Distribution Systems Planning

Distributed energy resources (DERs), including energy efficiency, demand response, distributed generation, batteries, and electric vehicles, provide a wide range of opportunities to make the electricity grid more efficient and less costly. Planning for and integrating DERs into a reliable and resilient electricity grid creates some of the most exciting challenges and opportunities of the evolving electricity landscape.

In order to optimize the deployment of DERs, state commissions and utilities must embrace effective distribution system planning practices. This requires recognizing the engineering and operational challenges of DERs, as well as the potential for DERs to defer or avoid costly investments in conventional distribution technologies. Effective distribution system planning requires a robust, transparent approach; meaningful stakeholder input; accounting for and promoting customer adoption of DERs; accounting for and enabling third party development of DERs; and the ability to spur the development of DERs in locations where they can contribute the most value.

Synapse understands how various approaches to distribution system planning can enable states and utilities to prepare for increasing penetrations of electric vehicles, dispatch flexible-demand resources, manage two-way power flows from distributed generation and storage, and deploy DERs as non-wires alternatives (NWAs) to conventional distribution facilities.

Modeling

Synapse performs operational and planning modeling analyses of electric power systems using industry-standard models to evaluate long-term energy plans, assess the environmental and economic impacts of policy initiatives, and review utility system modeling. In addition to our power sector modeling, Synapse frequently incorporates the use of economic models to estimate impacts of electric sector policies and investments on employment, gross domestic or state product, and other metrics. Our expertise includes the detailed representation of spending patterns for construction and operation for each energy resource type.

Power Sector Models: Strategist, EnCompass, Market Analytics, PROMOD, and PLEXOS

Economic Models: REMI, IMPLAN

Models developed in-house: Multi-Sector Emissions Model (M-SEM) and the U.S. Environmental Protection Agency AVERT displaced emissions model.

Synapse Energy Economics has over 20 years of experience as a leader in integrated resource planning, and we are now applying that expertise to the challenges of distribution system planning. We also have extensive expertise in technical and economic analyses of energy efficiency, distributed generation, and other DERs, as well as capabilities for utilizing several electricity system operational and planning models. Together, these skills and tools make Synapse highly qualified to provide expert advice on the full range of issues related to distribution system planning.

Relevant Projects

New York REV: Distributed Energy Resources

Client: Natural Resources Defense Council

The New York Public Service Commission has undertaken an ambitious initiative to improve system efficiency, empower customer choice, and encourage greater penetration of clean generation and efficiency technologies: the *Reforming the Energy Vision* initiative. Synapse reviewed and critiqued the Distribution System Implementation Plans filed by all New York electric utilities, with an emphasis on distribution load forecasting, assessment of the potential for distributed energy resources, identification of NWAs, and utilization of resources developed by third-parties. Synapse has also been engaged in several other aspects of the NY REV process, including benefit-cost analyses, utility business models, and performance incentive mechanisms.

Integrated Resource Planning

Synapse reviews electric utility Integrated Resource Plans (IRP) and pre-approval applications. We have the ability to run nearly every capacity expansion or production-cost model used by utilities to replicate, assess, and improve resource planning outcomes. This ability, paired with our insight into modeling techniques and assumptions, allows us to provide analyses and review at an unparalleled level of depth. We:

- Review technical and economic aspects of supply- and demand-side resources
- Examine and critique utilities' demand forecasts
- Assess regulatory policies used to promote and guide IRP
- Guide IRP processes through stakeholder engagement

We helped draft integrated resource planning rules on behalf of the Puerto Rico Public Service Commission and worked with EPA to draft guidance on state planning processes for regulatory compliance. Our staff authored a highly-cited IRP Best Practices guide and EPA's Guide to Action chapter on resource planning practices.

Grid Modernization in MA, NH, and RI: Synapse has participated in grid modernization working groups in all three states, covering a range of topics including the role of distribution system planning. In Rhode Island Synapse has been working closely with the consumer advocate office to develop straw proposals and lead the discussions of the state's aggressive power sector transformation initiative.

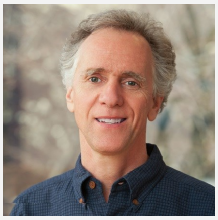
Grid Modernization in the District of Columbia, *Client: DC Department of Energy & Environment*. Synapse provided technical support regarding several aspects of grid modernization, including DER policies, time-of-use rates, and an NWA analysis of a substation upgrade.

Strategic Electrification, *Client: Northeast Energy Efficiency Partnerships*. Synapse and Meister Consultants Group identified the opportunity, costs, and benefits available if strategic electrification is adopted as a key strategy for decarbonization in New York and New England. The resulting report, *Northeastern Regional Assessment of Strategic Electrification*, characterizes current markets for efficiency electrification technologies, identifies policies to overcome market barriers, assesses the state of electrification technologies, and models the extent of electrification both possible given market dynamics and required to meet regional greenhouse gas emission goals.

Grid Modernization in Massachusetts, *Client: Conservation Law Foundation.* Synapse reviewed the grid modernization plans of three electric utilities in Massachusetts: Eversource, National Grid, and Unitil. Mr. Woolf and Dr. Horowitz filed testimony critiquing the methodologies and assumptions used by the companies and assessing the extent to which the plans meet Department of Public Utilities objectives for grid modernization, with particular focus on the plans' incorporation of DERs.

Energy Strong Program, *Client: NJ Division of Rate Counsel* Synapse performed a technical and engineering assessment of Energy Strong, PSE&G's program to harden utility infrastructure and guard against extreme weather. Synapse continues to support Rate Counsel in the oversight of a program to harden, rebuild, or eliminate 29 substations impacted by Superstorm Sandy, as well as a program to install advanced distribution and reconfiguration technologies to provide resiliency benefits to critical infrastructure across the PSE&G service territory.

Evaluation of Metrics for Smart Grid Initiatives, *Client: Maryland Office of People's Counsel.* Evaluated metrics for smart grid initiatives proposed by BG&E and PEPCO: reductions in energy prices, avoided capacity costs and reductions in capacity prices enabled by peak time rebates and reports to customers on their usage, and Conservation Voltage Reduction.



Tim Woolf
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Tim Woolf has over 30 years of experience analyzing technical and economic aspects of energy and environmental issues. In recent years he has focused on all topics related to power sector transformation, including: cost-benefit analyses of DERs, assessment of non-wires alternatives, distribution system planning, performance-based regulation, new utility business models, and related ratemaking issues. He served four years as a commissioner at the Massachusetts Department of Public Utilities.

Asa Hopkins, PhD
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Asa Hopkins, PhD, is an expert in the development of public policy and regulation regarding energy and greenhouse gas emissions, including cost-benefit analysis, stakeholder engagement, state energy planning, and utility planning. At Synapse he focuses on distributed energy resources, strategic electrification, non-wires alternatives, and performance-based regulation.

Melissa Whited
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Melissa Whited specializes in utility regulation and rate design issues, particularly in response to changes in the electricity industry spurred by declining energy use and increasing penetration of DERs. She consults on tools to effectively address these changes, including performance-based regulation, revenue decoupling mechanisms, and innovative rate design.

Ariel Horowitz, PhD
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Dr. Ariel Horowitz is an expert in data analysis and energy systems and technologies. At Synapse, she performs policy, cost-benefit, emissions impact, and technical potential analyses. She provides technical assistance to the Puerto Rico Energy Commission on integrated resource planning, revenue requirements, and utility performance issues.

Bob Fagan
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Bob Fagan is a mechanical engineer who has analyzed energy issues for 25+ years. His expertise includes: Economic and technical analysis of electric supply and delivery systems; wind and solar integration into utility systems; energy modeling; wholesale and retail electricity provision; energy and capacity market structures; and assessment and implementation of demand response alternatives.

Max Chang
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Max Chang provides economic analysis of technologies and policies, performs electricity policy modeling, evaluates distribution system infrastructure, and evaluates air emissions. His recent projects have focused on distribution system investments, technology strategy, and reliability metrics and infrastructure issues in utility rate cases.

Synapse is a research and consulting firm specializing in energy, economic, and environmental topics. Since its inception in 1996, Synapse has grown to become a leader in providing rigorous analysis of the electric power sector for public interest and governmental clients. We analyze electric-sector planning, regulation, and policies in states, regions, and market structures across the nation.

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