MICROGRID KNOWLEDGE SPECIAL REPORT

Stationary Fuel Cells

A Microgrid Gap Solution for Today and the Zero-Carbon Future

Photo courtesy of Robert Bosch

An employee from Bamberg's municipal utility company checks if the solid oxide fuel cell pilot system at the Bamberg central bus station in Germany is running smoothly.

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Executive Summary

Homeowners and businesses around the United States increasingly understand the value of microgrids to ensure a reliable supply of electricity, manage energy costs and operate sustainably. Unfortunately, many can't afford to wait the 12-24 months for a microgrid to be permitted, installed and brought online at their property. And the solar and battery storage systems that are popular for many homes and small businesses in sunny areas with ample roof space or land don't provide the amount of power needed to operate in many scenarios, such as high-power demand data centers and industrial facilities.

These customers need a Microgrid Gap Solution to fill three key gaps:

1. The power gap.
2. The fit gap.
3. The sustainability gap.

The ideal Microgrid Gap Solution is cleaner than a diesel generator today and enables the transition to net zero, can quickly serve on-site power requirements and can later be integrated into a microgrid. This staged approach not only gives customers immediate power reliability, but also can lead to lower capital and operating expenses.

Modular solid oxide fuel cells are a Microgrid Gap Solution for all three gaps. Off-grid fuel cells can be installed in a matter of weeks and can be configured for any project size and energy demand. They are able to run on readily available natural gas today and serve as an ideal technology to transition to the energy future. They can mix low- or zero-carbon hydrogen or renewable biogas into the fuel mix as supplies become more available, ultimately becoming zero-carbon energy generators.

Brought to you by Microgrid Knowledge in partnership with Instant On and Robert Bosch, a leading global supplier of technology and services, this special report helps microgrid developers and other service professionals—such as plumbers, engineering, procurement and construction (EPC) contractors and distributed energy resource (DER) installers—learn the basics about fuel cells as well as:

- How they serve as a Microgrid Gap Solution.
- How they act as a permanent, hydrogen fuel-ready transition to the future.
- How they offer an opportunity for industry professionals to provide new products and services to customers.

Chapter 1

Customers Need a Microgrid Gap Solution. Fuel Cells Are It.

Utilities, businesses and homeowners are tuned in to the value of microgrids as a reliability solution. They are being deployed around the United States in all shapes, sizes and combinations, from dense urban environments to rural farms.

However, the conventional path to a new microgrid doesn't work for everyone who needs one.

Increasingly, wildfires, hurricanes, severe weather, grid infrastructure failures and public safety power shutoffs have made backup generation for critical and essential loads a necessity for many. But they can't afford to wait the 12-24 months for a microgrid to be installed. They face a **power gap.**

> Fuel cells are a lower carbon solution today, compared to natural gas and diesel alternatives, that ultimately can reach net-zero emissions with a no-carbon hydrogen fuel source.

In other cases, popular distributed energy resources used in typical microgrid configurations aren't the right fit. Customers might not have the roof space or land or live in a region with enough sunlight for solar and battery storage to deliver the power required. In areas such as dense urban neighborhoods, many forms of electrification present customers with costly challenges. They face a **fit gap.**

Diesel-powered generators that produce excessive carbon dioxide, nitrogen oxide (NOx) and particulate matter might not fit with customers' sustainability commitments or might run afoul of local regulations and permitting requirements. Customers might need to invest in a cleaner reliability solution now and ultimately transition to a microgrid that delivers zero-carbon energy. They face a **sustainability gap.**

These customers all need a Microgrid Gap Solution, and modular solid oxide fuel cells can be it. Fuel cells bridge these gaps as a quick off-grid energy solution that delivers reliability now while a long-term, grid-coupled microgrid solution is developed around it. They are a lower carbon solution today, compared to natural gas and diesel alternatives, that ultimately can reach net-zero emissions with a no-carbon hydrogen fuel source. Consider the problems of customers who need a gap solution and how fuel cells address them.

Fuel Cells Address Customer Problems

Can't afford to wait 12-24 months for reliability?

Fuel cells installed independently from the grid can be online in just a few weeks to provide immediate power and ensure reliability for critical and essential loads. They can later be tied into a grid-coupled microgrid, which takes much longer to permit and integrate.

Need a cleaner solution than diesel?

Fuel cells powered by natural gas have much lower carbon intensity than diesel generators for the same job. They also avoid permitting and regulatory issues inherent with installing diesel generators because fuel cells provide power and heat with ultra-low emissions of NOx and particulates. They also operate quietly in compliance with noise regulations in urban areas.

Need to meet a zero-carbon goal?

Fuel cells can reduce carbon emissions compared to grid power by running on natural gas and biogas today to deliver efficient combined heat and power capabilities. This delivers a quick carbon win, with the ability to transition to running on a net-zero hydrogen source in the future for true zero-carbon generation.

Want to replace a natural gas-fired peaking plant or avoid including gas generation in a microgrid?

Many states and communities are seeking to replace gas peaking plants with decentralized alternatives, both for increased reliability and to lower emissions. Battery storage is often the first choice. But consider the Agua Mansa peaking plant in California, which delivers 61 MW of power for eight hours, on average, for each use.[1] Replacing it with batteries would require a storage system with 488 MWh of energy, which is no small matter. For these larger systems, solutions like fuel cells will likely be needed for them to achieve practicality. Fuel cells provide the same distributed reliability service as batteries using natural gas today that can be replaced with lower or no emissions fuel sources as they emerge.

[1] https://www.psehealthyenergy.org/wp-content/uploads/2020/05/California.pdf

Fuel cells mean project flexibility

The ability to "fill the power gap" isn't the only attribute that makes fuel cells the ideal Microgrid Gap Solution.

Stackable to address any level of critical or essential load from the kW to GW scale, they're a flexible fit for projects of all sizes.

Fuel cell flexibility extends to how they work with other technologies or how they can be redeployed, if desired. When installed quickly as a gap solution, they can later be integrated into a microgrid with solar, batteries, advanced microgrid controls and most any other DER or software system to become part of the permanent, long-term microgrid solution. In fact, fuel cells can boost the value proposition of many microgrids. As a reliable, dispatchable source of on-site power serving critical and essential loads, fuel cells support and enhance the benefits of other resources within a microgrid. Fuel cells can complement intermittent DERs such as solar, battery systems and EV chargers to deliver customers better optimized outcomes for resilience, sustainability and cost management.

In Vårgårda, Sweden, one such integrated microgrid was installed during renovations to six public housing buildings to provide year-round renewable electricity and heat to 172 apartments from solar panels, batteries, heat pumps, hydrogen production and storage, and hydrogen fuel cells.[2]

If maintaining fuel cells as part of the permanent microgrid is not part of the plan or a customer expects additional sites in need of a Microgrid Gap Solution down the road, fuel cells can be designed and packaged so they can be redeployed at new sites that need gap solutions after the initial job is complete.

Chapter 2
What Are Solid Oxide Fuel Cells?

Knowing the scenarios in which fuel cells can provide a viable energy solution is a start, but discerning customers will want to know more about this emerging technology before committing to it, even if the economics look compelling.

In Bosch's compact 10 kW-class stationary solid oxide fuel cell solution, an electrochemical reaction generates electricity and heat. It delivers an overall efficiency of 60% for power generation, which rises to more than 85% when using the heat, making it more efficient than other energy converters of its size. For example, in Bosch's first demonstration of the stationary solid oxide fuel cell in Bamberg, Germany, heat from the system was used to provide heating and hot water for a local bakery.[3]

An employee from Bamberg's municipal utility company checks if the solid oxide fuel cell pilot system at the Bamberg central bus station in Germany is running smoothly.

[2] https://microgridknowledge.com/microgrid-hydrogen-sweden/
[3] https://www.bosch-presse.de/pressportal/de/en/climate-friendly-neighborhood-electricity-226759.html

The fuel cells can be fed with natural gas, biogas or a mixture with hydrogen, and they can ultimately be fed 100% hydrogen to become truly zero carbon. Using natural gas today, they emit near-zero nitrogen oxides or particulates. They also deliver lower carbon emissions than average U.S. grid electricity. A fuel cell running on natural gas produces about 0.74 pounds of CO_2 per kWh[4], a nearly 20% savings compared to the 0.92 pounds of CO_2 per kWh emitted by average U.S. grid power.

Bosch has turned this innovation into a universally deployable, high-performance system that can be mass produced.

The components of a solid oxide fuel cell system. Source: Robert Bosch

At a glance: Stationary solid oxide fuel cell benefits

- They have the potential to be an affordable way to manage energy costs because of their low operating and fuel supply costs. Their digital systems enable cost-saving predictive maintenance and lifetime optimization functionality.
- They provide outstanding electric efficiencies beyond 60%, even for smaller deployments starting around 10 kW. And they have the ability to use waste heat and act as combined heat and power assets that deliver overall efficiency of around 85%.
- They deliver the resiliency and reliability many utilities, businesses and homes need in light of growing extreme weather and grid infrastructure challenges.
- They are space effective, providing reliability and capacity where space and sunlight are limited.
- They are "dispatchable," meaning fuel cell generation can be ramped up and down as needed, for example, to complement intermittent renewable generation from wind and solar. They perform this important function with a stable efficiency curve compared to gas-fired turbines and many other gensets that have a steeper drop in efficiency when running at partial capacity.
- They produce significantly lower carbon emissions than the diesel generators needed to meet the same power demand, with the potential to be part of a zero-carbon future if supplied with green hydrogen fuel.
- They do not sacrifice efficiency for fuel flexibility. The fuel cells operate at nearly the same efficiency, whether fueled by natural gas, hydrogen or biogas.
- They protect air quality, producing near-zero NOx or particulate emissions, even when running on natural gas.
- They are small-scale modular systems that fit into a wide variety of microgrid deployments, complementing renewable intermittencies as a reliable, dispatchable source of on-site power serving critical and essential loads.
- They can be deployed indoors or outdoors, thus fitting the environment and requirements of each unique location.

Novel DERs will plug into the Internet of Things (IoT) landscape of tomorrow

Microgrids optimized to best benefit customers rely on smart controls connected to IoT-enabled DERs. Stationary solid oxide fuel cell technology integrates with other DERs and microgrid controls. It offers seamless access to and transfer of data collected by the individual fuel cell units. That means these stackable DERs can be installed with a microgrid, or even before a microgrid, and then integrated into a new system that's built around the fuel cells.

But the IoT benefits don't stop at microgrid optimization. Importantly for customers seeking revenue and business opportunities in their local energy market as "prosumers," the seamless data access and transfer enables them to be a part of energy aggregation and virtual power plant programs. That ability to offer supply in power and capacity markets, participate in demand response programs and provide other ancillary grid services means significant new revenue opportunities for system owners. New prosumer-enabling rules and programs are being launched or improved at federal and state levels rapidly, so it's important to stay abreast of changes that could improve the economic case for many projects.

[4] Assumes fuel cell efficiency of 60%, related to lower heating value, and U.S. Energy Information Agency data stating natural gas produces 117 pounds of CO_2 per MMBTU. https://www.eia.gov/tools/faqs/faq.php?id=73&t=11

Chapter 3

Fuel Cells Offer a Transition to — and a Product for — the Energy Future

The first choice for a quick reliability option to fill the power gap today is often diesel generators, but climate commitments at the federal, state and company level as well as local air quality regulations make them less viable moving forward. A better Microgrid Gap Solution also fills the fit gap and sustainability gap.

Stationary fuel cells can run on natural gas, which is readily available and cleaner than the diesel used by diesel generators, and they are 1.5-2 times more efficient than diesel generators. Where sources of green hydrogen and renewable biogas are available, fuel cells are already using these fuels to deliver electricity with even lower carbon emissions. Importantly, the efficiency remains high even as different kinds of fuel sources are blended into the mix or replace natural gas entirely.

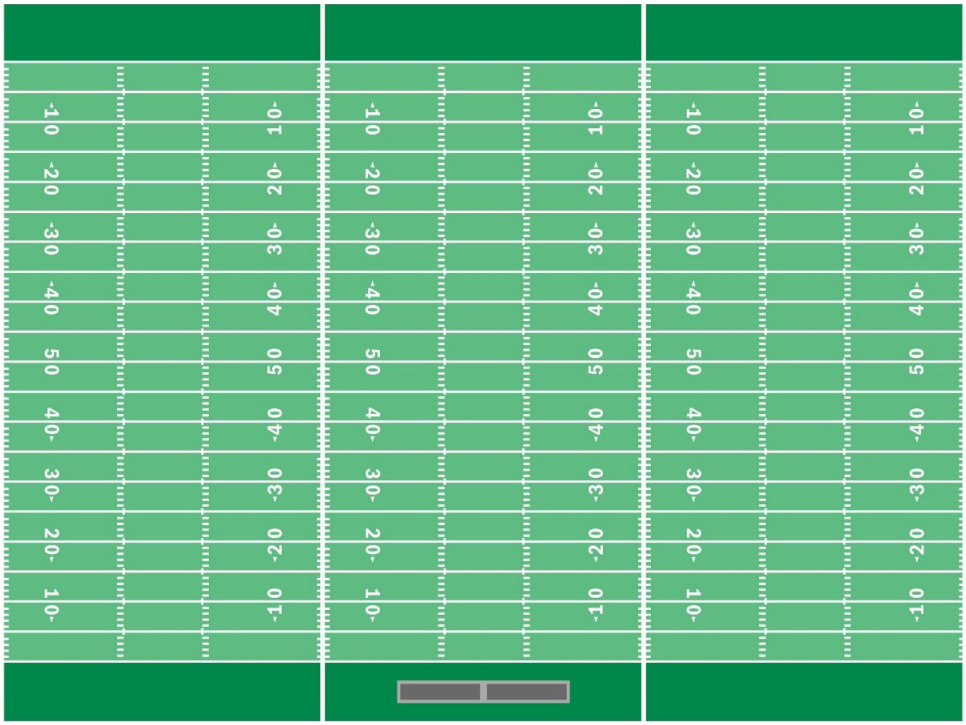
Solar PV combined with battery storage microgrids are ascending as a new zero-carbon reliability solution of choice. However, they are not the Holy Grail for all situations.

Many customers operate in a low sunlight region or space-limited facility in which a solar and battery storage-based microgrid won't deliver the power needed.

To demonstrate the space constraint, consider that a 1-MW solar PV system in a region with adequate solar resources would require a surface the size of three football fields with direct access to sunlight. The same 1 MW from fuel cells would require about 20% of a single end zone and can be installed almost anywhere, such as in basements or underutilized buildings. A solar MW and a fuel cell MW are not created equal either. One MW of installed solar capacity produces about 1.5 MWh of electricity per year. One MW of solid oxide fuel cell capacity generates about 8.8 MWh.[5]

This means solar and battery combinations are not a solution for energy resiliency for commercial and industrial (C&I) customers with office and retail spaces in high-rise buildings or data centers in cities. Solar simply can't deliver the necessary energy intensity given the space limitations. Fuel cells can play a major role serving these scenarios.

1 MW Solar Deployment: 3 Football Fields



1 MW Fuel Cell Deployment: 20% of Single End Zone

A comparison of the surface area needed for 1 MW of installed solar capacity and 1 MW of solid oxide fuel cell capacity. Source: Robert Bosch

[5] Annual generation from 1 MW of solid oxide fuel cell capacity assumes constant nominal baseload operation.

Case in point: Community-scale microgrids

Community-scale microgrids show the challenge of battery storage as a 100% resiliency solution.

Consider the Goleta Load Pocket Community Microgrid in California[6]. As part of an ambitious project to deploy a community microgrid that will help avoid outages because of fires, earthquakes, mudslides and other disasters in the load pocket, the 40-MWh Vallecito Energy Storage Resilience (VESR) project was brought online in December 2020 as the initial phase of the Goleta project.

However, the VESR project only provides 10% of the total MWh required for 100% resilience. In order to achieve that requirement, the wildfire and mudslide prone area needs 200 MW of solar and 400 MWh of storage.

This points to the need to have a solution with greater power density, such as fuel cells, for community-level resiliency from microgrids. However, it's not a "one or the other" problem. Because fuel cells integrate seamlessly with advanced microgrids and renewable DERs, their deployment can be right-sized with solar and battery systems, depending on needs. In the case of the VESR project, it could be optimized for cost, 100% resilience and sustainability by considering a combination of solar, battery and fuel cell solutions.

A fit for the net-zero future

The needle in U.S. energy use is pointing toward net-zero carbon emissions by 2050, with many states and communities aiming to get most of the way there by 2030. In this environment, installing a new carbon-emitting DER in the 2020s doesn't make sense—even if it is lower emitting than diesel-powered alternatives.

That's why the fuel flexibility of fuel cells is a critical advantage to fill the sustainability gap that stands between the power solutions of today and net zero. Cleaner than today's diesel generators running on natural gas, sources of low- and no-carbon hydrogen and renewable biogas can be mixed into the natural gas supply to the fuel cell with marginal impact on performance as supply of those fuels ramps up. The fuel cells will remain highly efficient, providing electricity and heat that gets cleaner as the fuel mix transitions. Ideally, the fuel supplied to the fuel cell will transition to zero-carbon hydrogen, making the system truly emissions-free.

As an example of the progress being made, Southern California Gas in 2021 is launching the first U.S. demonstration of green hydrogen produced by solar power and then converted back into electricity via fuel cells. The solar-powered green hydrogen is also blended with natural gas to fuel traditionally gas-fired home appliances.

Cleaner than today's diesel generators running on natural gas, sources of low- and no-carbon hydrogen and renewable biogas can be mixed into the natural gas supply to the fuel cell with marginal impact on performance as supply of those fuels ramps up.

In five to 10 years, sources of green hydrogen are expected to be much more widely available. By one estimate, global green hydrogen capacity is expected to rise 280 times by 2030, with the price falling 40% by 2025[7]. In the U.S., the Biden administration in June 2021 launched the Hydrogen Energy Earthshot initiative, aiming to reduce the cost of clean hydrogen to $1 per kilogram in one decade.[8] As those estimates are realized, customers will be able to source no-carbon hydrogen to make their solid oxide fuel cells generate carbon-free electricity.

In fact, customers with the right combination of microgrid DERs could even provide their own green hydrogen supply, maximizing their energy efficiency in the process. When combined with solar power and other renewable generating assets in a microgrid, excess power during periods of high sunlight or wind could be used to drive the electrolysis process and generate green hydrogen for later use by the fuel cell. It's an alternative to battery storage and, though the technology is not commercially ready today at smaller scales, it is on the way. This on-site green hydrogen production alternative has great potential for larger systems, considering hydrogen can be stored for much longer periods than electricity in a battery. Reversible fuel cell systems that can be used to generate hydrogen or electricity in a single application are already in development.

[6] https://microgridknowledge.com/community-microgrid-goleta/
[7] https://www.forbes.com/sites/mikescott/2020/12/14/green-hydrogen-the-fuel-of-the-future-set-for-50-fold-expansion/?sh=5d4df7b66df3
[8] https://www.energy.gov/articles/secretary-granholm-launches-hydrogen-energy-earthshot-accelerate-breakthroughs-toward-net

Chapter 4

The Business Model for Fuel Cells Is a Win for Customers and Installers

Experienced microgrid developers and DER installers know that the promise of new energy systems often comes into conflict with installation and integration challenges. These challenges blow up customers' financial models and result in workarounds made on the fly that add costs and complexity in order to deliver customer requirements for the system. In general, there are two primary areas where gaps emerge between planning and reality.

Financial modeling challenges

For a DER such as solar PV, residential, commercial and industrial customers generally don't get all the power they need from the equipment, which means they need to assess the complexities of local net metering policies to develop an accurate financial model. In this example, they also need to bake generation, transmission and distribution charges into their model.

Unlike solar, fuel cells can truly deliver to customers all the power they require. This would mean no net metering complexities and lower (or no) charges for generation, transmission and distribution in the financial modeling. The blended rate per kWh of electricity from a fuel cell—primarily consisting of the fuel cost—is much simpler to calculate and is more bankable for the purposes of acquiring financing than the energy charges covered in solar power purchase agreements.

Permitting, regulatory and interconnection challenges

Diesel generators come with inherent permitting and regulatory issues, given their use produces NOx and particulate emissions. In many urban areas, the noise created by running diesel generators is another permitting obstacle. Fuel cells avoid these issues with quiet power and heat generation with near-zero emissions of NOx and particulates.

Another emerging permitting advantage comes via how local officials define fuel cells. In one recent small-scale fuel cell project, the fuel cell was successfully integrated into a home after being classified as a gas appliance[9], similar to a gas clothes dryer or water heater.

If states, cities and utilities take the right approach to this form of power generation, they can avoid the cumbersome permitting processes that accompany not only large diesel generators but also solar installations. Solar installers and microgrid developers are increasingly on the record with complaints about utility interconnection rules and delayed approvals—which can be costly. The project developers for six school microgrids in Salinas, California, shared that Pacific Gas & Electric interconnection delays and a lack of standard utility interconnection procedures for solar plus storage systems that have a resilience component were among their biggest challenges.[10]

If fuel cells are treated similarly to gas appliances, installers could be granted access to an expedited, standardized interconnection process. In many service territories, utility rules and regulations on fuel cell installation and grid connection are still emerging.

Business model benefits for the installer/developer

If they prefer, customers can purchase and own their fuel cells. Depending on project size, this option can offer customers a three- to seven-year payback period, and it provides installers an opportunity to quickly complete a job with a comparatively simple installation and integration process.

However, many installers and developers are looking for a longer relationship with customers as well as opportunities for additional revenue. Fuel cells can be offered to customers via an energy-as-a-service (EaaS) model that provides continuing revenue. Fuel cells require more servicing and O&M than "set-it-and-forget-it" residential solar panels, so it makes sense to establish EaaS as a model.

Utility rules and regulations, and state and local rules governing fuel cell installation and grid connection are still emerging. Because of this uncertain landscape, fuel cells today aren't guaranteed to deliver their full potential in terms of quick, easy, affordable installation and integration. That's why it's critical that microgrid developers, EPCs and other service providers advocate for fair and business-friendly rules for fuel cells, which in Europe are already on a rapid growth curve thanks to supportive policy. Fuel cell supporters should advocate for an optimal business model enabled by several key market structures:

- A regulatory and permitting structure that allows for a simple installation process, such as that for home gas appliances.
- A utility tariff structure that would allow for fuel cell EaaS to be allowed.
- On-bill gas financing for fuel cells.
- Incentives promoting the use of clean hydrogen-ready appliances, such as those that use fuel cells.
- Behind-the-meter interconnection.

If that advocacy sounds like work, it is. But remember: Early solar installers had to fight many of the same fights to create the multibillion-dollar industry that exists today. Fuel cells today are in a similar position as solar a decade ago, and the early adopters who push them forward will win a huge market opportunity.

[9] Fuel cell systems must undergo rigorous testing by a qualified notified body to be classified as a gas appliance.
[10] https://microgridknowledge.com/school-microgrids-california/

Chapter 5

Opportunities for Microgrid Developers and Other Providers to Grow Customers and Services With Fuel Cells

Not so long ago, it was next to impossible to find a qualified solar installer. Today, the competition is not only fierce but diverse, with all manner of companies from investor-owned utilities to security system installers vying for business. That's because 10 years ago, solar was in its infancy. Now it is a thriving, multibillion dollar annual business.

Fuel cells today are where solar was 10 years ago. That means now is the time to understand the business opportunities. And it's not just a space for microgrid developers. Just like with solar, there are some potentially surprising service providers who are well-positioned to offer fuel cell installation. Plumbers and EPCs, take note: Because of the installation requirements for fuel cells, including gas pipes and potential integration with heat systems, plumbers have the certification required to install the technology, giving them a competitive advantage to enter the business at an early stage.

New technology can be scary or seem risky to installers, but the installation process is essentially the same—if not easier—than the install for diesel generators, natural gas-fired engines and combined heat and power systems.

Expand services and increase customer lifetime value

Fuel cells provide an opportunity for service providers to offer a new product to customers and build ongoing relationships that increase a customer's lifetime value.

> The market is expected to grow rapidly in the coming years, meaning service providers who hold the necessary licenses to install fuel cells will be needed by project developers to handle their growing fuel cell project loads.

Solar PV-battery storage combination microgrids are not always the right solution for customers, particularly C&I customers with high-rise office space and data center facilities. Diesel generators come with higher carbon emissions and NOx and particulate emissions that don't match every customer's sustainability commitments or local regulations. Fuel cells give service providers another arrow in the quiver to offer energy solutions to a broader set of customers.

> Microgrid developers and many other service providers, including plumbers and EPCs, should build a relationship with a trusted partner who can educate and train them to offer fuel cells to their customers.

Moreover, the opportunity with customers doesn't stop at installation. It includes commissioning, service and maintenance well into the future. Microgrid developers, DER installers and, as mentioned, even plumbers are well-positioned to adopt fuel cells as an offering. Many smaller service providers might not want to take on the risk of building out a new arm of their business to market and sell to customers. However, they can still benefit from the fuel cell opportunity. The market is expected to grow rapidly in the coming years, meaning service providers who hold the necessary licenses to install fuel cells will be needed by project developers to handle their growing fuel cell project loads.

Next steps

Microgrid developers and many other service providers, including plumbers and EPCs, should build a relationship with a trusted partner who can educate and train them to offer fuel cells to their customers.

Like all new things, there is a learning curve involved. However, as with solar installers a decade ago and, increasingly, those who have learned to navigate the process of installing combined solar and battery storage systems, there is a tremendous business opportunity awaiting those positioned to serve the emerging fuel cell market.

Chapter 6

California City Signals the Fuel Cell Future

There's a growing need for on-site energy reliability and clean energy in a world facing increasing grid reliability and climate challenges. Utilities, businesses and homeowners need two things to navigate those pain points: A Microgrid Gap Solution (for the power gap, fit gap, sustainability gap or any combination thereof) and a solution that is futureproof for the transition to net-zero carbon energy.

California City, California, offers a case in point for how fuel cells can serve those critical needs on even the largest scale.

California City has partnered with Baker Energy Team and Instant On to design, engineer and develop 3 GW of microgrids across multiple locations that deliver clean energy and resiliency. The design and engineering have begun, and initial construction starts in the fall of 2021. Projects will begin coming online in 2022. Instant On is installing and selling the power generated to California City under the city's future community choice aggregate. The solution will immediately help the city attain the power it needs now and energy independence for years to come.

> By pairing fuel cells with green hydrogen as a fuel source, California City is choosing a microgrid solution that can deliver 100% reliability and zero emissions on a large scale.

Instant On was brought into the project after Baker Energy partnered with the company previously on a 200-MW Microgrid Gap Solution. The California City project will allow Instant On to apply fuel cells as a gap solution with the vision to integrate the first hydrogen-based utility in the United States.

"California City was facing a capacity issue as they continue to grow their city [a power gap]. We needed a versatile solution, given the various scenarios for installation, especially where solar wasn't able to be utilized due to size constraints [a fit gap]," said Dusty Baker, founder and president of Baker Energy Team. "The city is really looking to move toward more sustainable solutions and move away from the diesel generators currently being used [a sustainability gap]."

By pairing fuel cells with green hydrogen as a fuel source, California City is choosing a microgrid solution that can deliver 100% reliability and zero emissions on a large scale. In a state such as California where environmental and climate standards are among the toughest in the country, this demonstrates that fuel cells are a fit for the energy future.

"Instant On created the Microgrid Gap Solution to solve the many issues we see in our daily work. California City has highlighted all of the gaps, and they are taking proactive steps to solve them now," said A.J. Perkins, founder and President of Instant On.

Get to know Bosch stationary solid oxide fuel cells

Microgrid developers, EPCs and service providers can position themselves as fuel cell providers by finding a trusted partner to educate and train them.

Bosch stationary solid oxide fuel cell solutions are currently produced in Europe with an aim to increase the annual production capacity to some 200 megawatts beyond 2024. Contact Bosch to partner on the future of fuel cell development in the U.S.

Contact

Martin Hering
Business Development Manager, Robert Bosch LLC
Martin.Hering2@us.bosch.com
LinkedIn: https://www.linkedin.com/in/martin-hering-b068ba192/

AJ Perkins
President, Instant On
AJ@InstantON.energy
LinkedIn: https://www.linkedin.com/in/ajperkins808/