



## Electrical Engineer (FC), GS-0850-13

Standard Position Description Number: REN0600

### 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 expert engineer providing electrical engineering consultation and advisement to senior colleagues and/or Department or Reclamation officials for significant projects with complex features representing an important segment of the Department's operating programs or affecting the welfare of the public and/or the sustainability of natural resources and the environment. As an expert engineer, provides mentorship and leadership; applies experimental theories and/or new applications or developments; and provides significant and innovative recommendations for advancing programs and/or electrical engineering methods. Electrical engineering assignments may specialize in one or more specialties: Design, Protection Systems and Studies, Industrial Control Systems (ICS) and Supervisory Control and Data Acquisition (SCADA), Diagnostics and Testing, and Control System 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); generators, motors, pump-generators, generator step-up transformers, station service equipment, switchyard equipment, and auxiliary systems.

### Major Duties

Performs the first three major duties (Technical Consultation, Guidance, and Leadership; Reviewing; and Engineering Analysis) on a regular and recurring basis with Engineering Analysis being performed a minimum of 25% of the work time.

#### Technical Consultation, Guidance, and Leadership

Advises senior leadership, program officials, and colleagues on engineering analysis, recommendations, and study conclusions (e.g., advising director on region-wide implementation plans for new or updated standards and on relay protection planning that cuts across major projects, advising on Category 1 Power Recommendation Information System). Develops engineering policies, technical guidelines and standards, and/or project or study objectives. Leads and advises technical teams, directing technical procedures and practices for the teams. Provides technical direction, leadership, mentorship, guidance, training, and advice to engineers and technicians and other internal and external stakeholders. Provides technical organizational representation and collaboration on teams external to the organization, including external stakeholders and partners. Remains current with agency and national standards; drafts, coordinates, and contributes to agency and/or national standards which may include serving on national standards committees in the electrical engineering industry (e.g., North American Electrical Reliability Corporation (NERC), Western Electric Coordinating Council (WECC), Institute of Electrical and Electronics Engineers (IEEE), National Fire Protection Association (NFPA), International Electrotechnical Commission (IEC), Centre for Energy Advancement through Technological Innovation (CEATI)).

#### Reviewing

Provides technical reviews, peer reviews, and checking of designs, drawings, engineering analysis, technical documents, specifications, cost estimates, and contract correspondence, ensuring documents are accurate and quality assurance processes were followed. Reviews may be outside of the organization or designed by others. Signs documents for technical approval in accordance with Reclamation and Department policies, directives, and standards; this includes signing as the engineer in responsible charge.

#### Engineering Analysis

Directs, plans, develops, and prepares procedures, policies, and/or protocols for electrical engineering studies and special projects that require advanced engineering analysis that extends or modifies theories, concepts, and assumptions or

resolves unique or novel problems, conditions, or issues. Plans and coordinates programs or projects which are innovative and original. Develops methods and procedures which become the established precedent. Engineering analysis may result in significant alteration of standard practices, processes, devices, equipment, and known techniques. Studies and projects include technical planning activities; data collection; modeling and data analyses; analyses of site location and/or conditions; risk estimation and analyses; and analyses of instrumentation data. Engineering analysis advances engineering methods, practices, and procedures; conclusions, recommendations and/or decisions are based on this high-level analysis. Serves as a subject matter expert for Reclamation in a particular electrical engineering role or specialty for hydroelectric power generation. Below are descriptions of representative roles and specialty area analyses:

- **Regional Relay Protection Engineer:** Leads regional relay protection strategic planning for major projects. Performs electrical engineering studies including power flow studies, fault studies, and special projects including establishing relay protection or control settings for transferred or reserved works. Leads regional misoperation impact and prevention analysis, analyzing and developing solutions to misoperations. Analysis also includes evaluating engineering aspects of state and Federal regulatory and permitting programs, oversight reviews, and facility reviews on Federal lands and/or under direct Federal jurisdiction (e.g., Federal Energy Regulatory Commission (FERC) and Lease of Power Privilege (LOPP) permit applications). Ensures that relay protection settings are current and that they are uploaded and tested and that the documentation of such is reviewed and completed.
- **NERC/WECC Auditor:** Under the technical direction of the Compliance Audit and Incident Evaluation Program (CAIEP) Manager for Reclamation, leads Reclamation-wide performance audits to assess consistency with documented Power Operations & Maintenance (PO&M) practices and compliance with NERC/WECC electric reliability standards throughout Reclamation. Establishes and manages Reclamation-wide audits by establishing schedules, standards, audit criteria, and executing plans of action consistent with Generally Accepted Government Auditing Standards (GAGAS) and the Department of the Interior Internal Control Review processes. Briefs senior management through audit reports and out-briefings on audit results, findings, and analyses.
- **Design:** Completes and/or reviews advanced engineering designs and design procedures and approaches that involve significant depth and complexity that have industry-wide influence to include: 1) directing, planning, and conducting engineering studies or evaluations such as preliminary, appraisal, feasibility, final design, and value planning/value engineering, and contractor designs; 2) creating, performing, reviewing, checking, and/or modeling engineering designs, contractor submittals and 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) selecting and applying professional engineering procedures for the design and modifications of new and existing complex features/facilities; 6) performing field acceptance testing and/or design, installation, commissioning, and testing instrumentation to provide engineering data for analysis and/or operational decision support; and/or 7) preparing and/or reviewing the development and adequacy of multi-layered construction cost estimates for planning, final design, and procurement (e.g., Independent Government Cost Estimates (IGCE) and contract modifications) for the construction of significant projects with complex features representing an important segment of the Department's operating programs or affecting the welfare of the public and/or the sustainability of natural resources and the environment.
- **Protection Systems and Studies:** Establishes protective relay basis of settings and consistent methodology for Reclamation hydroelectric powerplants and transmission substations. Ensures protective relay settings are in compliance with applicable electric reliability requirements (e.g., NERC, WECC). Develops technical policies, procedures, analyses, and approaches for arc flash studies, equipment rating recommendations, and protective relay schemes and setting methodologies. Provides support and expert analysis for relay misoperation events.
- **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); comparing the collected data with desired setpoints; and deriving command functions which are used to control a process through the final control elements, such as control valves. Writes, compiles, and implements coding for complex ICS and SCADA systems pertaining to the operation of hydroelectric power facilities, pumping plants, irrigation systems, and the like.

Develops standards to adhere to Department and industry security guidelines to minimize risk of cyber-attacks. Implements advanced data analysis procedures to increase efficiency and optimize the operation of Reclamation facilities providing the greatest return on investment for the organization. Develops and maintains secure data networks for the transmission of critical data between facilities and data centers to allow for remote operation.

- **Diagnostics and Testing:** Leads and performs diagnostics testing and analysis of power generation components including rotating machines, transformers, power circuit breakers, protection systems, and backup power systems including the commissioning, maintenance, troubleshooting, and emergency repair necessary to bring equipment back to service. Develops testing procedures to address unique operational constraints including the design and fabrication of custom test equipment necessary to safely and effectively address non-typical issues. Provides training to both engineers and crafts to ensure safety of employees and effectiveness of testing while reducing overall costs associated with maintenance activities. Leads and defines Reclamation-wide maintenance and testing programs and related operating procedures and practices.
- **Control System Diagnostics and Testing:** Leads and performs diagnostics testing and analysis of excitation and governor control systems including properly tuning these systems for interaction with power system dynamics and stability. Leads and performs experimental development activities in the field of excitation and governor control systems and power system stability enhancements including creating, designing, and building electrical parts and systems for use in hydroelectric powerplant excitation and governor control systems. Participates in planning the future direction of experimental development and developing new control concepts and methods of improving power system stability and reliability. Leads and defines Reclamation-wide maintenance and testing programs and related operating procedures and practices.

## Documentation and Presentation

Develops project job plans, guidelines, protocols, and procedures that are specific to the project and develops new methods and criteria. Leads or participates on teams that propose or develop new policies, standards, and power technical documents (e.g., Facilities Instructions, Standards and Techniques (FIST), power equipment bulletins (PEB), power reliability compliance bulletins (PRCB)). Directs the preparation of and prepares for final review or action technical documentation such as technical memorandums and reports, engineering study analyses and results (e.g., basis of settings and other supporting documentation for tested and reviewed relay protection settings), 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 for decision-making purposes by senior leadership, program officials, and stakeholders at coordination meetings, design briefings, or other technical briefings, in some cases in support of compliance and audit activities.

## Investigations, Assessments, and/or Inspections

Directs, guides, plans, schedules, coordinates, and conducts electrical engineering facility examinations, reviews, and/or inspections which include conducting condition assessments and construction and transfer inspections; commissioning and testing electrical equipment and protection systems; 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; identifying future needs for the asset investment such as extraordinary maintenance and rehabilitation; and project management planning. Ensures that programmatic requirements are met and addressed. Assignments may include leading and/or peer reviewing Power Review of Operations and Maintenance (PRO&M) Periodic Facility Review or Comprehensive Review Reports, for reserved and transferred facilities; serving as the senior engineer on Comprehensive Reviews in accordance with Reclamation and Department policies, directives, and standards; or electric reliability compliance audit reports.

Assignments also include electrical event analyses and investigations (e.g., relay protection misoperations, unexpected events).

### 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 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 or supply 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 (e.g., ensuring that in service settings are current and properly maintained). 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, maintained, updated, transmitted, downloaded, and received for its intended purpose.

Performs other related duties as assigned.

## Factors

### Factor 1. Knowledge Required by the Position (Level 1-8 1550 pts)

Mastery of, and skill in applying, professional expertise in advanced electrical engineering theories, concepts, principles, standards, and methods to provide expert engineering advice and consultation to senior colleagues and/or Department officials who are responsible for broad program operations and to execute significant projects with complex features/facilities that represent an important segment of the Department's operating programs and that affect the welfare of the public.

Mastery of, and skill in applying, advanced electrical engineering theories, concepts, principles, standards, and methods to provide significant and innovative recommendations for advancing programs and/or engineering methods and to apply experimental theories and/or new developments to projects that require extension or modification of engineering theories, concepts, or assumptions; resolution of unique or novel problems, conditions, or issues; or significant alteration of standard practices, devices, processes, and known techniques.

Knowledge of, and skill in applying, the principles and practical concepts and processes of other related engineering and technical disciplines in order to direct, advise, coordinate, or oversee combined efforts involving multiple disciplines and ensure connection, contribution, or inclusion of the multiple disciplines involved in electrical engineering assignments.

Skill in identifying, conceptualizing, and developing advanced, unique, or novel solutions to electrical engineering problems or needs, and skill in independently planning and conducting studies and reviews and developing technical documents. Knowledge of new and emerging engineering methods and technology to apply when addressing unique or novel electrical 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 electrical engineering assignments.

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, including senior leadership and officials, taking into account the nature of the information (e.g., technical, sensitive, controversial). 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 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.

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.

Advanced knowledge of and experience in applying cost estimating concepts and principles in the development and/or peer review of complex, multi-faceted construction cost estimates for the planning, final design, and procurement (e.g., IGCE and contract modifications) of significant projects with complex features.

Knowledge of and skill in applying qualitative and quantitative analytical techniques and project management principles, methods, tools, and techniques in order to direct, develop, schedule, coordinate, monitor, and manage projects and resources which are significant to the Department's and Reclamation's mission and operating programs. Project management certification may be required for specific assignments.

Practical knowledge of Generally Accepted Government Auditing Standards (GAGAS) and the Department of the Interior Internal Control Review processes for practical application during performance audits of NERC Electrical Reliability compliance.

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 independently plans and carries out projects and assignments, resolves conflicts, 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 developed, viable solutions and 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 insufficient, inapplicable to the engineering projects or assignments, or have significant gaps in specificity thus requiring considerable interpretation and adaptation for the unique and novel issues and problems encountered. The incumbent uses experienced judgement, initiative, and resourcefulness in applying and adapting advanced electrical engineering practices and departing from established practices and precedents as required to solve unique and novel problems for which precedents are not directly applicable due to complexity and scope of the engineering assignments. Furthermore, the incumbent must develop project job plans, guidelines, protocols, and procedures that are specific to the project and leads or participates on teams that propose or drafts new policies, standards, and practices for Reclamation, Department, or industry.

### Factor 4. Complexity (Level 4-5 325 pts)

The incumbent must exercise experienced judgment and ingenuity to address the complicating factors described in the paragraph below, without compromising the engineering integrity of existing features and associated systems. The incumbent applies this expertise to evaluating the value and applicability of new or improved technology and applications; investigating issues and conditions beyond the scope of a single specialty area; developing or collaborating in the development of new standards and applications and recommending strategies or actions to reconcile or resolve novel, conflicting, or controversial issues or policies. 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.

Engineering projects and activities involve the following complicating factors: in-depth analysis of controversial or high visibility issues or projects; exploring, reconciling, or resolving major uncertainties, unique situations, obscure problems, or conflicting objectives; accomplishing program or project objectives with unusual demands or major constraints such as funding, scheduling, labor, and materials; working with inconclusive data or variable data due to continually changing program or work requirements; balancing the needs of and serious conflicts among engineering requirements, other scientific requirements, technological developments, standards, program direction, and administrative requirements; the need to develop representative and accurate cost estimates when electrical engineering data and scope may not be well defined or mature; integrating many systems into one project; 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 require unique and well formulated engineering solutions and designs that incorporate existing conditions; and addressing unanticipated problems due to unique local conditions and combinations of unique features.

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

This position serves as an experienced expert providing electrical engineering consultation and advisement to senior colleagues and/or Department or Reclamation officials for significant projects with complex features representing an important segment of the Department's operating programs or affecting the welfare of the public and/or the sustainability of natural resources and the environment. As an expert engineer, provides mentorship and leadership; applies experimental theories and/or new applications or developments; and provides significant and innovative recommendations for advancing programs and/or electrical engineering methods. Electrical engineering projects and activities have significant effect upon the operations of Reclamation major 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 senior colleagues and leadership and program officials throughout Reclamation or the Department, 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 also include peers from colleges and universities and professional organizations, as well as public stakeholders. Contacts are for the purpose of advising senior colleagues/officials, consulting with stakeholders, obtaining, clarifying, and exchanging information and data as part of engineering activities, as well as exchanging professional expertise and experience; directing, 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 = 3190 (low) 3220 (high)

Point Range = 3155-3600

Grade = GS-13

### 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.

Other certifications may be required as a condition of employment, as articulated by Department and/or Reclamation policies and practices, and as annotated on the PD Cover Page.