



encoord: Optimizing the Energy Transition

— To help the power and utilities sector better prepare for the energy transition, encoord uses integrated modeling and advanced optimization methods powered by Gurobi.

The power sector today is confronted with complex planning decisions driven by local demand growth, technological innovation, and the need for infrastructure resilience.

encoord, an energy modeling software company, serves a wide range of customers in the energy sector—including electric and gas utilities, network operators, asset and technology developers, engineers, consulting firms, regulatory organizations, and energy traders.

What do these parties have in common? They all want to understand how energy markets and networks will behave and respond to external conditions under a broad range of future scenarios.

Navigating a Complex Planning Environment

Today's energy planning landscape is defined by several interconnected challenges. For one, the complexity of planning is escalating as energy demand rises annually at the local level and new technologies proliferate across electricity, gas, and other sectors.

Meanwhile, the risk profile of energy infrastructure is shifting, with severe weather events and geopolitical crises underscoring the need for enhanced resilience. In addition, the industry's decarbonization goals drive the need for renewable energy integration, green hydrogen, electrification of gas customers, and other solutions.

One of the most persistent structural problems in utility planning is that generation planning and transmission planning have historically been run as separate processes. Generation planners optimize the resource mix against forecast demand; transmission planners separately assess whether the grid can physically deliver that generation. The two analyses use different tools, different assumptions, and often contradictory data. The result: a utility can identify what appears to be the least-cost generation portfolio, only to discover—after separate transmission analysis—that significant grid upgrades are also required.

The total cost of the plan turns out to be far higher than anticipated, and the planning cycle begins again.

Solving for the optimal generation dispatch across a realistic utility fleet—incorporating unit commitment constraints, AC power-flow feasibility checks, and N-1 contingency analyses across thousands of operating conditions—requires solving large-scale mixed-integer programs where generation decisions and network constraints are evaluated simultaneously. Gurobi's solver performance is what makes it practical to run this analysis at the scale utilities actually need: hundreds of scenarios, sub-hourly resolution, full network representation.

In such a challenging and fast-changing planning environment, mathematical optimization can provide the answers that planners and energy system operators need.

Smarter Planning with SAInt (Scenario Analysis Interface for Energy Systems)

“Energy planners and operators around the world have a very large number of potential decisions they can make at any given time,” explains Dr. Kwabena Pambour, co-founder and CTO of encoord. “For example, a power system operator must decide which generators to dispatch every minute of every hour of every day, and they want to do that at the lowest possible cost for the consumer, while also maintaining the reliability and the resiliency of the power system. They need optimization models to understand the optimal way to operate the system at any given moment.”

Further complicating these decisions is the inherent uncertainty of renewable energy sources.

“You can forecast what the demand, or what the wind or solar generation, is going to be in the next five minutes or even the next three days—but you're always going to be a little bit off, because you can't perfectly forecast the future,” says Dr. Pambour.

Industry	Power & Utilities
Location	Global
Use Cases	Integrated Generation and Transmission Planning; Resource Adequacy; Power Systems Optimization.
Website	www.encoord.com

encoord develops SAInt, the integrated planning platform that enables utilities and system operators to coordinate generation and transmission planning in a single workflow — delivering least-cost plans that are validated against real network constraints.

Results

- ◆ A single integrated workflow that connects generation dispatch optimization with AC power-flow and contingency analysis — exposing reliability violations that siloed planning processes miss entirely.
- ◆ Least-cost planning that is actually reliable: encoord's utility customers identify the optimal, reliability-validated generation mix without reconciling incompatible outputs from separate tools.

That's why encoord developed SAInt. SAInt is an integrated planning platform that connects generation dispatch optimization with AC power-flow analysis and contingency assessment in a single coordinated workflow — enabling utilities to identify the most reliable, cost-effective combination of generation and transmission resources without reconciling outputs from separate models. Its integrated approach allows planners and stakeholders to quantify tradeoffs between different planning metrics (such as cross-reliability and environmental impacts), and coordinate decisions that were previously made in isolation.

“Today's utilities run generation planning and transmission planning in separate tools, with separate teams, using assumptions that often contradict each other. The cost of that disconnect shows up in capital investment decisions that look optimal in isolation but create reliability problems the other team discovers months later. SAInt eliminates that handoff,” says Dr. Carlo Brancucci, co-founder and CEO of encoord.

For example, utilities can assess the reliability impact of new generation resources—solar, wind, storage, or thermal additions—directly against their transmission network model, identifying violations and optimal investment strategies within a single planning workflow. This holistic modeling not only enhances resilience but also supports decarbonization goals through more informed and strategic investment and operational choices.

Gurobi: Providing Advanced Optimization for Energy Systems

For simulation models, the encoord team develops their own solvers. But for optimization, as Dr. Brancucci explains, “We wanted to partner with the best vendor out there.”

Gurobi's solver provides the computational performance necessary to solve the large-scale mixed-integer programs at the core of integrated G&T planning—where generation unit commitment, economic dispatch, and network feasibility constraints must be evaluated simultaneously across thousands of operating conditions. By leveraging Gurobi's capabilities, encoord enables users to identify optimal solutions for resource allocation, system expansion, and risk mitigation, even in the face of rapidly changing market and technical conditions.

Furthermore, Gurobi's solver integrates seamlessly with SAInt's flexible APIs, which allows users to run sophisticated scenario analyses with speed and accuracy.



This ensures that energy professionals can explore a wide range of planning options, quantify trade-offs, and make decisions that balance cost, reliability, and sustainability.

“We were really impressed by Gurobi's research and development efforts, and their commitment to developing better solutions for their customers. But there was also a clear cultural fit,” says Dr. Brancucci. “We both want to make the world a better place by helping decision makers make better and faster decisions. And when it comes to the energy transition, it is crucial that we make the right decisions, fast.”

Optimizing the Energy Transition, Together

Together, encoord's SAInt solution and Gurobi's solver deliver tangible benefits for energy sector stakeholders. encoord's utility customers have quantified the true cost of integrated generation and transmission plans—identifying reliability violations that siloed planning processes miss and surfacing investment strategies that are both cost-optimal and grid-feasible. Planning cycles that previously required multiple rounds of tool reconciliation now run as a single coordinated workflow.

As generation interconnection requests accelerate and transmission constraints tighten, the ability to evaluate generation and

transmission decisions together—not sequentially—will define which utilities can plan cost-effectively for the grid they are building. encoord and Gurobi are providing the computational foundation for that shift.

Through their collaborative approach to innovation, encoord and Gurobi are helping to shape a more resilient, efficient, and sustainable energy future for all stakeholders.

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