



Hans Lehndorff

Senior Consultant



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EDUCATION

- > B.A., Economics and Religious Studies, magna cum laude, Willamette University, Salem, Oregon
- > Masters in Data Science, Willamette University

EMPLOYMENT

- > Evergreen Economics
2016 – current

Hans Lehndorff is an experienced evaluator with a focus on leveraging quantitative analysis and data science to creatively problem solve and deliver data-driven insights. He has extensive experience using R for data analysis, data visualization and machine learning, among other applications, and is also experienced in SQL and Python.

AREAS OF EXPERTISE

Hans has developed a deep knowledge of the methods required for successful analysis in support of Evergreen's impact and process evaluations, and has taken increasingly important roles on projects, including serving as research manager and project lead. He has contributed to numerous market research and assessment studies to support energy efficiency program evaluation and implementation, including low-income needs assessments, market characterizations, and market effects studies. Hans possesses particular expertise in quantitative research and analysis in support of energy efficiency program evaluations and market assessments.

SELECTED INDUSTRY EXPERIENCE

- > **Portland General Electric (PGE) Commercial Smart Thermostat Impact Evaluation**
Conducted billing analysis with a non-routine adjustment for the impact of the COVID-19 pandemic as well as telemetry analysis by an engineering firm.
- > **Residential HVAC/Domestic Hot Water (DHW) Performance and Potential Evaluation**
For the Connecticut Energy Efficiency Board, leading the analysis for a study to conduct metering at 150 sites, focusing on monitoring of both electric HVAC and water heating equipment. The Evergreen team's approach to long-term metering of HVAC and water heating equipment is designed to capture average electrical demand (kW and power factor) at 1-minute intervals for electric end uses.
- > **San Diego Gas & Electric Multifamily Common Area Measures (MF CAM) NMEC Analysis for PY2020**
Worked on database development, reviewed data and performed data quality control, and conducted analysis for a project to estimate the energy savings attributable to a low-income program intervention at 57 multifamily properties that participated in 2020.



SELECTED INDUSTRY EXPERIENCE (continued)

- > **2025 California Investor-Owned Utilities and the California Public Utilities Commission Low Income Needs Assessment**
Conducted sampling for survey effort and collected and cleaned the data for sampling for the fifth California statewide low-income needs assessment to inform the state's low-income utility weatherization program (specifically, the Energy Savings Assistance [ESA] program) and the primary low-income rate program (the California Alternative Rates for Energy).
- > **Southern California Edison San Joaquin Valley Disadvantaged Communities (SJV DAC) Pilot Impact Evaluation**
Collected and cleaned data for analysis, developed and implemented method for creating analysis comparison group, and conducted regression analysis to assess program impacts on bills and energy usage for an impact evaluation to estimate the energy usage, energy bills, and non-energy impacts of Southern California Edison's (SCE's) SJV Disadvantaged Communities (DAC) pilot.
- > **Pacific Gas and Electric San Joaquin Valley Disadvantaged Communities (SJV DAC) Pilot Impact Evaluation**
Developed survey sample frame and fielded paper surveys for an impact evaluation to estimate the energy usage, energy bills, and non-energy impacts of the SJV DAC pilot in the communities served by two program administrators, Pacific Gas and Electric (PG&E) and Richard Heath and Associates (RHA). This pilot offered no-cost electrification, remediation, and electric appliance upgrades to communities that were reliant on propane and wood-burning appliances. Also collected and cleaned data for analysis, developed and implemented method for creating analysis comparison group, and conducted regression analysis.
- > **Washington Wood Supply Study**
For the Washington Department of Natural Resources, managed and analyzed large geographic datasets for a wood study to estimate the current and future supply and demand for wood in Washington west of the Cascade crest based on the current forest practices of private forest landowners, state trust lands, and federal lands.
- > **Xcel Energy's Energy Action Days Behavioral Pilot Savings Verification**
Conducted impact analysis to estimate the energy savings achieved by a behavioral demand response pilot. This was a verification exercise, replicating the analysis and savings reported by a third party program implementer.
- > **MCE CalTRACK Technical Support**
In support of MCE's development of a web tool that will provide existing customer characteristics and site-level baseline energy usage model fit, developed code to implement billing analysis using openEEmeter and developed and led trainings on billing analysis. Evergreen is providing support with the development of baseline models, advising on the web tool's infrastructure, and providing ad hoc support to MCE's team.
- > **MCE Low Income Families and Tenants (LIFT) Program Evaluation**
Conducted regression analysis to analyze program impacts on bills and energy usage to characterize the LIFT program cycle and assess the persistence of savings since the beginning of the LIFT pilot.
- > **Northwest Energy Efficiency Alliance Reduced Wattage Lamp Replacement Long Term Monitoring & Tracking Study**
Research manager and project lead for long-term monitoring and tracking of NEEA's Reduced Wattage Lamp Replacement Program across the Northwest; the objective was to get a complete understanding of reduced wattage lamps and their place in the linear fluorescent lighting market as well as the effects of tubular LED lamps.

- > **Northwest Energy Efficiency Alliance Residential Laundry Field Study**
Conducted quality control of incoming metering data and conducted analysis of metering and self-report data for a field study of residential consumer laundry habits. This residential laundry field study leverages NEEA's current Residential Building Stock Assessment (RBSA) project to collect data on laundry habits in the region served by NEEA.
- > **Northwest Energy Efficiency Alliance 2022 Residential Building Stock Assessment**
For NEEA, developed, managed, and implemented large-scale data quality control effort; produced final deliverable dataset; and conducted various analyses to assist in the development of a current, robust, and representative characterization of the existing residential single-family and multifamily building stock in the Northwest.
- > **Pacific Gas and Electric Home Energy Use Survey for Codes and Standards Program**
Analyzed survey data to understand the saturation and typical use of a variety of household appliances including clothes washers, dishwashers, and computers. Other tasks for this project have included using on-site data to evaluate diversity and capability of electrical service panels. The study covers the residential sector, encompassing all electricity and natural gas-using equipment, as well as building shell characteristics and the presence of distributed generation (i.e., solar photovoltaic). This study is utilizing a rigorous sampling scheme of 1,000 homes representative of the customer population.
- > **Pacific Gas and Electric Multifamily Energy Use Study for Codes and Standards Program**
Analyzed survey data for an energy use study of multifamily buildings in California, which includes energy audits at 90 buildings across the state. The site visits include common areas and samples of tenant units. The data will be used to support the development of improved building codes.
- > **Energy Trust of Oregon Existing Buildings Program Process Evaluation**
For an evaluation of the 2017-2018 Existing Buildings program, led analysis for market characterization of commercial buildings. The program offers five tracks of participation (Direct Install, Lighting, Standard, Custom, and SEM) for commercial customers in Oregon and Southwest Washington.
- > **Energy Trust of Oregon Impact Evaluation of the 2015-2016 New Buildings Program**
Evergreen was a subcontractor for an evaluation to develop reliable estimates of gas and electricity savings by participants of the New Buildings program for the 2015 and 2016 program years. For this project, developed the sample design used for the evaluation and selected the sample; created case weights for the evaluated sites, estimated realization rates by program track, building type, and fuel; and conducted Monte Carlo analysis to develop confidence intervals for all realization rates.
- > **Avista Low Income Needs Assessment (Phase 1)**
Lead analyst for a project to estimate the size and composition of the population in Avista's Washington State service territory that is eligible to receive benefits from one or more of Avista's energy assistance programs, utilizing only existing data sources. Evergreen assessed the current program penetration rates, which are the number of households that have received assistance as a proportion of the total estimated number of eligible households within the service territory.
- > **Low Income Programmable Communicating Thermostat Time of Use Pilot Evaluation**
Conducted AMI billing data analysis for an evaluation of a pilot program focused on transitioning low income customers to time of use rates. The pilot was being conducted across three utilities (Southern California Edison, San Diego Gas & Electric, and Pacific Gas and Electric).
- > **Avista Evaluation of Income Based Payment Program and Balance Management Arrangement Pilot Programs**
Conducted impact analysis and database and billing regression support for evaluations of two pilot programs designed to improve service to the low-income sector to understand the impact of the program on energy burden, disconnection rates, and the effectiveness of engagement methods. In addition to more quantitative impact

analyses, Evergreen conducted surveys with customers and in-depth interviews with pilot program implementers including Community Action Agencies and Avista staff.

- > **Commonwealth Edison Income Eligible High User Needs Assessment**
Conducted quantitative analysis to locate likely income-eligible customers and characterize their energy usage for a needs assessment study. The study employed consumption data analysis, a quantitative customer survey, in-depth interviews, and in-home visits to investigate causes of high usage, customer needs, and opportunities for program engagement. Results will aid utility program staff and social service agencies partnering with the program to more effectively address the needs of eligible high users.
- > **Northwest Energy Efficiency Alliance Residential End Use Load Research Study** – Assisting with a residential energy monitoring field study including 400 on-site metering equipment installations across the Pacific Northwest. This study involves recruitment of participants, coordinating field staff, data quality control, and the development of a robust IT infrastructure and data entry tools.
- > **Statewide Evaluation of New Mexico Investor-Owned Utilities' Electric and Gas Energy Efficiency and Load Management Programs**
For the New Mexico Public Regulation Commission, assisted with a statewide evaluation of electric and gas energy efficiency and load management programs focusing on five New Mexico utilities, including process and impact analysis for programs serving the residential (including multi-family and low-income), commercial, and industrial sectors. Work included designing samples for phone surveys and engineering reviews that provided statistically robust results, and synthesizing surveys and engineering results to determine program savings.
- > **Consumers Energy Commercial and Industrial Programs Impact Evaluation**
Developed a stratified sample design for on-site evaluation of commercial and industrial customers' energy efficiency programs. This required using a variety of statistical methods to structure the data in a way that would limit variation within the sample while maintaining the feasibility of on-site evaluations. Other tasks have included calculating adjustment factors that compared expected program-level saving to actual on-site results.
- > **Pacific Gas and Electric Advanced Metering Infrastructure (AMI) Billing Regression Study Phase 2**
Conducted billing analysis to develop energy consumption load shapes for commercial customers using AMI data. These load shapes were used to explore the impacts that weather and usage patterns have on energy use.
- > **Alaska Medicaid Cost of Chronic Disease**
Conducted analysis of Alaska's Behavioral Risk Factor Surveillance System (BRFSS) survey and Medicaid claims data to estimate the prevalence of eight chronic diseases in Medicaid-eligible and non-Medicaid-eligible populations.
- > **Pacific Gas and Electric Clothes Washer and Dishwasher Usage Research**
Conducted analysis for a short-term longitudinal study investigating customer usage patterns for clothes washers and dishwashers over a weeklong period using an online survey.
- > **California Solar Initiative (CSI) Research, Development, Demonstration and Deployment (RD&D) Program Evaluation**
For the California Public Utilities Commission, conducted qualitative analysis of dozens of projects participating in the CSI program, which is aimed at funding innovative solar research to improve photovoltaic (PV) integration with transmission and distribution systems. Also assisted by recruiting project grantees, stakeholders, and experts for in-depth interviews regarding their assessment of the CSI RD&D program.

SELECTED PUBLICATIONS AND PRESENTATIONS

- > Lehndorff, Hans, Kevin Price, Mary Anderson, and David Clement. 2022. "The Spin Zone: Unravelling Clothes Washer and Dryer Usage Behavior from Energy Monitoring Data." Paper presented at the International Energy Program Evaluation Conference, San Diego, California.
- > Lehndorff, Hans, Kevin Price, and David Clement. 2022. "End-Use Level Impacts of the COVID-19 Pandemic on Residential Energy Usage in the Northwest." Paper presented at the ACEEE Summer Study on Energy Efficiency in Buildings, Pacific Grove, California.
- > Lehndorff, Hans, Kevin Price, Mary Anderson, and David Clement. 2020. "From Beginning to End-Use: Analysis Approached from Two West Coast Residential Energy Monitoring Studies." Paper presented at the virtual ACEEE Summer Study on Energy Efficiency in Buildings.
- > Lehndorff, Hans and Mary Anderson. 2019. "Quality and Quantity: An Innovative Approach to the Quality Control of Metering Data." Poster presented at the International Energy Program Evaluation Conference, Denver, Colorado.
- > Price, Kevin, Hans Lehndorff, and David Clement. 2019. "A New Data Resource for a Changing Climate Landscape." Paper presented at the International Energy Program Evaluation Conference, Denver, Colorado.