

F R O S T & S U L L I V A N

2024 TECHNOLOGY INNOVATION LEADER

*IN THE NORTH AMERICAN
HIGH-TEMPERATURE
SOLID-OXIDE FUEL CELL
INDUSTRY*

F R O S T & S U L L I V A N

BEST
2024 PRACTICES
AWARD



Best Practices Criteria for World-Class Performance

Frost & Sullivan applies a rigorous analytical process to evaluate multiple nominees for each award category before determining the final award recipient. The process involves a detailed evaluation of best practices criteria across two dimensions for each nominated company. WATT Fuel Cell excels in many of the criteria in the high-temperature solid-oxide fuel cell space.

AWARD CRITERIA	
<i>Technology Leverage</i>	<i>Business Impact</i>
Commitment to Innovation	Financial Performance
Commitment to Creativity	Customer Acquisition
Stage Gate Efficiency	Operational Efficiency
Commercialization Success	Growth Potential
Application Diversity	Human Capital

Navigating the Challenging SOFC Market

The high-temperature solid-oxide fuel cell (SOFC) market is growing due to the rising demand for efficient and sustainable energy solutions. The push for clean energy sources to mitigate greenhouse gas emissions drove technological advancements that enhanced the efficiency, durability, and cost-effectiveness of

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- Raj Chawla
Senior Research Analyst

SOFCs. Still, the market faces several challenges, such as the high initial costs associated with SOFC systems, technical issues like material degradation at high temperatures, and system integration complexities. Furthermore, SOFCs compete with other clean energy technologies such as proton-exchange membrane fuel cells and renewable energy sources like solar and wind.

Looking ahead, collaborative efforts, alongside supportive government policies, can further propel the adoption of SOFCs across various sectors. Continued research and development will address current challenges, making SOFCs more viable and cost-effective in the coming years.

As these developments unfold, SOFCs play a crucial role in the region's energy landscape, contributing to a more sustainable and efficient energy future. Within this landscape, WATT Fuel Cell (WATT) stands out with its SOFC technology that converts chemical energy from natural gas, propane, or hydrogen into electrical energy through an electrochemical process. Founded in 2010 and headquartered in Pennsylvania, the company is a small-scale SOFC systems manufacturer.

WATT designs systems that provide reliable backup power and reduce dependency on the electrical grid. Additionally, it has innovatively integrated a technology similar to 3D printing into its manufacturing processes, enhancing the production efficiency and precision of its SOFCs. Ultimately, the company's extensive intellectual property portfolio and novel additive manufacturing process (AMP) reinforce its position as a market leader. Its industry-leading management team, with over 75 combined years of experience in fuel cells, underscores the company's depth of expertise.¹

The Cutting-edge of Innovation

WATT leverages tubular SOFC technology that presents distinct advantages over traditional planar technology. Tubular cells can handle thermal cycling and load following, making them ideal for small-scale residential, remote, and recreational power applications. On top of this technological edge, the company employs a patented, proprietary process to manufacture its tubular cells. This automated process significantly reduces production costs, enabling a distinct in-house creation of WATT's fuel cells.

With a solid commitment to sustainability, the company uses additive manufacturing, which ensures over 99% recyclability during production.² Such a high recyclability rate minimizes waste, which complements how the fuel cells allow for post-use recycling, further enhancing WATT's eco-friendly profile. Recyclability during and after the production process positions the company as a leader in sustainable energy solutions. Moreover, WATT utilizes proprietary materials designed for its anode, cathode, and electrolyte. These materials ensure that the fuel cells operate at peak efficiency, delivering reliable and robust energy solutions tailored to meet various applications' demands. They also help the company avoid using expensive precious metals in its production process, reducing overall production expenses.

“Leveraging advanced hybrid technology, WATT designs fuel cells that integrate seamlessly with solar and energy storage systems. These products can function as a primary power source running on natural gas or propane or in a hybrid configuration where solar power charges a battery and the fuel cell activates only when necessary.”

- Manuel Albornoz
Best Practices Research Analyst

Leveraging advanced hybrid technology, WATT designs fuel cells that integrate seamlessly with solar and energy storage systems. These products can function as a primary power source running on natural gas or propane or in a hybrid configuration where solar power charges a battery and the fuel cell activates only when necessary. Their adaptability caters to customers looking to create microgrids in remote applications, allowing WATT to address diverse customer needs and expand its market reach.

¹ “What We Do” (WATT Fuel Cell website: <https://wattfuelcell.com/about-us/>)

² Frost & Sullivan Interview with WATT Fuel Cell (Frost & Sullivan, July 2024)

To this end, the company adopted digitally controlled and remotely monitored fuel cells. As a result, WATT appeals to remote customers who face challenges with traditional combustion-based generators. This technology allows the company to gather real-time data, make informed decisions, and swiftly address product development and deployment issues.

Over and above, WATT's development of its patented AMP offers significant advantages in terms of control over the cells' geometry, chemistry, and content. While traditional approaches produce tubular SOFCs through extrusion, multiple coating, and sintering processes that limit precision and efficiency, WATT can seamlessly achieve precise control and optimization. Similar to 3D printing, AMP allows WATT to fine-tune the manufacturing process down to the microstructure level, ensuring control over the geometry, chemistry, and content of its fuel cells.³

Frost & Sullivan finds that this innovative approach allows the company to set a new standard in the industry. Extensive testing, with thousands of hours of run time under various conditions, evidence the robustness and reliability of WATT's 3D-printed fuel cells. This rigorous testing ensures that the fuel cells can withstand diverse and demanding environments, providing consistent and dependable performance.

As of 2024, WATT Fuel Cell has had operational units in homes and RV applications for over five years, demonstrating the reliability and effectiveness of its technology in real-world settings. With the recent expansion of its manufacturing capabilities, WATT is set to commence a full commercial launch in 2025.⁴ These successful pilot programs lay a strong foundation for broader market adoption, ensuring that WATT is well-prepared to deliver cutting-edge energy solutions on a larger scale.

One Power Source: Unlimited Possibilities

WATT's proprietary SOFC technology serves as the foundation of its product offerings. Its fuel cells generate electricity, heat, and water through an electrochemical process, offering high efficiency, extremely low carbon dioxide emissions, and zero criteria pollutants. The manufacturing advantages of WATT's AMP extend beyond innovation to include scalability and cost-efficiency. The AMP process reduces manufacturing time by 90% compared to conventional SOFC production methods and yields higher-quality, more durable fuel cells.⁵ The fully automatic production line, equipped with a vision quality control system and material recovery capabilities, ensures consistent quality and minimal human error.

Outpacing conventional generators that require regular maintenance and produce noise, vibrations, and harmful fumes, WATT's SOFCs offer a clean, efficient, and low-maintenance alternative, making them ideal for residential, remote, and recreational applications. The company's fuel cells also support hydrogen blended fuels and will accommodate pure hydrogen in the future, aligning with the growing hydrogen economy.

WATT designed a suite of products to address the varied energy demands of residential, remote, and recreational sectors. The company's portfolio includes three main offerings, all certified by Fuel Cell 1 and Underwriters Laboratories 1741: WATT HOME™, WATT REMOTE™, and WATT NOMAD™.⁶

³ Ibid.

⁴ "Manufacturing" (WATT Fuel Cell press release, August 2024)

⁵ "The WATT Manufacturing Advantage" (WATT Fuel Cell website: <https://wattfuelcell.com/technology/>)

⁶ "Product Characteristics" (WATT Fuel Cell website: <https://wattfuelcell.com/products/watt-home/>)

WATT HOME ensures homeowners access primary and uninterrupted power supply options and can utilize up to 20% blended hydrogen with existing residential natural gas infrastructure.⁷ WATT REMOTE™ is engineered for critical applications in isolated areas, serving industries such as rail, telecommunications, oil and gas, and meteorological stations. This technology also offers the capability to operate on propane and natural gas. WATT NOMAD™ appeals to outdoor enthusiasts, providing a portable, lightweight, and dependable power solution that accommodates load-following and is compatible with optional solar power and batteries. Each system boasts app connectivity for real-time monitoring and incorporates passive safety features to promote energy security and environmental sustainability. Furthermore, their non-combustion SOFC technology delivers better efficiency, quieter operation, and lower emissions than traditional generators while seamlessly integrating with solar and energy storage systems.

An Intelligent Go-to-market Strategy Results in Commercial Success

Focusing on the residential and remote power markets, WATT offers system sizes of 500 to 1,500 watts, ideal for small-scale applications.⁸ Despite concentrating on small-scale applications, these systems are modular and scalable, allowing them to grow alongside customer requirements. This modularity addresses concerns about long-term utility and attracts potential buyers. In addition, WATT's absence of supply chain problems builds trust and allows it to maintain a positive reputation in the market. The backing of investors like Generac also underscores the company's market potential and future growth prospects.

WATT retains customers by designing products for long-term performance and ease of maintenance. It engineers the fuel cells to require minimal upkeep, with module restacks needed every three to five years and desulfurization filter changes required every one to two years (depending on the usage).⁹ For residential units, WATT includes internal desulfurization capabilities, eliminating the need for external reformers and simplifying the maintenance process.¹⁰

Overall, WATT showcases a proven track record of successfully bringing new technologies to market through strategic partnerships. For example, its collaboration with Hope Gas resulted in a substantial 500-unit purchase order.¹¹ Additionally, its collaboration with Hope and EQT as part of the ARCH 2 hydrogen hub project highlights significant volume expectations and further market penetration.¹²

Finally, WATT's ongoing work with Peoples Gas (Peoples) in the Pittsburgh region, including planned demonstration applications, exemplifies its proactive approach to market expansion and technology demonstration.¹³ The combination of market focus, product flexibility, and supply chain stability positions WATT Fuel Cell as a reliable and innovative provider in the primary and backup power market.

Positioned for Business Growth

Among WATT's partners are EQT (the largest natural gas producer in the United States), Generac (the

⁷ "Why Choose WATT HOME?" (WATT Fuel Cell website: <https://wattfuelcell.com/products/watt-home/>)

⁸ Frost & Sullivan Interview with WATT Fuel Cell (Frost & Sullivan, July 2024)

⁹ Ibid.

¹⁰ Ibid.

¹¹ "Innovative Natural-Gas Powered Fuel Cells to Provide Clean, Reliable Power for 500 WV Homes" (WATT Fuel Cell press release, July 2023)

¹² "EQT Confirms What it's Planning for its ARCH2 Hydrogen Hub Project" (WATT Fuel Cell press release, October 2023)

¹³ "WATT Fuel Cell and Peoples Gas Announce Milestone in Residential Fuel Cell Program" (WATT Fuel Cell press release, December 2020)

largest manufacturer of home backup generators), and Hope Gas and Peoples, both prominent providers of natural gas services.¹⁴ Hope Gas alone serves 140,000 residential, industrial, and commercial customers in West Virginia while Peoples provides natural gas to 750,000 homes and businesses across Western Pennsylvania, West Virginia, and Kentucky.¹⁵ These partnerships facilitate the integration of WATT's fuel cell technology into existing natural gas infrastructures, promoting the adoption of clean energy solutions among a diverse customer base.

WATT's Advanced Manufacturing Plant Expands Capacity and Capabilities: In May 2024, the company expanded its advanced manufacturing plant at its Mount Pleasant, Pennsylvania headquarters. This expansion includes an additional 20,000 square feet, enabling increased production of its innovative solid oxide fuel cell technology platforms.¹⁶ The facility boasts the most advanced tubular solid oxide fuel cell manufacturing capabilities worldwide, featuring enhanced AMP and scaled production automation.

Seven-Year Lease Extension at Mount Pleasant Glass Centre: In December 2023, the company signed a seven-year lease extension for its headquarters at the Mount Pleasant Glass Centre. This extension (effective through October 2030) covers 39,153 square feet of space, ensuring that WATT will continue to drive economic growth and innovation within the Westmoreland region.¹⁷

Frost & Sullivan commends WATT for its strategic partnerships with industry leaders such as EQT and Generac, which enhance the integration and adoption of its innovative fuel cell technology. These initiatives position WATT as a leader in the clean energy sector, poised for continued innovation and market expansion.

Conclusion

Technology is pivotal in the solid oxide fuel cell (SOFC) industry, where diverse options abound. Market stakeholders must employ the most suitable technology-driven solutions to maximize their impact. WATT Fuel Cell (WATT), with its advanced proprietary SOFC technology, offers a robust, efficient, and sustainable energy solution. Leveraging tubular SOFC technology, known for its superior thermal cycling tolerance and load-following capabilities, WATT introduces a patented additive manufacturing process. This approach gives unprecedented control over the cell's geometry, chemistry, and content while drastically reducing production costs and time. The company ensures a 99% recyclability rate during and after production, integrates with hybrid systems, and supports hydrogen-blended fuels, establishing itself as a frontrunner in the evolving energy sector. Ultimately, WATT systems' quiet operation and minimal emissions demonstrate its technological prowess.

WATT earns Frost & Sullivan's 2024 North America Technology Innovation Leadership Award for its strong overall performance in the high-temperature solid-oxide fuel cell industry.

¹⁴ "Strategic Partners and Investors" (WATT Fuel Cell website: <https://wattfuelcell.com/about-us/partners-and-investors/>)

¹⁵ Ibid.

¹⁶ "WATT Fuel Cell's Advanced Manufacturing Plant Expands Capacity and Capabilities as the Company Prepares for Commercial Growth" (WATT Fuel Cell press release, May 2024)

¹⁷ "WATT Fuel Cell signs seven-year lease extension for its headquarters at Mount Pleasant Glass Centre" (WATT Fuel Cell press release, December 2023)

What You Need to Know about the Technology Innovation Leadership Recognition

Frost & Sullivan's Technology Innovation Leadership Award recognizes the company that has introduced the best underlying technology for achieving remarkable product and customer success while driving future business value.

Best Practices Award Analysis

For the Technology Innovation Leadership Award, Frost & Sullivan analysts independently evaluated the criteria listed below.

Technology Leverage

Commitment to Innovation: Continuous emerging technology adoption and creation enables new product development and enhances product performance

Commitment to Creativity: Company leverages technology advancements to push the limits of form and function in the pursuit of white space innovation

Stage Gate Efficiency: Technology adoption enhances the stage gate process for launching new products and solutions

Commercialization Success: Company displays a proven track record of taking new technologies to market with a high success rate

Application Diversity: Company develops and/or integrates technology that serves multiple applications and multiple environments

Business Impact

Financial Performance: Strong overall financial performance is achieved in terms of revenues, revenue growth, operating margin, and other key financial metrics

Customer Acquisition: Customer-facing processes support efficient and consistent new customer acquisition while enhancing customer retention

Operational Efficiency: Company staff performs assigned tasks productively, quickly, and to a high-quality standard

Growth Potential: Growth is fostered by a strong customer focus that strengthens the brand and reinforces customer loyalty

Human Capital: Commitment to quality and to customers characterize the company culture, which in turn enhances employee morale and retention

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Key Impacts:

- **Growth Pipeline:** Continuous Flow of Growth Opportunities
- **Growth Strategies:** Proven Best Practices
- **Innovation Culture:** Optimized Customer Experience
- **ROI & Margin:** Implementation Excellence
- **Transformational Growth:** Industry Leadership



The Innovation Generator™

Our 6 analytical perspectives are crucial in capturing the broadest range of innovative growth opportunities, most of which occur at the points of these perspectives.

Analytical Perspectives:

- **Mega Trend (MT)**
- **Business Model (BM)**
- **Technology (TE)**
- **Industries (IN)**
- **Customer (CU)**
- **Geographies (GE)**

