

Think you've got to search here, there, and everywhere for your Electric Power Engineering expert system planning and design, system studies, and consulting?

*Think again.*

## Electric Power Engineering Technologies/Services

### Experience Counts

Carmagen's team has demonstrated extensive expertise in Electric Power Engineering including system planning and design, system studies, and consultation in a wide range of areas. These include equipment applications, system protection, reliability analysis, infrastructure evaluation, debottlenecking solutions, and troubleshooting.

### Consulting Services

- 🏗️ Project development activities, including:
  - ⇒ Scoping and screening of design options
  - ⇒ Definitive planning and design specifications for grassroots and retrofitted electrical systems with purchased power, cogeneration, power distribution, and utilization facilities
- 🏗️ Design issues include:
  - ⇒ Balancing economics versus reliability
  - ⇒ Developing interconnection configurations and operating controls
  - ⇒ Designing grounding and protection
  - ⇒ Providing for load growth and system expandability
- 🏗️ System studies, including:
  - ⇒ Load flow and voltage profiles
  - ⇒ Short circuit analysis
  - ⇒ Equipment applications
  - ⇒ Generator and large motor dynamics
  - ⇒ Plant-wide motor reacceleration
  - ⇒ Relay coordination

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- ⇒ Cable sizing
- ⇒ Voltage and power factor control



Consulting activities, including:

- ⇒ Analysis of system protection
- ⇒ Rating and application of equipment
- ⇒ Investigation of electrical system upsets
- ⇒ Solutions for excessive short-circuit duties and overloads
- ⇒ Interpretation and application of codes and standards
- ⇒ Evaluation of electrical infrastructure
- ⇒ Cold-eyes reviews of designs

## Typical Projects



Screening study to develop a project to improve the reliability and capacity of a plant's main-power supply.



Design specification for the power supply to a new process unit.



Design specification covering a power system for a new plant, including interconnection of the new system to an existing plant's power system.



Design specifications for a new power system for a major plant expansion, including utility and cogeneration facilities.



Identification and correction of improperly applied and improperly set protection.



Review and optimization of plant protective relaying.



Evaluation of transformer and circuit breaker emergency overload capability.



Analysis of system grounding problems.



Training personnel in short circuit calculations and protection.



Develop motor reacceleration strategy for plant to survive voltage dips.




Augment existing staff with high value added expertise and support.

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**For some Power Generation consultants, project execution plans, equipment applications, mechanical engineering, and environmental compliance may describe their scope of services. But, for us ...**







*It's just the beginning.*

## **Electric Power Generation Consulting Services**





### **Experience Counts**

Carmagen's team has demonstrated extensive expertise in a variety of Power and Energy related projects. Our services include systems planning and design, system studies, and consultation in a wide range of areas including project execution plans, equipment applications, specifications, mechanical engineering, heat transfer, environmental compliance, safety reviews and project audits. Significant expertise is available in troubleshooting, maintenance and outage planning.

### **Power Generation Engineering Consulting Services**

-  Project development activities including scoping and screening of design options, front-end loading, definitive planning and design specifications for grassroots and retrofitted generating facilities, cogeneration, power distribution and balance of plant systems.
-  Conceptual system studies and designs including development of P&IDs, facility layout, balance of plant utility requirement, estimating, scheduling, environmental compliance and project execution plan.
-  Contracting strategies, scope of work definitions, Bidder and Suppliers Pre-Qualifications, Bid Analysis, Negotiations and Contract Management.
-  Construction Method and Planning including special equipment and heavy lift analysis.
-  Design for Operation Analysis, Outage planning, Fault and Failure Analysis and Safety programs.
-  Maintenance and Troubleshooting Surveys and Improvement Plans.

### **Typical Projects**

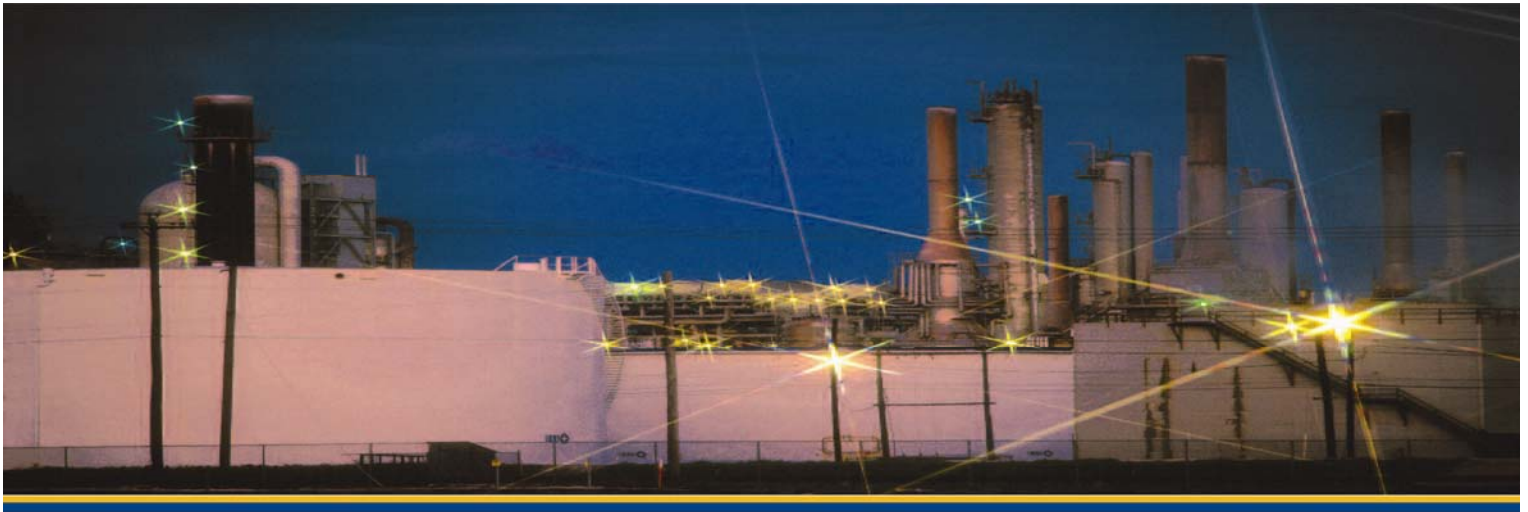
-  Integral member of Owner's team in the development of a cogeneration project in Texas including Process & Instruments Diagram (P&ID) process and safety review and review of heat recovery steam generator.
-  Performed failure analysis of reheater tubes at Utility companies generating station.
-  Recommended alternative solutions for boiler NOx reduction program for Louisiana power generating station.
-  Under a multi-million dollar contract to the United States EPA, designed a mobile laboratory used to investigate the effects of various types of combustion modifications on NOx emissions and life expectancy of large-scale utility boilers.

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- Managed the preparation of Design Basis Memorandum (DBM) defining the scope of the utility supplies, including steam, electricity and water, essential to ensure a Refinery's safe and reliable operation following an upgrade.
- Prepared a study for alternative power supply for a major chemical producer in the Asia Pacific region, to minimize impact of excessive power outage experienced by the public utility. Studied cogeneration alternatives and recommended gas turbine power generation with waste heat steam recovery.
- Engaged in several steam/power and energy assessment studies for US Army ammunition depots necessitating the establishment of a complete utility system database of information for process operation. Provided recommendations and prepared definitive details to modernize steam and power generation facilities with cogeneration.
- Participated as Panelist in NACE CORROSION/89 Panel Discussion, "Air Pollution Corrosion Control in Utility Power Plants and Municipal & Industrial Incinerators."
- Led "Workshop on Co-Firing Industrial Sludges and Slurries in Coal-Fired Utility Boilers." Sponsored by the Incineration Division, NSF Industry/University Cooperative Center for Research in Hazardous and Toxic Substances, November 19, 1985.
- Led all phases for grassroots and retrofitted electrical system projects including purchased power facilities, cogeneration facilities, power distribution systems, and utilization substations. Project phases include front-end planning, screening studies, definitive planning, design specifications, and detailed-design quality control.
- Assessed design issues impacting power generation project scope including balancing economics and reliability; developing interconnection configurations and operating controls; designing grounding and protection; providing for future load growth and system expandability.
- Investigated causes and remedies for refinery electrical upsets; evaluated refinery electrical infrastructure; identified and corrected improperly applied or improperly set protection; designed cabling applications; performed relaying reviews; evaluated transformer and circuit breaker emergency overload capability; provided solutions for excessive short circuit duties; defined application/interpretation of company and industry standards; resolved system grounding issues; taught short circuit calculations, defined protective device setting and coordination.
- Performed studies and tasks including load flows, voltage profiles and voltage control, short circuit duties, equipment applications, large motor dynamics, generator transient stability, plant-wide stepped motor reacceleration, relay coordination, and cable sizing.
- Prepared water balance, process specifications, job requisitions, equipment bid tabulations, system flow diagram, and P&IDs for steam/electric generation, BFW treatment, and supporting utilities for detailed engineering of a municipal waste-to-water energy project.
- Design of complete cogeneration system (selection of gas turbine, design of heat recovery units (including design of circulation loops for boilers and design of superheaters. This project included integration of turbine exhaust as combustion air for a reforming furnace.



- 🏭 Specification, installation and troubleshooting of rotary and tubular heat recovery units.
- 🏭 Design and troubleshooting of baghouses.
- 🏭 Design (thermal and mechanical) of 1500# steam systems including natural circulation calculations and steam drum selection, BFW and deaerator systems, etc.
- 🏭 Management of integration of co-generation plant supplying steam and electricity for \$1 billion grass-roots plant in Holland. Included co-ordination with vendors and utility personnel to ensure reliability targets were achieved. Included development of documentation defining effect of outages and expense to co-generator owner of outages of different length and impact on plant.
- 🏭 Development of tube-life model for major petro-chemical company to allow study of effect different operating conditions and different shutdown periods had upon probability of failure of tubes. Used latest methodologies.
- 🏭 Design and operation of pressurized and atmospheric coal fired fluid bed combustors.

## Publications

- 🏭 "Long-Term Optimum Performance/Corrosion Tests of Combustion Modifications for Utility Boilers. Host Site: Utah Power and Light Company, Hunter Generating Station, Unit 2". By Paul S. Natanson and Richard M. Vaccaro. Exxon Research and Engineering Company.
- 🏭 "Evaluation of Tubewall Corrosion Rates on a Coal-Fired Utility Boiler Using Staged Combustion for NOx Reduction". (Host Site: Gulf Power Company, Crist Generating Station, Unit No. 7, Pensacola, Florida.) By Paul S. Natanson, Erwin H. Manny, and Al R. Crawford. Exxon Research and Engineering Company.

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