Optimizing Nordic District Heating

How OpenSTEF Powers 40% of Sweden's Heat Production

SUMMARY SIGNAL

This case study explores how Sigholm, a Nordic energy technology company specializing in digital optimization and forecasting for district heating and combined heat and power systems, implemented LF Energy's OpenSTEF as the forecasting engine behind Aurora by Sigholm®. The study examines how OpenSTEF supports large scale forecasting for thermal energy production and enhances operational decision making across the Nordic region.

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OVERVIEW

Sigholm implemented LF Energy OpenSTEF as the forecasting engine behind Aurora by Sigholm® (AbS), its production optimization platform for district heating and combined heat and power systems. Nordic energy producers needed accurate, scalable, and continuously updated forecasts to schedule production effectively. Without reliable predictions for electricity prices, weather conditions, and multiple heat loads, operators could not optimize electricity price arbitrage, asset utilization, or heat demand matching.

By adopting OpenSTEF's machine learning based forecasting technology and integrating it into a cloud native architecture, AbS achieved high volume, high accuracy forecasting at operational scale. The system now generates approximately 20,000 forecasts per week across customer facilities and completes each forecasting cycle in about 4 seconds. This work has demonstrated the viability of OpenSTEF as a foundation for production grade forecasting in thermal energy systems.

THE SOLUTION

Sigholm implemented OpenSTEF as the core forecasting layer for Aurora by Sigholm® (AbS) and deployed it as an automated machine learning pipeline running in the cloud. Although OpenSTEF was originally developed for short term net load forecasting on electrical grids, this project applied the framework to district heating for the first time. The work shows how OpenSTEF's modular architecture can adapt to fundamentally different forecasting domains, supporting both electrical and thermal systems with the same underlying engine. Its flexible model structure allowed multiple forecasting approaches to run simultaneously, with each facility receiving a model tuned to its specific operating conditions.

Key advancements included:

- **Automated Forecast Pipelines:** Hourly workflows generate updated weather, heat load, and price forecasts that feed directly into optimization algorithms.
- **High Speed Processing:** The full workflow executes in approximately 4 seconds, even when processing thousands of data points and multiple heat load types.
- **Adaptive Forecasting Engines:** Each facility receives forecasting models aligned with its operational profile, and weekly automated retraining ensures that improved models are only deployed when their performance is verified.
- **Scalable Infrastructure:** Cloud native implementation scales automatically to handle fluctuating computational demand without manual intervention.

These capabilities enabled Sigholm to support district heating operators of varying sizes across Sweden, Norway, and Finland, demonstrating that OpenSTEF can extend beyond electrical load forecasting to deliver reliable forecasting for complex thermal energy systems.

RESULTS

The OpenSTEF based forecasting system has transformed production optimization across the Nordic region. Aurora by Sigholm® (AbS) now supports approximately 40 percent of Sweden's district heating production, with accuracy levels that are comparable to national weather service predictions.

Forecasting reliability enables operators to optimize electricity price arbitrage, align production with heat demand, and integrate renewable or waste heat sources more effectively. Customers report significant operational savings through improved asset utilization, optimized fuel selection, and elimination of manual forecasting work.

AbS achieved perfect scores, 10 out of 10, in multiple procurement evaluation categories and is recognized as the leading CHP optimization platform in the Nordic region.

NEXT STEPS

Sigholm is committed to expanding its contributions to the OpenSTEF community. Planned areas of focus include:

- Contributing technical enhancements and heat production domain expertise to strengthen forecasting for thermal energy systems
- Supporting grid congestion management applications for utilities using OpenSTEF based forecasting
- Sharing implementation experience to help position OpenSTEF as an international standard for short term forecasting across electrical and thermal domains

This initiative shows how OpenSTEF enables scalable forecasting systems that support reliable operations, regional energy planning, and the broader transition to sustainable energy in the Nordic region and beyond.

FAQs

How does OpenSTEF support operational scale forecasting?
It provides modular forecasting pipelines, automated workflows, and cloud native scalability.

What regions currently use Aurora by Sigholm® with OpenSTEF?
Sweden, Norway, and Finland.

How frequently are forecasts generated?
Automated workflows update forecasts every hour.

What types of heat loads are supported?
District heating, district cooling, steam, and industrial waste heat.

ABOUT OPENSTEF

OpenSTEF is an open source short term forecasting framework designed to support electricity, thermal, and multi vector energy systems. It provides modular forecasting pipelines, automated retraining, and scalable cloud native deployment for operational energy forecasting.

Visit lfenergy.org/projects/openstef

ABOUT LF ENERGY

LF Energy is an open-source foundation within the Linux Foundation dedicated to accelerating the energy transition through collaborative software, hardware, and data initiatives.

Learn more at lfenergy.org

ABOUT SIGHOLM

Sigholm is a Nordic energy technology company focused on digital tools that improve operational planning and decision making for district heating and combined heat and power systems. The company develops forecasting, optimization, and analytics platforms that support utilities in managing thermal assets, aligning production with demand, and integrating renewable and waste heat sources. Through its AbS platform, Sigholm works with operators across the Nordic region to advance data driven planning and scalable digital infrastructure for thermal energy systems.

Read on here: aurorabysigholm.com/en/

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