

# Electric Transmission Lines and Substations

As the need for energy escalates, so does the demand for new transmission lines and substations. GAI Consultants has been assisting clients in the power generation and transmission industry with design, upgrades, uprating, expansions, and substation electrical automation and control systems for more than 30 years.

Start to finish involvement means dedicated teams in all the disciplines required to develop and upgrade reliable power lines and substations.

Power line design requires skill in foundation investigations, computer modeling, corridor mapping, design, and construction management. GAI provides comprehensive services for new above-ground lines and structures (34.5kV to 765kV), underground lines and manholes (69kV to 345kV), and corridor routing. We also specialize in tower retrofits and reconductoring and uprating.

Members of GAI's team of structural and electrical engineers and technicians have been recognized internationally for transmissions line siting, engineering, upgrades and standards development, transmission structure foundation design and research, reliability-based transmission design and assessment, and failure analysis.

Substations are the cornerstones of electric transmission and maintain the flow of energy from power stations to consumers. GAI's electrical substation project experience includes greenfield siting and permitting, upgrades and uprating, and electrical automation and control system design. We bring value to clients pressed to meet the demands for new and expanded substations.

GAI's capabilities in substation analysis and design include site selection and development, equipment selection, and layout. Our start-to-finish involvement begins with project initialization, continues through energization of the line, and follows up with training and maintenance plans.



## Service Profile



Upgrading substations involves structure and foundation reinforcement and equipment updates—protective relays and panels, auxiliary equipment, obsolete or over-dutied circuit breakers, aged or overloaded transformers, bus conductors. GAI's skilled teams find solutions when repair needs escalate.

GAI's proven experience in power delivery system design and implementation is complemented by survey, route permitting, and traffic control services. Our dedicated teams provide complete services for overhead and underground lines and substations, creating a holistic approach to every project.

### Electric Transmission Lines and Substations Services

- Underground line and manhole design
- Overhead line, pole, and tower design
- Line and cable route evaluation and selection
- Conductor movement analyses/recommendations
- Tower retrofit design and detailing
- Reconductoring, sag and uprating studies
- Loading criteria development
- Evaluation of alternative power delivery options
- Right-of-way acquisition
- Structure and substation foundation analysis/design
- Geotechnical, geological, archaeological services
- Construction monitoring and administration
- Final testing and commissioning
- Operation and maintenance of equipment training
- Public information workshops
- New and expanded substation design (up to 500kV)
- Substation siting, permitting, layout, access roads
- Environmental permitting/regulatory compliance
- Control building, water and sewer utility design
- Protective relaying/control systems design (SCADA)
- Lightning protection and grounding system design
- Substation access control, security, lighting design
- Substation ground grid analyses and design
- Bus, switch, arrestor support structure design
- Outdoor switchgear, series reactors, shunt capacitor banks installation
- Slack buses and structures design and installation

### GAI Services Summary

- Airport Planning and Design
- Bridge and Structure Inspection and Design
- Coal Combustion Residuals Management
- Construction Inspection and Management
- Cultural Resources Management
- Economic Analyses and Strategies
- Electric Transmission Design and Siting
- Environmental Engineering
- Environmental Studies, Species Studies, Permitting
- Gas Pipeline Surveying and Mapping
- Geographic Information Systems (GIS)
- Geotechnical Engineering and Geology
- Impoundment and Landfill Permitting and Design
- Land Development Engineering
- Landscape Architecture and Design
- Master Planning and Urban Design
- Mechanical, Electrical, Structural Engineering
- Natural Gas FERC Certification and Permitting
- Nuclear Energy Engineering Support
- Right of Way and Appraisal Support
- Land Surveying and Mapping
- Transportation Planning and Design
- Utility Management Consulting
- Water, Stormwater, Wastewater Management

The scope of professional services that are provided by or offered out of each GAI office including, but not limited to, engineering and surveying services, is governed by the professional and business licensing requirements of each individual State or jurisdiction in which the GAI office is located and whether GAI has the requisite professional and business licenses for that State or jurisdiction. Nothing on GAI's Web Site or marketing materials is intended to be interpreted or construed as offering to perform professional licensed services where prohibited unless the licensing requirements have been met. Engineering services are not offered out of GAI's Northern Kentucky (Florence) office location. Surveying services are not offered out of GAI's Illinois location or by our New York subsidiary.

