

Jon T. Leman

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YEARS OF EXPERIENCE

23

EDUCATION

- » Ph.D., Electrical Engineering, Washington State University, 2021
- » M.S., Electrical Engineering, University of Idaho, 2010
- » B.S., Electrical Engineering, University of Idaho, 2001

AREAS OF EXPERTISE

- » High Voltage Electromagnetics
- » Overhead and Underground Lines
- » Insulation Design and Analysis
- » HVAC & HVDC Systems
- » Lightning Performance
- » Transient Studies
- » High Voltage Testing
- » Reactive Compensation
- » 2D/3D Equipment Modeling
- » Power System Failure Analysis
- » Numerical Methods: FEM, CSM, FDTD
- » Leadership & Process Improvement
- » Teaching & Public Speaking
- » Technical Presentations
- » Computer Simulation
- » Engineering Economics

CERTIFICATIONS & LICENSING

- » Professional Engineer, Idaho
- » Power System Protection
- » FCC Extra Class Amateur Radio
- » FAA Part 107 Drone Pilot
- » IIBA Business Analysis Professional

INDUSTRY INVOLVEMENT

- » Institute of Electrical and Electronic Engineers (IEEE), Senior Member
- » IEEE Power and Energy Society
- » IEEE Electromagnetic Compatibility Society
- » CIGRE, Former Secretary of Working Group B4.63

LEADERSHIP TRAINING

- » Negotiations
- » Department Management
- » Engineering Project Management
- » Navy Officer Leadership Training
- » Organizational Behavior

OVERVIEW

Dr. Leman is an expert in high voltage electromagnetics and electrical design of AC and DC power delivery systems. His technical depth, practical experience, and leadership have helped many clients achieve successful project outcomes.

WORK HISTORY

Power Electromagnetics Consulting, PLLC (Aug. 2024 – Present)

OWNER AND PRINCIPAL ENGINEER

Provide consulting services in high voltage electromagnetics, transmission systems, equipment failure analysis, transients, and other power system studies.

Electric Utility Design Tools, LLC (Jul. 2017 – Present)

PARTNER AND PRINCIPAL ENGINEER

Develop software ideas and prototypes and manage product quality control. Market products, develop web applications, and support customers. Supervise regulatory compliance, accounting, and tax reporting.

Clearwater Power Company (Jun. 2022 – Aug. 2024)

CHIEF ENGINEERING AND TECHNOLOGY OFFICER

Supervised compliant and economic design, construction, and repair of the company's electric plant. Introduced key modernization initiatives, including addition of a drone program, recloser upgrades, and SCADA system expansion. Led a successful grant application for a \$1.2M reliability project. Served on the executive committee developing business strategy, budgeting, and reviewing contracts in support of the CEO and board of directors.

POWER Engineers, Inc. (Jun. 2005 – Jul. 2022)

PRINCIPAL ENGINEER AND MANAGER OF SENIOR ELECTRICAL ENGINEERING STAFF

Performed AC and DC system studies in the areas of electromagnetic fields, overhead and underground transmission line electrical design, power system failure investigation, transients, and other technical disciplines. Developed new technical services and helped grow the client base through customer outreach.

Developed project proposals and collaborated with clients to plan project approach and to monitor and maintain project health during execution. Supervised the senior engineering department and trained junior engineers.

Served over five years on the Power Deliver Design Conference planning committee. Helped identify topics and presenters to provide NCEES qualified content to an audience of about 250 industry professionals.

Washington State University (2018)

ADJUNCT INSTRUCTOR

Taught the first semester junior/senior level electromagnetics course. Prepared lesson plans, exams, homework, and delivered lectures on campus. The course covered transmission line wave propagation, electrostatics, and magnetostatics.

United States Navy Nuclear Training Command (2001 – 2005)

COMMISSIONED OFFICER (LIEUTENANT), INSTRUCTOR, AND CLASS DIRECTOR

Taught and led officer and enlisted students at the Navy Nuclear Power Training Command, Naval Weapons Station, South Carolina. Earned the Master Training Specialist qualification. Served monthly as the command duty officer (CDO) in charge of operations for a campus of over 3,500 students.

PUBLICATIONS

- » J. T. Leman, R. G. Olsen, and D. Renew, "Calculation of Transmission Line Worker Electric Field Induced Current Using Fourier-Enhanced Charge Simulation," *Energies*, 2023, 16, 7646.
- » J. T. Leman and R. G. Olsen, "On Calculating the Phase-to-Phase CFO of Overhead Transmission Lines Based on the Spatial Minimum Electric Field," in *IEEE Trans. Power Deliv.*, vol. 37, no. 5, pp. 3698-3708, Oct. 2022.
- » J. T. Leman and R. G. Olsen, "Fourier Enhanced Charge Simulation Method for Electrostatic Analysis of Overhead Transmission Lines," in *IEEE Trans. Power Deliv.*, vol. 37, no. 2, pp. 1078-1087, April 2022.
- » J. T. Leman and R. G. Olsen, "Bulk FDTD Simulation of Distributed Corona Effects and Overvoltage Profiles for HSIL Transmission Line Design," *Energies* 2020, 13, 2474.
- » R. G. Olsen, M. W. Tuominen, and J. T. Leman, "On Corona Testing of High-Voltage Hardware Using Laboratory Testing and/or Simulation," in *IEEE Trans. Power Deliv.*, vol. 33, no. 4, pp. 1707-1715, Aug. 2018.
- » R. G. Olsen and J. T. Leman, "On Calculating Contact Current for Objects Insulated from the Earth and Immersed in Quasi-static Electric Fields," in *IEEE Power Energy Technol. Syst. J.*, vol. 4, no. 1, pp. 16-23, March 2017.
- » CIGRE Technical Brochure TB-697, Testing and Commissioning of VSC HVDC Systems, 2017.
- » J. T. Leman, E. J. William, and B. K. Johnson, "DC fault dynamics in VSC based MVDC shipboard distribution," 2015 IEEE Power Energy Soc. Gen. Meet., Denver, CO, USA, 2015.

ARTICLES AND SEMINARS

- » J. T. Leman, R. G. Olsen, and D. Renew, "Overhead or Underground Transmission? That is (Still) the Question: Part I and Part II," *Article*, T&D World, Feb. 2022, Apr. 2022.

PROJECT EXAMPLES

Transmission Line Electrical Design and Analysis

69 KV THROUGH 765 KV AC AND ±320 KV THROUGH ±600 KV DC.

Engineer responsible for electromagnetic design and analysis of overhead and underground transmission lines for projects in thirty-six states in the U.S. and in five other countries. Roles included project scoping, primary engineering, client interface, leading teams, and quality control. Services included development of electrical specifications, high voltage test specifications, and analysis to establish the following design items: conductor sizing and structure geometry inputs for optimization of electrical reliability and economics; OPGW short circuit and lightning withstand; fault performance; insulation design and flashover risk including lightning, switching transients, and contamination; arrester sizing; parallel circuit interactions; induced voltages; AC interference; electric and magnetic fields; conductor and hardware corona performance (audible noise, radio/TV interference, and visible light); NESC 5 mA rule; transposition and voltage imbalance; resonance susceptibility; line constants; electrical clearances; secondary arcing; reactive compensation; voltage drop; and capacity.

Transmission Line Expert Witness Testimony

Engineer responsible for providing electrical design services and expert witness testimony regarding electric and magnetic fields in public outreach meetings and formal hearings before the South Dakota Public Utility Commission (PUC). Collaborated with the client's legal team to prepare statements and answers to anticipated questions from opposing groups. Topics included EMF induction, impact on health and medical implants, radio interference, and impact on dairy and farm operations.

500 kV Transmission Line Equipment High Voltage Testing

Owner's representative responsible for specifying and witnessing tests of high voltage transmission equipment by the supplier. Assessed adequacy of the supplier's lab and test procedures. Identified lab setup deficiencies while onsite that would have led to an inadequate testing regimen. Directed additional testing procedures to confirm the problem. Completed an impromptu analysis and presentation to explain the problem to lab staff and made recommendations to mitigate the situation. The staff were convinced of the issue and altered their setup. The lab later moved a ceiling crane to prevent the problem in the future.

Transformer Failure Root Cause Analysis

Engineer responsible for analyzing electrical causes of failure of a large transformer at a generating facility. Identified plausible causes and studied the feasibility of each. Performed transient and finite element analysis which ruled out external system factors and allowed the client to focus on other causes. Ultimately, the cause was found to be manufacturing deficiencies.

Substation Insulation Coordination

Completed analysis to identify BIL/BSL levels at a nuclear power plant substation. Time domain transient simulations were completed to identify incoming transmission line overvoltages from switching operations and lightning strikes. Identified protective margins and impact of distance between arresters and protected equipment.

- » J. T. Leman and R. Seegmiller, "High Voltage AC Transmission Line Design: NESC 5 mA Rule Considerations," Article, T&D World, Jan. 2022.
- » J. T. Leman, "Using Electrostatic Simulation to Validate Corona Testing of High Voltage Transmission Hardware," Seminar, WSU Energy Systems Innovation Center, 2020.
- » J. T. Leman, "Why Wires? A Look at the Infeasibility of Wireless Bulk Energy Transfer," Seminar, POWER Engineers Power Delivery Design Conf., 2019.
- » J. T. Leman and C. Schuermann, "Assessing Sheath Voltage Limiter Failure Caused by Improper Bonding of Cable Sheaths," Seminar, INMR, 2019.
- » J. T. Leman, "Induced Voltages in Underground Cable Sheaths and Parallel Conductors," Seminar, POWER Engineers Power Delivery Design Conf., ID, 2016.
- » J. T. Leman, "Thermal Impact of Steel Casing on Cable Current Ratings," Seminar, POWER Engineers Power Delivery Design Conf., 2016.
- » J. T. Leman, "Symmetrical Components & Fault Current Rating of Optical Ground Wires," Seminar, Duke Energy, Charlotte, NC, Mar. 2015.
- » J. T. Leman, "Enhancing High-Voltage Transmission Line Performance with Numerical Simulation," Virtual Seminar, IEEE Tech Brief, 2015.
- » J. T. Leman and R. Schaerer, "Quasi-electrostatic Induction on Stationary Vehicles under High Voltage Power Lines," Seminar, COMSOL Conf., Boston, MA 2012.
- » J. T. Leman, "Shield Wire Segmentation," Seminar, 45th Annual Transmission & Substation Design & Operation Symposium, Dallas, TX, Sep. 12-14, 2012.
- » J. T. Leman, "Electrical Performance of HVDC Overhead Transmission Lines," Seminar, EUCI & Western Area Power Admin., Sep. 2012.

EHV Cable Failure Evaluation

Engineer responsible for performing root-cause analysis for failure of an EHV cable termination between a GIS substation and a generator step-up transformer. Reviewed system designs and event data to prepare a list of possible failure causes. Completed 3D finite element analysis to evaluate electric field hypotheses regarding the failure. Presented findings and refuted erroneous claims of the cause of failure by a third party. As a result, the company represented was not named in subsequent litigation.

Underground Transmission Cable Derating Assessment

Engineer responsible for helping clients determine the impact of magnetically induced heating of steel casing and nearby steel structural members on cable ampacity. Prepared electromagnetic finite element models of the underground cable, steel components, and surrounding materials. The model included applicable magnetic properties, joule heating, and heat transfer characteristics of the cables and surrounding media. Performed simulations to identify cable derating, key technical constraints, and design recommendations.

RESEARCH

Washington State University PhD Dissertation (2021)

ELECTROMAGNETIC DESIGN METHODS TO MAXIMIZE TRANSMISSION LINE CAPACITY

The goal of the research was to refine transmission line analysis methods to facilitate the study of electrical design tradeoffs related to line capacity. Three practical contributions were made toward this goal.

- 1) A method to model attenuation from corona losses to refine statistical transient overvoltage simulations.
- 2) A method to efficiently compute electric fields from transmission conductors and nearby space charge. This allows explicit modeling of all subconductors in each phase bundle, including image charge effects.
- 3) A method to model the breakdown process of high voltage transmission lines such that phase spacing and detailed bundle geometry effects on flashover can be explicitly simulated.

These contributions facilitate a more cohesive and refined approach to electrical design of transmission lines using the correlation between electric field uniformity, transmission line capacity, and transient overvoltage susceptibility. The research was sponsored by American Electric Power through the Power Systems Engineering Research Center (PSERC), and by POWER Engineers, Inc.

University of Idaho Master's Thesis (2010)

DC SIDE FAULT CHARACTERIZATION ON MULTI-TERMINAL MEDIUM VOLTAGE DC GRIDS.

The U.S. Navy was considering multiterminal DC grids for shipboard power distribution systems and needed to understand how quickly such systems could be expected to respond to fault conditions. The goal of the research was to help fill this knowledge gap through simulation. A real-time model of a multi-terminal, medium voltage DC grid with controls was developed and validated. Various DC side fault scenarios were simulated, and the system response was studied. Controls were adjusted to minimize response time while characterizing performance tradeoffs.