North America's largest green hydrogen production plant uses a combined heat and power plant Source: 2G Energy

Green Hydrogen and Biogas in Harmony: CHP Makes It Possible

Many countries view biogas and hydrogen economies as competitors when discussing energy systems. However, a Tranquility, California project demonstrates that both can work wonderfully together. The U.S.-based CHP Alliance awarded the site the "2024 CHP Project of the Year". A combined heat and power (CHP) plant provides both electricity from biogas for electrolysis and heat for the biological fermentation process.

Under the project name SoHyCal, North America's largest green hydrogen production plant began operating in mid-2024 in Tranquility, California. Developed by H2B2 Inc., a global provider of integrated green hydrogen energy solutions, the plant is designed to produce up to 3 t of green hydrogen daily. This significant output will significantly contribute to the region's energy transition, particularly in the transportation sector. This amount of hydrogen is sufficient to fuel up to 210,000 cars or 30,000 city buses entirely with hydrogen.

Electrolysis: A key component of the energy transition

As a mission-driven leader in the energy transition, H2B2 is dedicated to supporting global initiatives aimed at reducing CO_2 emissions and promoting clean energy through its innovative projects. Although hydrogen has garnered significant attention in recent plans and declarations, few projects have progressed to actual implementation on a global scale.

H2B2 operates on a vertically integrated and comprehensive business model that encompasses every phase of the hydrogen value chain – from development, permitting, and construction to the operation and transportation of hydrogen. Pedro Pajares, CEO of H2B2 USA, emphasizes that „SoHyCal is a cornerstone of California's commitment to developing and promoting clean, sustainable hydrogen technologies. This project will play a significant role in meeting the increasing demand for hydrogen, particularly in the transportation sector, helping to reduce emissions and decarbonise mobility."

The implementation of SoHyCal is a technological milestone and an important public demonstration of the ongoing development of the hydrogen economy in California and beyond. Amid geopolitical crises and public scrutiny of energy policies worldwide, the project is a powerful example of how a transition to a sustainable and economically viable energy supply is achievable when innovative technologies are integrated harmoniously.

In its initial phase, the facility operates with a 3 MW PEM electrolyser, which will expand to 9 MW by the end of 2025. This expansion demonstrates the project's scalability in meeting the increasing demand for green hydrogen.

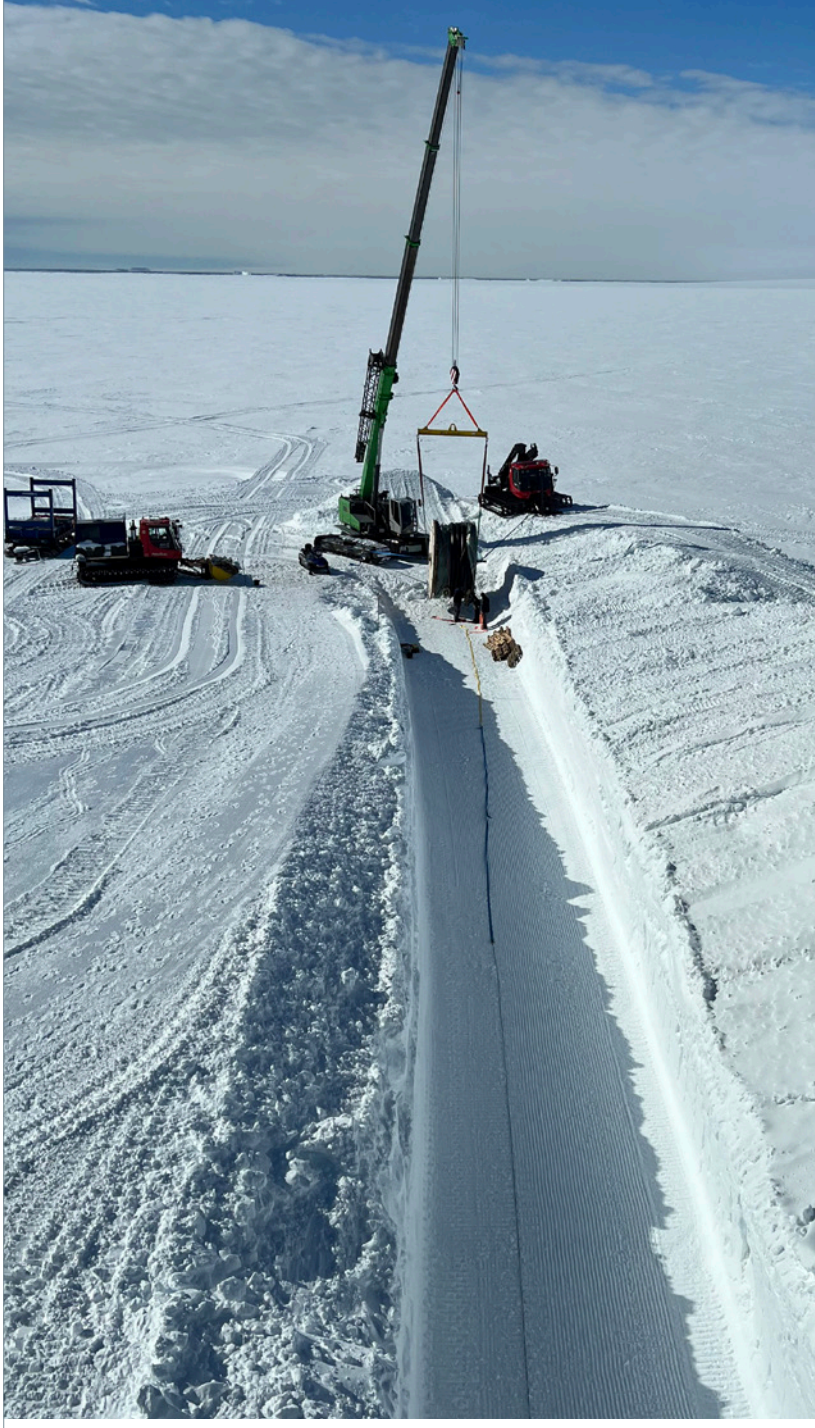
Biogas technology as a first step: CHP demonstrates its strengths

In contrast to many other green hydrogen projects, the electricity needed for electrolysis in this case is generated from biogas derived from the region's organic waste. This approach not only contributes to reducing greenhouse gas emissions but also aligns with the project's comprehensive and renewable concept.

The conversion occurs in a combined heat and power (CHP) plant with an electrical output of 1 MW (Figure 1). This plant is supplied by 2G Energy AG, a German company headquartered in Heek, with its North American subsidiary headquartered in St. Augustine, Florida. Since its establishment in 1995, 2G Energy has focused on developing and producing CHP systems powered by renewable gases, earning a reputation as a pioneer in biogas and hydrogen applications.

Frank Grewe, the CTO of 2G Energy, views the project as a prime example of the company's commitment to legacy and innovation. He explains the significance of the partnership with H2B2: "Our technology has allowed us to demonstrate the potential of biogas in large-scale renewable hydrogen production, both of which are central to our product development over the past few decades. This award underscores the importance of innovation in decentralised energy production, and we are proud to be part of this movement."

In addition to integrating biogas and hydrogen, the CHP technology offers other key advantages in the project. Grewe emphasises how the unit's versatility was critical to the project's success: "A reliable and consistent heat supply to the fermenters is essential for a stable digestion process of organic waste. Our global project experience enabled us to create a solution that utilises the heat generated during electricity production to support the biological fermentation process. This once again highlights the high efficiency of combined heat and power."



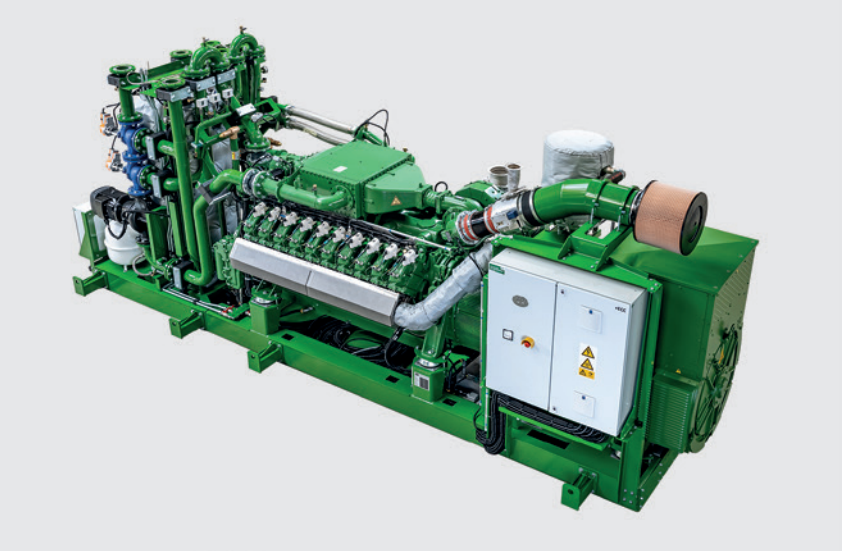


Figure 1. An Avus 1000plus with an electrical output of 1 MW is used in the hydrogen project

Source: 2G Energy

Grewe also points out the significance of energy security, another vital aspect of the project: "Across our projects worldwide, we are witnessing a growing need for energy security. That's why we design our CHP units for island operation – ensuring they can function independently in the event of grid outages. The SoHyCal project in Tranquility is no exception."

He concludes by underlining the various innovations of 2G reflected in this project: "From the use of renewable gases to managing thermodynamic processes and providing standardised backup power solutions, this project beautifully illustrates 2G Energy's innovative capabilities."

The excitement surrounding the project extends beyond just 2G Energy. In September 2024, the SoHyCal project, developed by H2B2 USA and 2G Energy, was awarded the prestigious "CHP Project of the Year 2024" by the Combined Heat and Power (CHP) Alliance. The Alliance highlighted the project's significance in the energy transition: "The award recognises SoHyCal as a groundbreaking achievement in hydrogen production and showcases the successful integration of innovative technologies by H2B2 and 2G Energy. These technologies not only meet the current demand for clean hydrogen but also establish a solid foundation for California's climate goals."

Thinking about hydrogen production in multiple steps

Despite its success and recognition, the project is not considered finished. In fact, H2B2 has announced a critical next phase for this year: a 13 MW solar photovoltaik (PV) system will be installed alongside biogas to generate enough electricity for an additional 2 t of hydrogen production per day, further reducing reliance on fossil energy sources.

This development aligns the project with numerous global initiatives where large-scale solar farms are increasingly employed to produce green hydrogen through electrolysis. Previously, 2G has implemented a similar project by installing a hydrogen CHP plant with a gigawatt-scale PV installation.

Therefore, SoHyCal is not just a one-time success; it serves as a blueprint for the efficient utilisation and coordination of various renewable energy sources, whether in the electrical power or thermal energy sectors. The combination of biogas and solar power demonstrates the potential of sector coupling for a sustainable and emission-free energy future.

A global outlook: embracing creativity

The increasing demand for green hydrogen across all sectors is driving ongoing advancements in electrolyser technologies. SoHyCal exemplifies how large-scale hydrogen electrolysis can be transformed through the use of renewable energy. As scalability improves and biogas and solar power are integrated more fully, green hydrogen is becoming a crucial component of the global energy transition.

Grewe views the project as evidence that practical approaches are essential for successful energy transformation: "In Germany, we've spent too much time discussing what isn't possible – especially regarding hydrogen. The topic was often approached from a top-down perspective, with strict directives on where the molecules should go. This project in California demonstrates that there are alternative, grassroots approaches that do not adhere to political agendas."

He concludes by highlighting the significance of regional flexibility: "Every continent, country, and region has different infrastructure and energy market conditions. We should trust local stakeholders to develop the best solutions rather than impose directives from above."

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