

SEAN F. HAGEN

Senior Consultant



Sean Hagen is a focused leader with over 35 years of consulting and engineering experience managing major capital projects, organizations, and engineering teams. He has demonstrated versatility by leading cross-discipline, multi-function teams in a wide range of technologies and industries.

Hagen adds significant value to clients, organizations and project teams by effectively assessing problems and developing potential solutions. He understands and translates complex technical and cost issues into understandable actions that enable executives and project teams to optimize project execution based on common and clear understanding of scope, schedule, budgets, and risks. He has successfully managed consulting and engineering teams, projects, and regional offices worldwide.

EXPERTISE

- ▶ Technical, Project & Risk Management Consulting
- ▶ Independent Engineering & Due Diligence Services
- ▶ Asset Management & Strategic Planning
- ▶ Cross-functional Engineering Management
- ▶ Project Management
- ▶ Low Level Radioactive Waste & Spent Fuel
- ▶ Nuclear Power Plant Decommissioning

35+ YEARS OF EXPERIENCE

EXPERIENCE

Mr. Hagen formed Hagen Global Consulting LLC in 2017 to support Clients plan, organize, lead, control, and/or change projects and organizations as necessary to meet their objectives. His diverse experience and broad technical acumen enable him to make integrated technical and management assessments to identify actions required to achieve results.

From 1997 to 2017, Mr. Hagen was with Sargent & Lundy LLC (S&L). Mr. Hagen successfully led engineering projects and consulting engagements in most electric power generation technologies, including: fossil fueled power plants (sub- and super-critical coal, heavy oil, ore emulsion and both single cycle and combined-cycle natural gas units); nuclear power plants (BWR, PWR and CANDU); renewable energy projects (wind, solar PV, solar CSP and biomass projects); grid interconnection; and electric power transmission projects. While in the S&L Consulting group, Mr. Hagen developed the group's system of processes and qualifications and became the 'go-to' consultant for unique and complex technical consulting engagements. His versatility, technical, and communication skills were probably best demonstrated when he led the Independent Project Oversight (IPO) team for NBPower's Point Lepreau Refurbishment Project. Due to the technical, commercial, and project management complexity of the project, Mr. Hagen personally developed and lead the oversight process. Based on input gained by working closely with the project team, he distilled and clearly presented key issues directly to the NBPower Board of Directors. His reports enable the Board to understand and proactively address the integrated project issues and risks, in alignment with the project team and actual progress. Based upon his leadership on the Point Lepreau IPO team, NBPower recommended Mr. Hagen to Hydro Quebec to lead the Gentilly 2 Executive Advisory Committee. Outside of his consulting work, Mr. Hagen focused on restart projects, Independent Spent Fuel Storage Installations, and nuclear plant modifications projects.

From 1988 to 1990, and again from 1992 to 1997, Mr. Hagen worked with Westinghouse companies that processed, packaged, and transported low-level radioactive waste (LLRW) for disposal. Based in the Midwest, after a brief stint to gain manufacturing engineering experience with Packaging Corporation of America and to complete his MBA in 1990-1992, he rejoined Westinghouse as Scientific Ecology Group's (SEG's) Manager of Midwest Operations. He was subsequently promoted to Plant Engineering Manager for SEG's Central Waste Operations facility in Oak Ridge, TN. In this position, he successfully led the installation and integration of SEG's second LLRW incinerator. He utilized the needs for the project to develop and implement standard programs for design control, project engineering, plant engineering, start-up and commissioning of new production systems, configuration management, HAZOPs, preventative and predictive maintenance, capital expenditure optimization, and project management. In 1996, Mr. Hagen was appointed Central Waste Operations' Director of Technical Services, where he effectively integrated SEG's Plant Engineering, Maintenance and Facilities Departments into a single, cost-effective organization that provided comprehensive technical support for LLRW compaction,



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incineration and metal melting operations. Technically, he envisioned and led the design and implementation of significant HVAC improvements to the Metal Melt Operations facilities.

As noted earlier, Mr. Hagen worked with Packaging Corporation of America's Molded Fibre Division (PCA) during 1990 to 1992. Eight months after joining PCA as a project engineer, he was promoted to Manager, Manufacturing Engineering, based on his integrated technical leadership versatility and expertise. In this position, he led the development and implementation of PCA's major capital projects and manufacturing improvement initiatives before accepting SEG's offer to rejoin them in 1992.

In 1988, Mr. Hagen joined Westinghouse Radiological Services (WRS), where he successfully managed LLRW mobile processing, packaging and transportation operations for several Midwest nuclear power plants. Mr. Hagen gained increasing levels of responsibility managing LLRW field services before being recruited to join PCA.

Mr. Hagen first joined Sargent & Lundy as summer help in 1981, then full time in 1982. After field engineering assignments at Byron & Braidwood nuclear power plant construction sites, Mr. Hagen was transferred to the home office in 1985 and promoted to Senior Structural Engineer in only 3 years to lead design engineering groups working on new nuclear power projects.

EDUCATION

North Central College in Naperville, Illinois, Master of Business Administration (1991)
University of Illinois at Urbana/Champaign, B.S. Civil Engineering (1982)

PROFESSIONAL MEMBERSHIPS

American Society of Civil Engineers
American Society of Mechanical Engineers
Project Management Institute
American Nuclear Society
Canadian Nuclear Society

PAPERS & PRESENTATIONS

Managing the Risk of Large Projects: Independent Project Oversight Panel Discussion, 37th Annual Canadian Nuclear Society Conference, June 6, 2017.

Integrated Resource Planning for Utilities, Matt Thibodeau, Chris Ungate & Sean Hagen. Presented at the AWEA Windpower 2012 Conference in Atlanta, Georgia on June 5, 2012.

Wind Turbine Structures and Foundations - Past, Present and Future, Sean Hagen and Dr. Shujin Fang. Presented at the 13th Annual University of Illinois at Urbana-Champaign Structural Engineering Conference on April 17, 2012.

Renewable Energy and Integrated Resource Planning for Utilities, Matt Thibodeau, Chris Ungate and Sean Hagen. Presented at the 2012 Electric Power Conference in Baltimore, Maryland, on May 17, 2012.

Electric Energy's Low Carbon Future and the Tough Choices Required, Jeremy Bero, Ken Davis, Sean Hagen and Matt Thibodeau. Presented at the Electric Power 2009 Conference, Rosemont, IL, May 14, 2009.

Codes and Standards for Wind Turbine Foundations: An Overview and Future Outlook, Tomas Vazquez and Sean Hagen. Presented at the AWEA Windpower 2009 Conference, Chicago, Illinois, May 4-7, 2009.



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Cost Estimates for Utility-Scale Renewable Energy Projects, Sean Hagen. Presented to the American Association of Cost Engineers, Chicago, Illinois, October 9, 2008.

Optimizing Wind Farm Design for Profitability, Daniel W. Bernadette (AWS Truewind), Sean Hagen, Nick Robertson (AWS Truewind). Presented at AWEA Windpower 2008 Conference, Houston, Texas, June 1-4, 2008.

Municipal Utility Small Wind Projects: Challenges and Benefits - A Municipal Perspective - New Ulm, Minnesota, Patrick Wrase (New Ulm Public Utility) and Sean Hagen. Presented at AWEA Windpower 2008 Conference, Houston, Texas, June 1-4, 2008.

New Ulm Public Utilities Commission Long Term Power Project, Patrick Wrase (New Ulm Public Utility) and Sean Hagen, presented to the Minnesota Municipal Utilities Association Winter Legislative Conference, March 14, 2008.

An Assessment of Canada's Used Nuclear Fuel Management Approach from the Perspective of Current Nuclear Host Communities, Sean Hagen and Joe Hunwicks (City of Pickering, Canada). Presented at American Nuclear Society, Denver, August 7-11, 2005.

PROJECT-SPECIFIC EXPERIENCE

Mr. Hagen's specific consulting, management, and engineering, experience includes the following:

- ▶ **Bruce Power - Ongoing MCR and Asset Management Program**
Developed Independent Oversight plan for the ongoing selection, review, and study of Bruce Power's Asset Management capital projects. The plan needed to select the optimal projects for review out of the 200-300 projects in various stages of development, execution, start-up, turnover, and closeout. The goals of the plan were to assure the CEO, Board of Directors, and Executive team that the right projects were identified and reviewed, to determine if these representative projects were being appropriately developed & executed, and to identify opportunities for improvement.
- ▶ **PSEG Long Island**
Developed legally mandated study, with critically short timeline and to be issued to the public by Long Island Power Authority's CEO & Board, for repowering two power plants approaching end-of-life by replacing oil-fired boilers and steam turbine systems with new combined-cycle power generation units.
- ▶ **Sargent & Lundy Site Manager, Barakah Nuclear Power Plant**
As S&L's Site Manager at Emirates Nuclear Energy Company's Barakah Nuclear Power Plant (BNPP), was responsible for leading S&L's site team to transition from design to construction of BNPP's Physical Protection System project. Starting with 1 electrical engineer, 4 structural engineers, led the team's expansion to become a fully functioning and capable design team comprised of multiple electrical, mechanical, fire protection & civil engineers, designers, and admin personnel from S&L's Chicago & Abu Dhabi offices, LTSL JV personnel from India, and local contract employees.
- ▶ **Manager, Sargent & Lundy Canada Company's Ontario Regional Office**
Responsible for leading S&L's Ontario Office team and for the effective integration of S&L's programs, policies and procedures with Canadian nuclear power industry regulations and practices



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- ▶ **Ontario Power Generation**
Responsible for multiple modifications to support the Darlington Nuclear Generating Station's Refurbishment Project. Specific project responsibilities include developing and executing the preliminary and detailed engineering packages for the Construction Island Barriers, Work Control Modular Building, Radiation Protection Modular Building, Contaminated Material Shops, Fire Protection System upgrades, moving the containment boundary and the vault vapor recovery systems modifications. Responsible supporting and ensuring that lessons learned are effectively communicated to other S&L refurbishment modification teams.
- ▶ **Hydro-Quebec**
Lead member of the Gentilly 2 Nuclear Refurbishment Advisory Committee, which met bi-annually to review the refurbishment project planning and implementation and provide an independent assessment to Hydro-Quebec's senior executive team
- ▶ **NBPower Nuclear**
Reporting to NBPower's Board of Directors, developed and led Independent Project Oversight services of the Point Lepreau Nuclear Generating Station refurbishment project.
- ▶ **Canadian Association of Nuclear Host Communities**
Perform independent peer review of Canada's Nuclear Waste Management Organization's work in developing a recommended management approach for Canada's used nuclear fuel.
- ▶ **First Energy Service Company**
Project Manager responsible for leading the S&L team to assess the remaining useful life of a 4 coal-fired and 1 combined-cycle power plant for a large utility. The overall purpose of the assessment was to provide an independent, technically accurate, and justifiable life of the plants based on the client's revenue projections, overall plant conditions, projected non-fuel O&M expenses, and the projected magnitude of capital expenses required to maintain the plant's current level of performance and operation. This life could subsequently be used for asset depreciation calculations, and enabled the client to assess the impact of potential investments to meet new EPA regulations, etc., based on an accurate assessment of the plants' current technical capabilities.
- ▶ **Confidential Project**
Project Manager responsible for identifying power procurement options for an industrial client with very high electric power costs. The S&L team performed a high-level assessment of the options to determine which were feasible, and of those to compare potential costs, benefits, and risks. The S&L team considered establishing a new power purchase agreement with either the existing supplier or a new supplier. The team also assessed the option of purchasing the power plant located adjacent to the client's facility and either utilizing the power plant output in a combined heat and power application or utilizing the output by selling excess power in the electric power market directly as an independent power producer.
- ▶ **Hyundai Heavy Industries**
Project Manager responsible for providing reviews and support to HHI during their design of the Saudi Electric Company's Jeddah South Thermal Power Plant Stage-1. S&L is providing technical consulting services to support HHI in the Basic Engineering, Detailed Engineering, and Start-up and Commissioning of the 4-unit, 2,640 MW supercritical oil-fired thermal power station



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▶ **NextEra Energy Resources LLC**

Project Manager for performing an independent engineering due diligence review to support the sale of five combined cycle and simple cycle natural gas fired generating stations with a combined capacity of over 2700 MW.

▶ **Banco de Crédito del Peru**

Project Manager responsible for leading the Independent Engineering team to provide technical advisory services to the major project lender for the Abengoa Transmission Norte 2 Transmission project in Peru

The project consists of the construction of a 220 kilovolt (kV) double-circuit transmission line; the installation of protection and control equipment in the Las Bambas substation and the expansion of the Cotaruse substation currently under construction.

▶ **Patrick & Henderson**

Project manager responsible for leading teams in the review of wind turbine generator foundation design concepts. P&H engaged S&L assess its major foundation types to ensure that the structural concepts and behaviors were appropriately analyzed and designed consistent with the expected actual behavior of the foundations in accordance with applicable codes and standards.

▶ **Macquarie Bank Ltd.**

Project manager leading consulting team responsible for providing Lender's Technical Advisory services for the repowering of a 50 MW fossil-fueled steam electric generating station located in California, US, converting the plant from burning lignite coal to wood chip biomass. Provided technical reviews of modifications and project execution, identifying areas of concern and offering recommendations to achieve or improve expected project execution and final plant performance.

▶ **Wind Energy Consulting Projects**

Project Manager for performing independent engineering due diligence reviews and assessments of wind energy power generation facilities. Detailed work scopes include evaluations of wind turbine foundations, foundation design criteria, and balance of plant systems, structures and components for over 10,000 MW of wind power projects located throughout North America and South Africa

▶ **Confidential Client**

Provide consulting and engineering services in the development of a new wind power project for a municipal-owned electrical power utility and serve as the owner's representative in the delivery of the local project in its entirety, including cost estimates, conceptual engineering, independent reviews, and project planning

▶ **Confidential Client**

Provide consulting and engineering services to develop several 100 – 200MW sized wind power projects, including initial site screening and selection, transmission assessments, interconnection request development and submittal support, and cost estimates

▶ **Antilles Energy**

Project Manager to provide independent engineering services to support development of integrated biomass gasification and power generation plant



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- ▶ **National Renewable Energy Laboratory**
Support review of solar power technology to ascertain the feasibility of continued development and commercial deployment
- ▶ **Confidential Client**
Perform due diligence review to support potential acquisition of a nuclear power station, including assessing decommissioning and spent fuel management scenarios and cost estimates
- ▶ **Confidential Client**
Evaluate main steam generator replacement technical and economic issues for a pressurized water reactor nuclear power station
- ▶ **CPS Energy**
Project Manager and principal consultant for performing technical risk assessment relative to different power generation alternatives, including coal, IGCC, renewable energy projects, and new nuclear units at the South Texas Project
- ▶ **Confidential Client**
Evaluate technical and decommissioning issues associated with the sale of ownership interests of a nuclear power station in support of another part-owner's right of first refusal
- ▶ **Confidential Client**
Review of nuclear plant decommissioning cost estimate for corporate financial statements
- ▶ **TXU Electric Delivery Company**
Develop independent fair value certificate of the company's overall operating transmission and distribution system assets
- ▶ **Enel, SpA**
Evaluate construction and materials sub-contract costs for Brazilian transmission line EPC projects
- ▶ **European Bank for Reconstruction and Development**
Provide technical design, procurement and implementation support for the construction of two 330kV transmission lines in the Odessa region of Ukraine
- ▶ **Confidential Client**
Perform due diligence review to support potential acquisition of five combined cycle gas turbine power plants, including evaluation of operating performance, condition assessment, and potential plant expansion capabilities
- ▶ **Pacific Gas and Electric**
Evaluate bids to develop new combined cycle power plants as part of PG&E's request for offers to build new generating capacity in its service region



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- ▶ **Enel, SpA**
Independent assessment of commercial, technical, and project execution risks related to several international combined-cycle power plant EPC projects located in Europe and the Middle East
- ▶ **Confidential Client**
Independent Engineering due diligence reviews to support potential acquisition of 1,750 MW combined cycle power plant project
- ▶ **AES Meghnaghat Limited**
Independent review of foundation ground improvement project for a new 450 MW combined cycle power plant located in Bangladesh
- ▶ **AES Merida III**
Independent Engineering reviews and certification of overall project completion of combined-cycle power plant located in Mexico
- ▶ **Tuxpan III & IV**
Independent Engineering reviews of the Engineering, Procurement, and Construction contract for combined-cycle power station located in Mexico
- ▶ **Site Energies, Inc.**
Owner's engineering services to support development of the Port City Power combined-cycle power plant located in northern Illinois
- ▶ **San Diego Gas and Electric**
Perform asset unitization study to allocate total EPC project costs to specific assets for a simple cycle gas turbine power plant project and for a combined cycle gas turbine power plant project; perform due diligence reviews to support potential acquisition of 13 combustion turbine peaker units totaling over 180MW capacity
- ▶ **West LB AG**
Evaluate turbine repair options and contracts for simple-cycle gas fired power station located in Brazil
- ▶ **Southern Illinois Power Co-op**
Reliability and high-level condition assessment the Marion coal-fired units to develop a risk-based life expectancy and capital investment requirements of major equipment and systems
- ▶ **Allegheny Energy**
Reliability and high-level condition assessment Allegheny's fleet of supercritical coal-fired units to develop a risk-based life expectancy and capital investment requirements of major equipment and systems

Asset optimization study of six coal-fired power stations to determine optimum spending and O&M practices required to achieve expected performance levels
- ▶ **E.On US Generating Services**
Develop scope, approach, methods and procedure for performing a high-level condition assessment E.On's fleet of



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coal-fired units to develop a risk-based life expectancy and capital investment requirements of major equipment and systems

▶ **Manitowoc Public Utilities**

Independent engineering review of project to add new coal-fired boiler and steam turbine to existing power station

▶ **Confidential Client**

Provide impartial technical expertise to support resolution of insurance claims resulting from earthquake damage to a coal fired power plant in located in Peru

▶ **Confidential Client**

Provide litigation support related to a dispute involving the procurement and utility interconnection of temporary diesel generators.

▶ **NRG Energy, Inc.**

Independent Engineering services, including technical reviews and financial evaluations, to support project financing for a new 1,200 MW combined cycle power plant project located in southern Mississippi

▶ **Confidential Client**

Engineering and building code reconciliation reviews and subsequent reconstruction cost estimates to support insurance claim resolution, including feasibility of reusing existing foundations to rebuild damaged coal-fired power plant

▶ **Arizona Public Service**

Palo Verde Nuclear Generating Station Units 1, 2, and 3 (PVNGS). Project Manager for design of an Independent Spent Fuel Storage Installation and North Access Facility

▶ **American Electric Power**

D. C. Cook Nuclear Plant Units 1 & 2. Technical Assistant to the Director of Design Engineering to support the plant restart project

▶ **Westinghouse Electric Corporation**

Develop and lead management re-engineering project that achieved over \$25 million in subsidiary cost reductions, resulting in the successful divestiture of the subsidiary

▶ **Scientific Ecology Group (SEG)**

Director, Central Waste Technical Services. Managed plant engineering, maintenance, and facility services departments for low-level radioactive waste compaction, incineration and metal-melt processing facilities. Previously responsible for managing low-level radioactive waste processing, packaging and transportation operations.

▶ **Packaging Corporation of America**

Manager of Manufacturing Engineering, responsible for the planning, development and implementation of process improvement and capital expansion projects.



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- ▶ **Tennessee Valley Authority**
Watts Bar Unit 1. Structural engineering lead for the design baseline verification project

- ▶ **Commonwealth Edison**
 - LaSalle County Nuclear Generating Station, Unit 2 Project Engineer. S&L's Structural design group manager for restart of LaSalle 2
 - Dresden Nuclear Station, Unit 1. S&L's Project Engineer for spent fuel storage
 - Zion Nuclear Generating Station, Units 1 & 2. S&L's Lead Civil/Structural project engineer responsible for providing structural and civil engineering support for ongoing plant operations
 - Byron 1&2 /Braidwood 1&2 Nuclear Generating Stations. Managed and performed structural design and analysis of systems, structures and components.

