

Parent Organization
EnBW Energie
Baden-Württemberg AG

Headquarters
Karlsruhe, Germany

Industry
Energy Service Provider

Bloom Installation
300 kW Primary Power
with Heat Capture



Executive Summary

EnBW with its affiliated company Geothermie-Gesellschaft Bruchsal GmbH, deployed a Solid Oxide Fuel Cell (SOFC) system at its Bruchsal geothermal facility to power auxiliary operations and supply district heating. The 300 kW installation delivers continuous baseload electricity at 54% efficiency, outperforming conventional gas engines by 15-25%, while capturing high-grade exhaust heat for municipal heating infrastructure.

The site serves also as an EnBW research platform for analyzing SOFC performance across efficiency, thermal integration, durability, economics, and emissions. Currently natural gas-powered, the fuel-flexible system can transition to green hydrogen without major modifications, supporting long-term decarbonization goals.



The fuel cell system is highly versatile and easily scalable to meet the specific requirements of industrial, municipal, and data center applications. Our installation in Bruchsal provides critical, long-term validation of the technology's efficiency, robustness, and economic viability.

Markus Edel

Group Expert for Fuel Cells, EnBW

Key Values

1.

Industry-Leading Electrical Efficiency

54% lifetime efficiency.

2.

High-Grade Thermal Integration

Direct thermal recovery simplifies district heating integration without complex heat-recovery hardware.

3.

>80%

Combined electrical + thermal efficiency.

4.

Fuel-Flexible Platform

Engineered for seamless transition from natural gas to hydrogen without major hardware modifications.

Bridging the Energy Transition Gap

Decarbonization Mandates & Asset Longevity

Germany's Energiewende and Baden-Württemberg's 2040 carbon neutrality targets require immediate, low-emission and dispatchable power without “fossil fuel lock-in.” Traditional combustion-based heat capture systems, without an option to switch to carbon/free fuels and gases, risk becoming stranded assets as emissions regulations tighten.

The Bloom Solution

Provides a modular bridge to the hydrogen economy, scaling carbon-neutral power as green hydrogen infrastructure matures.

Meeting Energy Demand On-site

Geothermal facilities are capable of satisfying significant energy demands sustainably for both heat and electric power. The Bruchsal plant contributes significantly to the heat and electricity needs of the local community. However, such geothermal plants also consume power to operate pumps and other auxiliary devices.

The Bloom Solution

This dedicated solution with heat capture reliably provides power for these internal loads in a firm and weather-independent manner.

Simplifying District Heating Integration

Expanding Bruchsal's district heating network requires reliable thermal supplements with minimal technical complexity. The SOFC with heat capture can be easily installed and integrated into facilities of different size and type and minimizes operational burdens for local teams.

The Bloom Solution

High-grade exhaust profile enables streamlined, single-stage heat recovery (engineered by 2G Energie AG) with low integration costs.



For years, the Bruchsal facility has demonstrated the high potential of our regional geothermal resources. By integrating innovative technologies like lithium extraction and now this high-efficiency proven fuel cell plant, we are establishing Bruchsal as a premier hub for forward-looking, sustainable energy solutions.

Sven Weigt

Mayor of Bruchsal

Solution Architecture



Electrical Integration & Facility Load

The 300 kW SOFC-heat capture system provides dedicated, weather-independent baseload power to support the facility's auxiliary power.

- **Operational Support:** Powers critical auxiliary equipment, including main circulation pumps, control systems, and cooling infrastructure.
- **Research Enablement:** Provides the reliable power required for Bruchsal's intensive lithium extraction research and processing systems.
- **Hybrid Renewable Strategy:** Augments the existing (0.58 MW electrical and about 6 MW of geothermal heat) to create a resilient, high-efficiency power hub.

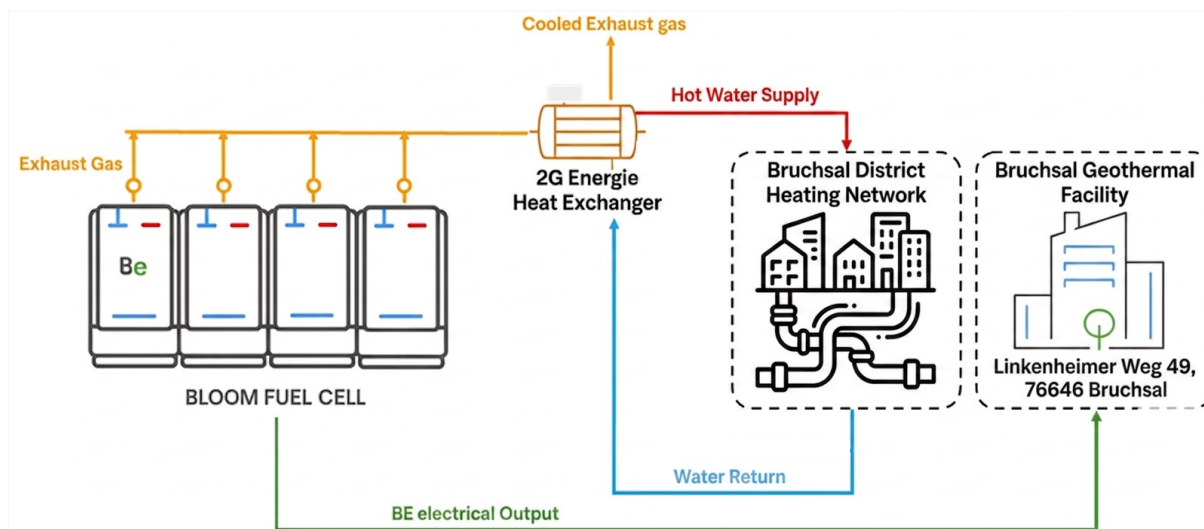
Thermal Integration & Recovery Loop

A design-build contractor engineered the heat recovery infrastructure to bridge the SOFC exhaust with the municipal network.

- **High-Grade Heat Capture:** Harnesses up to 350°C exhaust to deliver ~160 kW of thermal output via custom heat exchangers and thermal buffering.
- **System Efficiency:** Productive waste heat utilization drives total system efficiency up to 85%, representing a state-of-the-art energy utilization.
- **District Heating Export:** This heat supplements the site's about 6 MWth (thermal) geothermal thermal output, positioning the facility for a full municipal connection.



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Performance Metrics

Operational Performance

Electrical Output	~2,365 MWh annually at >54% LHV electrical efficiency (90% capacity factor)
Thermal Output	~160 kW (~1,191 MWh annually) up to 350°C
Fuel Savings	25% reduction ¹ in natural gas consumption vs. gas engines

Environmental Impact

NOx Emissions	<0.1 mg/Nm ³ (>99% lower than gas engine heat capture systems) ²
Carbon Intensity	300g CO ₂ /kWh (20% reduction vs. German grid average) ³
Regional Alignment	Supports 2040 carbon neutrality mandate and National Hydrogen Strategy

Strategic Validation & Future-Proofing

Hydrogen Readiness	Fuel-flexible and engineered for hydrogen transition without major hardware modifications.
Research Utility	Long-term data collection platform for SOFC efficiency stability, robustness, and techno-economics in industrial and municipal applications.
Scalability	Demonstrates technical viability for larger-scale deployments in district heating, industrial manufacturing, and data center environments.

Strategic Insights Summary

The Bruchsal installation validates SOFC performance for broader industrial and municipal applications, providing a technically proven blueprint for hydrogen-ready baseload power across Europe's data center, industrial manufacturing, and district heating sectors.

Bloom Energy's partnership with a local EPC partner demonstrates effective risk distribution, with Bloom providing core SOFC technology whilst the EPC partner manages balance-of-plant engineering, permitting, and thermal integration to ensure seamless infrastructure connectivity within Germany's regulatory framework. Superior electrical efficiency offsets SOFC capital costs by maximizing fuel-to-power conversion, while hydrogen readiness mitigates stranded asset risks and enables investment in baseload infrastructure that remains viable throughout Germany's energy transition.



Our CHP Energy Servers are purpose-built for markets demanding high-efficiency, low-emission, and reliable baseload power. This inaugural German installation signals a significant milestone in our commitment to supporting Europe's energy transition and decarbonization goals.

Aman Joshi
Chief Commercial Officer,
Bloom Energy

¹ <https://www.sciencedirect.com/;deep-dive-bloom-energy>
² [nox-emission-reduction](#)
³ <https://www.electricitymaps.com/grid-in-review-2025/germany>