchyard and substation equipment, and collector circuits.
- Long-range planning for voltage uprating of a municipal distribution system from 4 kV to 25 kV, with design, equipment, and labor budgets and schedules developed. Cost of ownership, anticipated reductions in outage times and system electrical losses, and improved voltage regulation modeling were parts of the final delivered report.
- Design and installation of interconnections for utility scale battery systems for voltage and power ramp rate control on wind farm installations.
- Sizing and specification of a battery energy storage system for an islanded microgrid comprised of seven 23 MW reciprocating engines serving two large industrial plants totaling 100 MVA load via two 115 kV transmission lines. Load flow, frequency regulation, and dynamic stability studies were used to determine battery power and stored energy ratings as well as control system requirements. Led the electrical design of the equipment integration and participated in the onsite acceptance testing as well as the in-service energization. Providing continued support to this client and project. Consideration of augmentation for the purposes of enlarging the system are underway. Rationalizing on a technical and commercial basis the augmentation of the existing 14 MW/12 MWH system to a system roughly double those ratings against system replacement and the physical space, elapsed schedule, and outage requirements for the two options.
- Development engineering, preliminary engineering, and 30 percent detailed design engineering for a Hawaii grid scale project of a 185 MW/565 MWH project in Hawaii. Upon the developer's selection of a construction EPC, retained as owner's engineer to confirm submitted designs.
- Lead engineer holding responsible charge for the development of more than 80 battery energy storage projects totaling 4,104 MW/12,835 MWH. Development activities included development of single line diagrams, site planning of systems for the available limited area (equipment layouts, exterior and interior access planning, and location of auxiliary systems such as control room and

fire suppression), and cost estimates. Often two alternate battery suppliers are considered with one or more inverters.

- Lead engineer for the Preliminary and 30% Designs for a 40MW/160MWH BESS and step-up substation interconnecting at 69 kV to a California municipal electric system. This project is underway as of October 2022, and ASSET and Mr. Rich expect to be tapped to complete the design and participate in IFC document preparation, construction observation, and commissioning.
- Engineering for the development of the protection and control systems for a 230 kV switchyard. Physical design work scopes included raceway and grounding designs.

PROFESSIONAL EXPERIENCE

Whitsun LLC
Madison, Mississippi (October 2024 to Present)

Electrical Engineering Expert Witness services are offered by Mr. Rich at Whitsun LLC. Mr. Rich provides claims analysis, construction and change order dispute analysis, forensics engineering, failure analysis, equipment or systems analysis, arbitration/litigation support, and expert witness and testimony services.

Qualus LLC
Ridgeland, Mississippi (June 2024 to October 2024)

After Mr. Rich's sale of ASSET Engineering to Qualus, he led the Qualus Mississippi office as Director of Engineering. He fulfilled leadership and operational functions within Qualus similar to those as owner of ASSET Engineering. He coordinated the business unit's successful and speedy integration into Qualus. Mr. Rich actively collaborated with other North American business units, particularly focused on renewable energy and industrial projects.

The ASSET Company, PLLC dba ASSET Engineering
Canton and Ridgeland, Mississippi (February 2000 to June 2024)

As Owner of ASSET Engineering, Mr. Rich offered a variety of knowledge and experience including, but not limited to, power systems design, construction, operation, and maintenance, including transmission systems to 500 kV and 34.5 kV utility and industrial substations and generating plants. As the company's internal resources have expanded, Mr. Rich's role shifted from primarily project engineering and project management, to front-end engineering and conceptual designs, to mentoring subordinate staff and consulting on unique system issues, schedule administration, and forensic analysis. His background as physical, protection, communication, and studies engineer and early-career work as a field engineer provided an abundance of first-hand experience to support his work in these roles and as an electrical engineering expert witness.

REPS, Inc.
Madison, Mississippi (November 1997 to January 2000)

Mr. Rich served as Sales/Application Engineer for REPS, Inc. in Mississippi, Alabama, the Florida panhandle, and the west-Tennessee area. He was responsible for the sales and application support for protective relaying, communication, electrical testing, and metering products. Customers included

investor-owned utilities, public-power utilities, and large industrial consumers of electricity. An emphasis on technical support and customer training was necessary due to the complex nature of the products represented.

S. I. D. Corporation
Jackson, Mississippi (August 1991 to October 1997)

Mr. Rich held the role of Vice President of Substation Design and was responsible for outdoor substation electrical designs, including equipment selection, system protection design, control building layout and electrical specification, and control and power cable and raceway design. He led a staff of engineers, drafters, and technicians to accomplish complete substation design and system studies, panels manufacturing, and related field installation and testing work. Mr. Rich oversaw profit and loss performance, estimating, and bidding and performed relay panel design and fabrication, turnkey substation design and installation, and industrial electrical testing and appraisal.

General Electric Company
Jackson, Mississippi (May 1981 to July 1991)

Mr. Rich began his career as a Field Engineer for GE. As a Field Engineer, he performed the installation, maintenance, and repair of major electrical equipment, including power transformers, oil, air magnetic, vacuum circuit breakers, AC and DC industrial motor drives, protective relays, and meters.

Mr. Rich was subsequently promoted from Field Engineer to Project Engineer/Manager within GE's EPC Group. In this role, Mr. Rich was responsible for customer relationships, project management, and engineering design of his projects. Moreover, he specified equipment and material for high and medium voltage substations, transmission, and distribution line projects, self-performed and coordinated design work, procured all equipment and materials, selected subcontract labor, managed scheduling, reported within the company, and oversaw the customer relationship throughout project execution.

Before leaving GE, Mr. Rich was Engineering Manager over Substation Projects. He led a group of more than 30 personnel, comprised of electrical engineers, civil engineers, designers, drafters, purchasing agents, expediters, a schedule specialist, and an administrator. Mr. Rich held responsibility for electrical engineering designs for GE's substation, transmission, distribution, and product department-led projects. Other duties included lead electrical design engineer on multiple technically complicated projects including static car compensators, series capacitor compensators, and cyclo converters.

PUBLICATIONS AND SPEAKING ENGAGEMENTS

Microgrid Generation and Storage and Distribution Interconnection," Electric Cooperatives of Mississippi Spring E&O Meeting, Ridgeland, MS, March 2023.

"Engineering Ethics," TVPPA E&O Annual Meeting, Chattanooga, TN, August 2016.

"D-Day at the Substation, Defending the Grid," DistribuTECH Conference, January 2015.

"Substations in the Crosshair – Hardening & Design Evolution at U.S. Utilities," *Electric Power & Light POWERGRID International*, October 2014.

"Engineering Ethics," Professional Development Training, IEEE Central MS Chapter, Jackson, MS, May 2014.

"Universal VAR Controls for Windfarms / Dynamic VAR Controls," Professional Development Training, IEEE Central MS Chapter, Jackson, MS, May 2013.

"Portable Emergency Utility Power," Professional Development Training, IEEE Central MS Chapter, Jackson, MS, May 2011.

"SCADA for Large Wind/Solar Projects," IEEE PES, Jackson, MS, November 2010.

"Medium and Low Voltage Grounding Methods," Professional Development Training, IEEE Central MS Chapter, Jackson, MS, August 2010.

"Professional Ethics," North Mississippi E&O Section of Tennessee Valley Public Power Association (TVPPA), Tupelo, MS, May 2006.

EXPERT SERVICES AND FORENSIC ENGINEERING EXPERIENCE

2025-2026 Transmission Line, U.S.A.: Provided expert engineering services to consider the claims and counterclaims of a consultant/surveyor and electric utility in matters of alleged non-performance and underachieved standard of care in the administration, legal work, valuation, interface with landowners for a transmission line project in the northwest U.S.

2025 Renewable Energy, U.S.A.: Developed test plan and performed field investigation following reports of overheated DC inputs on multiple solar farm string inverters. Prescribed laboratory testing root cause analysis procedure to ascertain if the thermal issues were related to equipment failures of field conditions. Oversaw laboratory activities at the manufacturer's assembly and repair facility.

2025-2026 Transmission Line, U.S.A.: Supported landowner in his claim that the electric utility routed its transmission line across the landowner's property rather than selecting another alternate route which would have been a more direct route, avoided wetlands, and carried lower ongoing maintenance costs.

2025 Renewable Energy, U.S.A.: Developed engineering report to determine the necessary minimum and recommended right-of-way widths for a 345 kV transmission line which will interconnect a solar generation site to the New Mexico transmission system. Collaborated with Counsel to complete the needed testimony which accompanied the report when submitted to the Public Regulation Commission.

2025 Renewable Energy, Italy: Supported an Italian solar plant developer/owner/operator to determine the root cause(s) of numerous failures in its grid interconnection cables on multiple projects. Reviewed field test reports and photos of installations and failed splices, performed onsite inspection of cable splice replacements, new construction, and splice shield grounding enclosures. Deliverables included report of findings and causes contributing to failures, specifications for equipment and materials for new installations, and recommended testing and maintenance practices.

2025 Renewable Energy, U.S.A.: Supported an Engineer-Procure-Construct (EPC) contractor with their claim for errors in the solar farm design and utility interconnection. The two principal matters were (1) the absence of solidly grounded generation (PV inverters) and incorrect

utility interface design and (2) undersized DC and low voltage AC power cables which overheated in the field and required replacement.

2025 Bitcoin Miner, U.S.A.: Supported a Bitcoin mining facility developer/owner to opine on the causes for delays in the design, equipment deliveries, and construction of a recent project. The shareholders and company leadership were in disagreement of the causes. Prospective causes which were considered were Covid-era related equipment delays, electric utility delays and changes in requirements, inadequate project management, and misleading statements to shareholders that did not reflect known delays.

2025 Renewable Energy, U.S.A.: Supported the US distributor of a non-domestic transformer manufacturer following the failure of its 345 kV transformer several days post-energization. Assigned work included reviews of factory acceptance test reports, field inspection and test repots, and photographs of the damaged transformer. Deliverables included a report of review findings and recommendations for technical specification additions to be used for future transformers sold by the manufacturer.

2025 Renewable Energy, U.S.A.: Developed engineering report to determine the necessary minimum and recommended right-of-way widths for a 345 kV transmission line which will interconnect a solar generation site to the New Mexico transmission system. Collaborated with Counsel to complete needed testimony which accompanied the report when submitted to the Public Regulation Commission.

2023-2024 Industrial Cogeneration, U.S.A.: Provided expert electrical engineering services to determine if the industrial plant operated and maintained their turbine-generators and other electrical equipment in accordance with manufacturer recommendations and industry norms. The industrial plant declared force majeure after multiple equipment failures prevented it from fulfilling on-time, on-spec, supply in contracted volumes which caused financial damage to the customer. I developed my opinions after extensive review of maintenance records, monthly reports, in-company correspondence, and in-person participation at fact witness depositions. Following my deposition, the case concluded after I testified in federal court in July 2025.

2022 Institutional Cogeneration, U.S.A.: Supported an electrical contractor and its legal team to review the contractor's electrical design of a combined heat and power plant to determine if it met the design basis criteria. Of particular interest were the utility interface, controls related to system grounding, claims of an excessive number of trips related to chiller motor starts, and utility circuit faults.

2022 Data Center Equipment Failures, U.S.A.: Supported an electrical distributor in its forensic evaluation of the failure of medium voltage circuit breakers that failed when used on prime power generators. The circuit breakers and switchgear were supplied in accordance with the specification, which did not include transient suppression devices.

2021–2022 Electric Generation, U.S.A.: Supported the analysis of field reports and depositions following the failure of a 345 kV transformer bushing that caused injury to a worker. The expert report demonstrated shared liability for the failure on the parts of the bushing manufacturer, transformer manufacturer, electrical testing company, and bushing monitor manufacturer.

2020 Electric Transmission, U.S.A.: Supported an international equipment manufacturer's legal team with information and strategy to defend against claims associated with deaths from fallen power lines during a flooding event. Manufacturer was removed as a respondent in the claim.

2020 Industrial Power, U.S.A.: Supported a major equipment supplier and its legal team in the supplier's claim for additional costs when the owner's specifications led to the incorrect supply of equipment. The expert report resulted in an arbitration finding in support of the supplier.

2019–2022 Utility Connection, Data Center, U.S.A.: Provided expert electrical services to ascertain the root cause of a data center's utility-scale UPS not properly transferring the facility load to its batteries when an electric serviceman inadvertently caused an electric fault on the incoming utility service. The financial impact to the data center was significant.

2019 Electric Generation, Canada: Provided expert electrical services to review history of hydroelectric generation transformer condition based on factory and field tests and subsequent tests to determine that the testing company improperly processed the transformer's insulating oil, which resulted in its shortened life.

2019–2021 Industrial Power, Kazakhstan: Provided electrical expert review, report, and reply reports for the owner's legal team in its claim against the owner's design-build contractor for non-performance and defective design. The contractor used novel equipment configurations with no precedent of success and could not supply documentation of their basic engineering satisfactory to support equipment selection and ratings and subsequent detailed engineering. This case required multiple reports and reply reports, and the electrical disputes were settled prior to commencement of the arbitration hearing.

2019–2020 Electric Generation, Hong Kong: Supported the owner and its legal team in defense of claims from and with counterclaims to the design-build contractor. Issues were project work scope changes, changes to the interface with the electric utility, and deficient designs that required remediation and would cause ongoing increased operating cost through the life of the generating plant. This case required multiple reports and reply reports and testimony before the arbitration tribunal. A second part of the case dealt with the contractor's claim on inadequate owner project management and excessive comments from the owner's representative. This second case concluded when the contractor withdrew its claim.

2018 Electric Generation, U.S.A.: Investigated damages to equipment that occurred during a flooding event at a hydroelectric facility. Recommended equipment to be placed and other equipment to be cleaned and placed in service and estimated the cost of equipment and services.

2018 Electric Generation, Chile: Investigated electrical fault and explosion of high current generator breaker, assisting contractor's legal team to ascertain the root cause. After examining the failed equipment and its design and in-service operation at other locations, studying the electrical control diagrams, reviewing the test and commissioning procedure and sign off sheets, and interviewing those involved, determined that the electrical fault was attributable to human error in inadvertently bypassing safety circuits.

2016 Industrial Power, U.S.A.: Performed forensic analysis of high voltage capacitor bank failures at a national shipyard's main power service. One failure was attributable to moisture intrusion coupled with insufficient electrical clearances while another was determined to be a manufacturing defect in an electrical reactor.

2015 Electric Generation, U.S.A.: Performed forensic analysis of generator auxiliary switchgear failure, determining that the root cause was faulty insulation around buswork in the cable termination compartment. Assisted the plant owner in its claim resolution with the manufacturer.