Electrical Engineer (FC), GS-0850-12

Standard Position Description Number: REN0500

Introduction

This position is located in an operating office (Office) within the Bureau of Reclamation (Reclamation) within the Department of the Interior (Department). This position serves as an experienced engineer providing electrical engineering mentorship and expertise for a variety of complex projects and activities throughout the Office which typically include a variety of geographic locations, complex features, and unusual needs or special demands. Electrical engineering includes design, studies, diagnostics, automation, protective systems, electric reliability compliance and other compliance evaluations, controls, analyses, construction administration, documentation, inspections, assessments, investigations, reviews, cost estimating, specifications writing, applied research, and evaluating facility capacities and operations. Electrical engineering assignments may specialize in one or more specialties: Design, Construction Management, Operations and Maintenance (O&M), Protection Systems, Industrial Control Systems (ICS) and Supervisory Control and Data Acquisition (SCADA), and Diagnostics and Testing. Complex features/facilities include hydroelectric generating powerplants; transmission systems; pumping plants; buildings; and multipurpose water conveyance, treatment, and storage systems such as dams, canals, pipelines, tunnels, desalination, and related appurtenant systems. Electrical systems include communication, control, and security systems (e.g., ICS, SCADA); interior and exterior lighting; generators, motors, pump-generators, generator step-up transformers, station service equipment, switchyard equipment, and auxiliary systems.

Major Duties

Engineering Analysis (minimum 25% of work time)

Performs engineering analyses to include performing and coordinating technical planning activities; data collection (including validation and management); design; modeling and data analyses; analyses of site location and/or conditions; troubleshooting electrical equipment and systems; and risk estimation and analyses. Analysis may also include evaluating engineering aspects of state and Federal regulatory and permitting programs, electric reliability compliance programs, and power contracts. Makes engineering recommendations and/or decisions based on engineering analysis for complex projects and activities with unusual or special demands. Below are general descriptions of specialty area analyses:

- **Design**: Completes and/or reviews engineering designs of electrical systems to include: 1) planning and conducting engineering studies or evaluations such as preliminary, appraisal, feasibility, final design, value planning/value engineering, and contractor designs; 2) creating, performing, reviewing, checking, and/or modeling engineering designs, contractor submittals & transmittals, including performing analytical calculations and computer-aided design and drafting; 3) developing design criteria, procedures, instructions, and material specifications; 4) providing technical approval as the engineer in responsible charge of design activities and engineering decisions; 5) contributing to the design and modifications of new and existing complex features; 6) performing field acceptance testing; and/or 7) preparing and/or reviewing the development and adequacy of various levels of construction cost estimates for planning, final design, and procurement (e.g., Independent Government Cost Estimates (IGCE) and contract modifications) for the construction of complex features.
- **Construction Management**: Work primarily involves the performance and/or oversight of on-site construction work, including inspection and acceptance of facility or utility construction work performed by a contractor. Duties may include serving as a Contracting Officer's Representative (COR), reviewing designs for constructability, drafting specifications, determining and evaluating construction sequencing, and researching, preparing and/or reviewing appropriate levels of cost estimates (including reviewing and evaluating third party cost estimates) through all phases of the planning and final design process.
- **O&M**: Provides electrical engineering expertise in the O&M of complex features/facilities. Plans, coordinates, and directs scheduled and emergency (breakdown) maintenance, repair, and modifications. Identifies, analyzes, and troubleshoots problems, performs diagnostic testing, distinguishes relevant and irrelevant information to make logical decisions and develops solutions to resolve problems and mitigate future risks and optimize reliability. Synthesizes

and trends O&M data and test results into job plans, corrective maintenance plans, and/or justifications for strategic/capital asset plan recommendations and reports.

- **Protection Systems**: Work primarily involves technical electrical engineering studies including transient and subtransient reaction studies, power flow studies, fault studies, stability studies, arc flash analyses, and dynamic calculations; technical studies resulting in equipment recommendations for new and existing equipment type, size, capacity, and ratings including power transformers, distribution transformers, circuit breakers, surge arresters, cables, bus, protective relays, disconnect switches, fuses and other equipment, as required; establishing and documenting protection system settings including relay event analysis, coordination of protection settings with other protective devices/systems including those operated by transmission owners; and ensuring settings are in compliance with applicable electric reliability requirements (e.g., North American Electrical Reliability Corporation (NERC), Western Electric Coordinating Council (WECC)).
- **ICS and SCADA**: Work involves analysis, troubleshooting, testing, evaluating, optimizing, and programming ICS and SCADA (systems that receive data from remote sensors measuring process variables); compare the collected data with desired setpoints; and derive command functions which are used to control a process through the final control elements, such as control valves. Designs and prepares technical specifications for additions and modifications to communications networks including microwave systems, optical carriers, local-area networks, load/frequency/generation control systems, powerline carriers, mobile radio systems, telephone systems, telemetry systems, fire alarm and security systems, and various other electronic equipment used to operate water and power facilities. Analyzes, schedules, and installs system patches as appropriate. Performs technical analysis assuring installations meet security requirements and utilizes monitoring tools to ensure efficient and effective operation of infrastructure.
- **Diagnostics and Testing**: Reviews standards of performance and maintenance techniques, including schedules and types of tests performed; performs specialized diagnostic tests on electrical equipment; and evaluates test data and the corrective measures performed to assure adherence to existing procedures and instructions. Based on review, test results, and analysis, recommends improvements to methods, operations, and types of equipment used or modifications to equipment. Provides technical recommendations in establishing proper maintenance intervals and scope of maintenance required.

Documentation and Presentation

Develops project job plans, guidelines, protocols, and procedures that are specific to the project. May review for comment or propose draft Reclamation directives, standards, policies, and power technical documents (e.g., Facilities Instructions, Standards and Techniques (FIST), power equipment bulletins (PEB), power reliability compliance bulletins (PRCB)). Prepares, or oversees the preparation of, and reviews technical documentation such as technical memorandums and reports, engineering study analyses and results, correspondence, publications, design criteria, calculations, design summaries, design standards, designer's operating criteria, drawings, job plans, forecasted capital budget plans, operating procedures, evaluation and oversight reports, value studies reports, inspection and assessment reviews, impact assessments, permit applications, emergency action plans and exercises, construction plans and reports, quantity estimate worksheets, specifications, constructability reviews, solicitation packages, required planning, final design, and/or procurement construction cost estimates such as IGCE and contract correspondence including responses to submittals and Request for Information (RFI). Makes oral presentations of technical documentation at coordination meetings, design briefings, or other technical briefings, in some cases in support of compliance and audit activities.

Investigations, Assessments, and/or Inspections

Plans, schedules, coordinates, and conducts electrical engineering facility examinations, reviews, and/or inspections which include conducting condition assessments and construction and transfer inspections; identifying and addressing deficiencies relative to design criteria, applicable codes and standards, or state or Federal statutes or regulations; calculating preliminary estimates for repairs; coordinating with internal and external partners; documenting and presenting results; conducting root cause analyses; analyzing unexpected event reports; conducting accident and incident investigations; and identifying future needs for the asset investment such as extraordinary maintenance and rehabilitation.

Assignments may include conducting and/or peer reviewing Periodic Facility Review or Comprehensive Review Reports in accordance with Reclamation and Department policies, directives, and standards.

Reviewing and Mentoring

Provides technical reviews, peer reviews, and/or checking of designs, drawings, engineering analysis, and technical documents (e.g., trip reports, project notes), specifications, and contract correspondence, ensuring documents are accurate and quality assurance processes were followed. Provides technical mentorship, guidance, training, and advice to engineers and technicians and other internal and external stakeholders. May sign documents for technical approval in accordance with Reclamation and Department policies, directives, and standards.

Other Duties (non-grade controlling/non-series controlling work)

- **Project Management**: Develops, monitors, and manages project plans that outline the scope, schedule, and budget of assigned projects. This includes: coordinating and communicating with other groups and offices throughout the organization such as program and project managers, engineering, finance, maintenance, permit compliance, and acquisition; managing changes to the project plans with external stakeholders, transmission owners, tribes, and regulatory authorities; identifying and addressing issues prior to adverse impacts to the schedule and budget; and participating on and/or leading technical teams.
- **Contracting Officer's Representative (COR)/Grants Officer's Technical Representative (GOTR)**: Works with Contracting Officer/Grants Officer to implement and administer a variety of assigned contracts, including construction contracts, service contracts, P.L. 93-638 Indian Self Determination and Education Assistance Act as amended contracts/agreements, interagency agreements, and financial assistance agreements. Initiates timely actions and technically monitors the contract/agreement to ensure that they are carried out to completion as outlined in the contract/agreement. Researches the background on problems, identifies and devises courses of action in coordination with the Contracting Officer or Grants Officer as appropriate, and prepares recommendations for decision by management. Certain projects and activities require certification as a Contracting Officer's Representative (COR) and/or Grants Officer's Technical Representative (GOTR).
- **Compliance:** Provides engineering support in connection with regulatory program oversight, policy and rulemaking efforts, review of regulatory compliance issues, and resolution of engineering related issues as they are encountered. Ensures compliance with applicable electric reliability requirements (e.g., NERC, WECC).
- **Database Operation**: Develops, modifies, and utilizes relational databases to maintain engineering data for conducting operational and planning analyses. Oversees development and operation of engineering data collection systems directly and/or in coordination with other government agencies and non-Federal sources. Ensures necessary data is collected, transmitted, downloaded, decoded, and received for its intended purpose.
- **Technical Working Groups**: Participates on and/or leads technical work groups or teams. May provide technical organizational representation and collaboration on teams external to the organization, including external stakeholders and partners.

Performs other related duties as assigned.

Factors

Factor 1. Knowledge Required by the Position (Level 1-7 1250 pts)

Broad professional knowledge of, and skill in applying, a wide range of electrical engineering theories, concepts, principles, standards, methods, and practices sufficient to provide advisory services in engineering analyses, documentation, and investigations, and in the planning and/or design process; and to provide engineering design, analyses, review, inspection, and/or documentation for a wide range of electrical engineering assignments involving combinations of complex features which require adaptation of precedents and existing strategies to meet the unusual or special demands of the specific assignment.

Knowledge of the principles and concepts of electrical generation, transmission, and marketing; and knowledge of high, medium, and low voltage hydro-generation equipment and the associated control, protection, excitation, relaying, and auxiliary systems.

Familiarity with the principles and practical concepts and processes of other related engineering and physical and biological/environmental science disciplines in order to ensure connection, contribution, or inclusion of the multiple disciplines involved in electrical engineering assignments.

Skill in identifying, conceptualizing, and developing solutions to engineering problems or needs, and skill in independently planning and conducting studies and reviews and developing technical documents such as site reviews, feasibility through final designs, and associated guidance criteria, procedures, and instructions. Ability to develop new insights into situations and knowledge of new and emerging engineering methods and technology to apply when addressing engineering problems and needs.

Knowledge of engineering data collection methods. Knowledge of and skill in evaluating data sources within Reclamation and industry. Skill in identifying and assessing the data needed for design development and engineering assignments, including site assessments.

Knowledge of automated engineering systems and applications in order to effectively and efficiently plan, gather the appropriate data for input into the system, and assess, interpret, and analyze the validity of the generated results. Skill in using computers, software applications, databases, and automated systems to accomplish engineering assignments which may include programming, scripting, and/or coding.

Skill in effectively conveying information to individuals or groups, taking into account the nature of the information (e.g., technical, sensitive). Skill in writing in a clear, concise, organized, and convincing manner for the intended audience. Skill in establishing collaborative working relationships with stakeholders to ensure that their needs are heard and addressed; identifying and analyzing problems; distinguishing between relevant and irrelevant information to make logical decisions and develop solutions and communicating effectively with all levels and types of organizations and audiences. Skill in using partnerships to achieve collaborative solutions and resolve complex problems; utilizing project management, conflict management, and/or team building tools to achieve results in a collaborative spirit; and analyzing diverse viewpoints to make planning decisions and solve work problems.

Knowledge of Reclamation and Office mission, structure, projects, and facilities. Knowledge of project benefits, authorities, stakeholders, and their governing laws, statutes, regulations, compacts, and treaties. Knowledge of asset criticality and risk assessment methodology and processes.

Knowledge of and skill in applying cost estimating practices and principles to develop and/or review construction cost estimates for the planning, final design, and procurement (e.g., IGCE and contract modifications) of complex features.

Knowledge of and skill in applying qualitative and quantitative analytical techniques and project management principles, methods, tools, and techniques in order to develop, schedule, coordinate, monitor, and manage projects and resources. Project management certification may be required for specific assignments.

Knowledge of administrative activities associated with contracting and agreement actions, procedures, and options, and working knowledge of the associated documents and contract and agreement actions in order to assist the Contracting Officer/Grants Officer in performing contract administration functions. COR or GOTR responsibilities may require specific training and/or certification.

Knowledge of and skill in applying Federal Acquisition Regulation (FAR) requirements and Construction Specifications Institute (CSI) guidelines for drafting contract documents.

Factor 2. Supervisory Controls (Level 2-4 450 pts)

The supervisor outlines overall objectives and available resources and the incumbent and supervisor, in consultation, discuss scope of the assignment, methods, and time frames. The incumbent plans and carries out projects and assignments and resolves most conflicts independently and coordinates and collaborates with stakeholders to accomplish the work. The incumbent interprets policy and regulatory requirements in terms of established objectives and keeps the supervisor informed of progress and potentially controversial problems, concerns, issues, or other matters. Throughout the project or activity, the incumbent develops changes to plans and/or methodology and provides recommendations for improvements in order to meet program/project objectives. The supervisor reviews completed work for soundness and quality of overall approach, effectiveness in meeting requirements or producing expected results, the feasibility of recommendations, and adherence to requirements.

Factor 3. Guidelines (Level 3-4 450 pts)

Guidelines include applicable Reclamation and Department instructions, policies, and procedures; national and state codes, standards, regulations, and compliance standards for electrical engineering; manufacturers' literature; precedents for similar situations; applicable Federal, state, and tribal resource laws and regulations; and applicable construction management regulations/guidelines such as the FAR, applicable Code of Federal Regulations (CFR), and CSI. Such guidelines are often inadequate in dealing with individual assignments in that they seldom provide concrete solutions to specific engineering problems. The incumbent uses experienced judgement, initiative, and resourcefulness in applying and adapting electrical engineering practices or departing from established practices and precedents as required to solve problems for which precedents are not directly applicable due to such factors as unusual local conditions (e.g., climatic, geographic, environmental) or the specialized requirements of the particular facility or structure. Due to the complexity and scope of engineering projects and assignments, the incumbent must develop project guidelines, protocols, and procedures that are specific to the project and may review for comment or propose draft directives, standards, and policies.

Factor 4. Complexity (Level 4-4 225 pts)

Engineering projects and activities involve the following complicating factors: design data is not readily available or there is a large amount of data to work through when determining the most relevant data to work with for the specific project; the need to develop representative and accurate cost estimates when electrical engineering data and scope may not be well defined or mature; diversity of the design and review activities - the nature of the engineering assignment can vary significantly; integrating many systems into one project; high profile projects and projects that involve operational losses; balancing creativity and engineering judgment to best address the needs of the activity and stakeholders; the need to stay informed regarding the latest technology and/or methodologies and how it can be incorporated into specific engineering solutions; aging infrastructure and dealing with existing footprints often require unique and well formulated engineering solutions and designs that incorporate existing conditions; incorporating accessibility, cultural resource or environmental considerations; addressing unanticipated problems due to unusual local conditions and combinations of unusual features; managing changes to the project scope, budget, and schedules. The incumbent must ensure application of sound engineering judgment and principles while addressing these complexities without compromising the engineering integrity of existing features and associated systems. The incumbent must recognize the complex relationships of the systems involved and exercise judgment, resourcefulness, and originality to ensure the design or engineering solutions and recommendations can be integrated into the existing systems. Some assignments may involve interpretation of engineering aspects of Federal and state laws, regulations, or policy for engineering support in compliance assignments. Additional complexities include collaborating with multiple stakeholders with competing interests, goals, and objectives; coordinating projects for/with Federal, state, tribal governments, and/or local entities with overlapping roles and authorities; and balancing complex multi-purpose approaches necessitating significant stakeholder involvement and modification and refinement of existing applications, processes, precedents, and techniques.

Factor 5. Scope and Effect (Level 5-4 225 pts)

This position serves as an experienced engineer providing electrical engineering mentorship and expertise for a variety of complex projects and activities throughout the Office which typically include a variety of geographic locations, complex features, and unusual needs or special demands. Assignments include assessing project and program effectiveness; investigating, evaluating, advising on, and resolving unusual problems, issues, and conditions; developing criteria, procedures, or instructions. Electrical engineering projects and activities have significant effect upon the operations of Reclamation projects, as well as Reclamation's ability to meet its program goals. Engineering activities impact the overall operational efficiency and effectiveness of the facilities in delivering power to the Bulk Electric System and water to the stakeholders. Electrical engineering assignments impact the efficiency, feasibility, integrity, accuracy, adequacy, and safety of a wide range of Reclamation activities, or the activities of organizations within a regional or equivalent geographic area. Engineering assignments may impact the life, health, and property of the general public.

Factors 6. & 7. Personal Contacts and Purpose of Contacts (Level 6-3 and 7C 180 pts)

Personal contacts include counterparts and employees within the immediate Office and other offices throughout Reclamation, as well as other Federal agencies. Contacts also include representatives from other local, state, tribal governments, water districts and commissions and from industry such as architecture and engineering firms, transmission owners, manufacturers' representatives, and contractors. Contacts may also include peers from colleges and universities and professional organizations, as well as public stakeholders. Contacts are for the purpose of obtaining, clarifying, and exchanging information and data as part of engineering activities, as well as exchanging professional expertise and experience; planning, coordinating, and advising on work efforts; and leading, guiding, and/or participating on teams. Requires collaboration skill and skill in dealing with individuals with differing views.

Factor 8. Physical Demands (Level 8-1 5 pts or Level 8-2 20 pts)

- (Level 8-1) The work is typically performed in an office setting with no special physical demands. However, work may also be performed in the field which involves periods of moving about worksites, bending, climbing, or driving motor vehicles to worksites.
- (Level 8-2) The work regularly combines both office and field assignments. Field work requires physical exertion, such as long periods of standing, or recurring and considerable walking, stooping, bending, crouching, crawling, and climbing such as in regular and periodic construction activities and field inspections. Work may also include frequent lifting of moderately heavy items weighing less than 50 pounds. Field assignments may involve driving motor vehicles to work sites in remote locations requiring overnight stays.

Factor 9. Work Environment (Level 9-1 5 pts or Level 9-2 20 pts)

- (Level 9-1) The work is usually performed in an office setting. However, work time may also be spent periodically visiting field sites. Field site visits are typically performed in either an outdoor setting subject to weather changes, diverse terrain, and safety hazards associated with working around complex features and/or construction, or an industrial setting subject to noise, fumes, and moving machinery. Both settings may require the use of personal protective equipment. The work may also involve some overnight travel for training, meetings, and site visits. Safety precautions and protocols are observed at all times and the incumbent complies with safety instructions and regulations and ensures individual and others' safety by promptly reporting unsafe acts, unsafe conditions, and accidents to the supervisor.
- (Level 9-2) The work involves regular and recurring exposure to moderate risks, discomforts, and unpleasantness such as: high noise levels, infectious materials, or toxic or irritating chemicals; travel in safety approved small aircraft and watercraft; high winds and low or high temperatures; infestation of dangerous reptiles or poisonous plants, snakes, or insects; adverse weather conditions; noxious fumes; flammable liquids; or radiation. The work involves performing tasks in close proximity to rotating heavy mechanical and electrical machinery and may involve working within confined spaces for extensive periods of time. Special safety precautions such as protective clothing and gear are necessary. Safety precautions and protocols are observed at all times and the incumbent complies with safety

instructions and regulations and ensures individual and others' safety by promptly reporting unsafe acts, unsafe conditions, and accidents to the supervisor.

Total Points and Grade Conversion

Total Points = 2790 (low) 2820 (high)
Point Range = 2755-3150
Grade = GS-12

Other Significant Facts

Functional Classification (FC): Completed by servicing human resources office and annotated on PD Cover Page.

Registration: Registration as a Professional Engineer may be required as articulated by specific Reclamation policy and practices and as annotated on the PD Cover Page.

Certification: Certification and/or training to serve as a Federal Acquisition Certification (FAC) COR or GOTR may be required as articulated in Department and/or Reclamation policies. Federal Acquisition Certification for Program and Project Manager (FAC-P/PM) may be required as articulated in Department and/or Reclamation policies.