TERRENCE P. COYNE

Senior Principal Energy Consultant
Sargent & Lundy Consulting Group

Sargent & Lundy

Summary

Terrence Coyne has over 17 years of experience in power consulting services at Sargent & Lundy, including resource planning, financial and contract analysis, generation and electrical cost and performance studies, resource adequacy, production cost modeling, design of new power stations, technical and economic review of existing power stations, and various consulting services for utilities, developers, lenders, and independent power producers. Terrence has substantial experience with nuclear power, fossil (including coal, both simple- and combined-cycle facilities, and reciprocating engines), energy storage, and renewable energy (including PV, CSP, and wind power). Terrence is the company process owner for the resource planning process.

Education

- MBA—The University of Chicago Booth School of Business—2015
  - Concentrations: Finance, Economics, and Corporate Strategy
- MS Mechanical Engineering—University of Illinois at Urbana-Champaign—2009
  - Concentrations: Computational Fluid Mechanics, Thermodynamics, and Heat Transfer
- BS Mechanical Engineering—University of Illinois at Urbana-Champaign—2008

Registrations

Professional Engineer (Illinois)

Proficiencies

- Resource Planning
- System Resource Adequacy
- Financial and Contract Analysis
- Economic Analysis
- Renewable and Thermal Generation
- Energy Yield Resource Assessments
  Statistical Analysis
- Cost and Performance Analyses
- Independent Engineering
- Owner's Engineering
- Statistical Analysis
- Production cost modeling (PROMOD IV and PLEXOS)

Sargent & Lundy Selected Experience

Generator Capacity Resource Study for Maritime Electric and Ongoing Support

- Worked with Maritime Electric in Prince Edward Island, leading the preparation of a Capacity Resource Study for the purpose of evaluating a variety of different electricity capacity resource technologies. The work included developing cost estimates and ultimately recommending technologies best suited to help the utility cost-effectively achieve its most critical goals and needs.
    - Evaluated how the different capacity resources options would be able to help the utility serve system load in a situation where the island was disconnected from the mainland. Other generation adequacy considerations ultimately helped contribute to the final recommendations, including the estimated effective load carrying capability (ELCC) of the resource.
    - As part of this work, led the development of detailed overnight capital and operational cost estimates for the different technologies considered, including reciprocating engines, combustion turbines, onshore wind generators, solar PV, battery energy storage, and biomass power.
    - Continued support through preparation of an addendum to the study as a result of a subsequent polar vortex extreme cold event and subsequent adjustment to the load forecast.
    - Continuing regulatory and cost estimating support.

Confidential Cost and Performance Analysis

- Led the project team for a generation cost and performance analysis for a confidential utility client in the Midwest United States. Multiple generation types were considered, including simple cycle CTs, combined cycles (of various sizes), reciprocating engines, nuclear generation, wind, solar PV, battery energy storage, and coal-to-gas conversion.

Confidential Electrical System Replacement Cost Analysis

- Led the project team and performed analysis related to the preparation of a replacement cost new (RCN) estimate for the entire electrical system (transmission and distribution) within the boundaries of a large major city in the United States. Assets considered included overhead and underground conduits, substations, distribution and transmission conductors, electrical subsurface structures, transformers, switches, and other similar electrical system assets. Work was associated with the potential separation of the city from the utility.

Confidential Cost and Performance Analysis

- Led the project team for a generation cost and performance analysis for a confidential utility client in the United States. Generation types considered in the analysis included combined cycles (of various sizes), engines, simple cycle CTs, nuclear generation, wind, solar PV, biomass, hydroelectric, fuel

cells, geothermal, and battery energy storage.

Technical Advisory Services for the Virgin Islands Water and Power Authority

- Led the preparation of both a PLEXOS production cost modeling and resource adequacy analyses for the islands of St. Thomas, St. John, and St. Croix in the U.S. Virgin Islands.
    - The PLEXOS production cost model was used to help estimate fuel costs and system dispatch for a variety of different system operating scenarios.
    - The resource adequacy tool developed for the Virgin Islands quantifies system resource adequacy with respect to loss of load expectation (LOLE), loss of load hours (LOLH), and expected unserved energy (EUE).

Confidential Business Case Analysis

- Led the preparation of a business case analysis to evaluate the conversion of existing simple cycle combustion turbine generators into a combined cycle configuration. The analysis incorporated the unique financial, economic, and technical considerations associated with the conversion project and compared the project to alternative generation options the utility might consider.

Technical Advisory Services for LUMA Energy

- Led the preparation of a resource adequacy analysis for the entire electrical system of Puerto Rico. As part of this work, developed a probabilistic simulation tool to evaluate generation adequacy from a statistical perspective (using a Monte Carlo analysis).
    - The tool developed quantifies system resource adequacy with respect to loss of load expectation (LOLE), loss of load hours (LOLH), and expected unserved energy (EUE).
    - Various different scenarios were analyzed, including the evaluation of the current system, the system with increasing amounts of renewable energy in the future, expanded demand response initiatives, the addition of dispatchable generators, the addition of energy storage, and other related scenarios.
    - The public version of the report can be found here: https://energia.pr.gov/wp-content/uploads/sites/7/2022/09/Motion-to-Submit-Lumas-Resource-Adequacy-Study-NEPR-MI-2022-0002.pdf

Technical Advisor on Resource Adequacy for Newfoundland Power

- Providing advisory services to Newfoundland Power related to both resource adequacy and long-term planning topics in the region. In addition to advisory services, represented Newfoundland Power as part of technical proceedings as a technical advisor

Technical Advisory Services for the Puerto Rico Electric Power Authority

- Lead Project Manager for Sargent & Lundy's resource planning, economic, and financial analysis teams for our work on the island. Work includes developing short- and long-term generation planning

recommendations and associated quantitative analysis.

- Helped develop both PROMOD and PLEXOS production cost models of the island's electrical system to aid in strategic planning and cost forecasting initiatives.

- Helping lead the long-term fuel procurement strategy and contract negotiations efforts on the island. Work included long-term forecasting of fuel consumption (both liquid fuels and natural gas), contract negotiations and associated financial analyses, and strategic planning of fuel distribution.
- Participated in contract negotiations on behalf of the electrical utility to extend the contract of an existing independently owned combined-cycle facility. Overall contract scope included both gas supply and power delivery with the overall contract value at over $5 billion over the lifetime of the agreement.
  - Led the analysis team in developing a financial model to quantify the value of the contract for the utility. Financial analysis included investigation of various financing terms, fuel commodity price scenarios, and other related variables. The financial analysis fed larger strategic decision making, which Sargent & Lundy also helped prepare.
- Developed a model used to forecast island fuel orders (both liquid fuels and natural gas) on a rolling three-month forward-looking time period. The model accounts for facility fuel storage capabilities, consumption, barge and ship supply quantities, fuel commodity pricing, and other related variables. Additionally, the model benchmarks generating facility heat rate curves with existing consumption data to properly capture facility fuel burn.
- Developed a depreciation study to quantify the utility's depreciable assets and total depreciation per year. The study helped determine the absolute book value of assets for the utility's financial disclosures and internal accounting groups. Work entailed sorting through and categorizing over 200,000 individual assets, assigning appropriate depreciation curves to each asset, and making manual adjustments as needed to incorporate up to date inspection information.

Confidential Midwestern U.S. Utility Resource Planning Study | United States

- Leading a project to investigate different retirement / modification scenarios for both a medium-sized coal-fired power plant and an existing natural gas fired simple cycle unit
- Work includes the development of a PLEXOS production cost model that considers various sensitivity analyses
  - A total of ten different replacement/modification options were analyzed, including renewable and thermal replacement generation
  - Analysis also considered a one-month high severity weather simulation (categorized by both high locational marginal prices and fuel prices) to investigate generation portfolio operation and costs during an event similar to the February 2021 U.S. Polar Vortex
- All costs feed into a net present value of production costs analysis

Confidential Solar PV Developer | United States

- Leading a project to investigate potential transmission congestion and associated curtailment for a solar PV developer in ERCOT
- Work includes the development of a PLEXOS production cost model and utilization of existing ERCOT interconnection queue data to capture future generation in ERCOT (when the solar PV power plant is forecasted to enter into commercial operations)
- The curtailment impact of a BESS installation at the project site is investigated

System Flexibility Study for a Western U.S. Utility | United States

- Leading a project to develop a PLEXOS-based production cost model of the utility's electrical system to evaluate various long-term planning scenarios
    - PLEXOS model considers over 100 generating units, economic market interactions, contracted energy, and other related items
    - Work includes validation of forecasted production costs and technical inputs for the electrical system operation
- Model is being used to perform a system flexibility study, specifically with the goal to determine needed changes to the utility's existing generation portfolio to facilitate the integration of large amounts of variable renewable generation.
    - Considerations to improve system flexibility include the integration of battery energy storage and flexible thermal generation, modifications to improve the flexibility of existing generators, changes to system operational reserves, and other similar items.

Confidential Wind Developer | United States

- Leading a project to investigate potential transmission congestion and associated curtailment for a wind developer in ERCOT
- Work includes the development of a PLEXOS production cost model and utilization of existing ERCOT interconnection queue data to capture future generation in ERCOT (when the wind power plant is forecasted to enter into commercial operations)

Confidential Southwestern U.S. Utility Planning Analysis | United States

- Led a project to investigate different retirement / modification scenarios for a coal-fired power plant
- Developed a production cost model that considered various sensitivity analyses
    - A total of five different replacement/modification options were analyzed, including renewable and thermal replacement generation and various combinations of new generation and / or modifications (i.e., conversion of the coal power plant to burn natural gas) to the existing site
- All costs feed into a net present value of production costs analysis