

## SMALL CELLS ARE NOT A TREND, NEITHER ARE HYDROGEN FUEL CELLS

### FIVE REASONS WHY FUEL CELLS WORK FOR SMALL CELLS

In October 2015, Toyota took the top slot in global vehicle sales. The demise of Volkswagen and their emissions scandal might have helped, but Q4 should show the real fallout. And while Toyota's new hydrogen powered Mirai did not put them over the edge, their ability to harness new technology, specifically alternate technology to power their vehicles, has given the public something to be excited about (especially when clean diesel is not really clean?).

Toyota's expanding portfolio of fueling sources for their vehicles drives home the need for everyone to rethink the way they get power. The demand for alternative energy is not just for Greenpeace supporters anymore, it is a critical need, worldwide.

Many experts suggest that in the near future, our homes, cars and workplaces will be a hybrid of all types of power generators. In short, don't place all of your eggs in one power basket — our world is changing and we have a responsibility as company stewards to drive positive change as it pertains to our heavy reliance on the commercial power grid and foreign oil.

Companies need to look at our overall business

operations, and take advantage of new technologies that are proven and reliable, with the ability to not only impact our environment positively, but the company's bottom line. Just like many companies have a no single vendor sourcing rule, think about this as it pertains to power.

Batteries degrade, diesel generators pollute. Yes, they are familiar and comfortable technologies with both positive and negative attributes. And admittedly, it is simply unrealistic to get rid of them all, just yet. But there are real alternatives to those technologies today.

From wind to sun to the most abundant element on earth — hydrogen. Companies worldwide are finding new and innovative ways to deliver power, cleanly and affordably, to our cars, our homes and cell towers.

### WHAT IS A FUEL CELL?

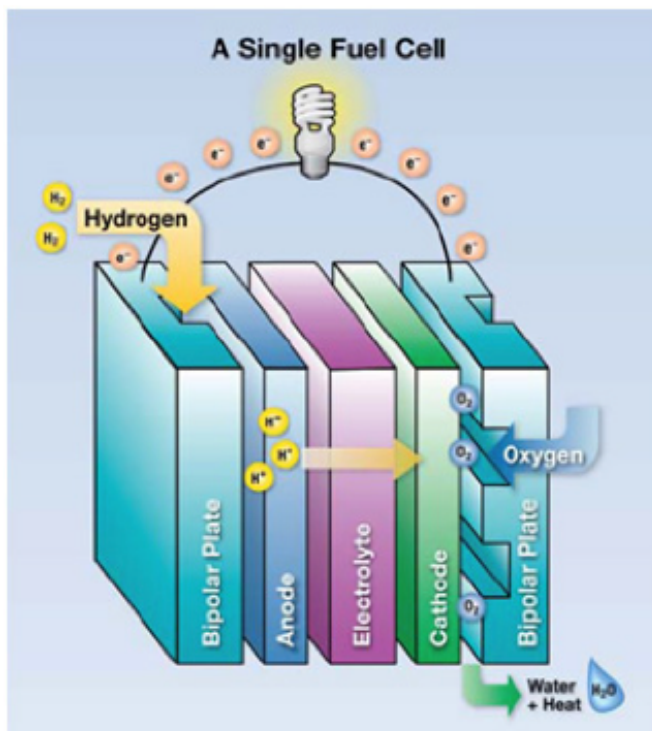
Fuel cells convert chemical energy into electrical energy, with the only byproducts being water and heat which can be harnessed and used for other things. Hydrogen is an abundant element that exists everywhere from plants to trees to the water in our lakes and oceans. Hydrogen is an inexhaustible, renewable domestic fuel. It is non-toxic, and lighter than air.

Hydrogen-powered fuel cells have no pollution and can be much more efficient than traditional technologies. A conventional power plant generates at about a third of the maximum efficiency. Fuel cells generate at almost twice that, even without cogeneration. Fuel cells are quieter and have fewer parts, making them more suited to a variety of applications.

Hydrogen fuel cells are not new, but technological advances have brought them a long way lately. Some fuel cell companies still manufacture by hand, which make them unaffordable for mass production. Some companies focus on primary power applications, others on backup power.

The telecommunications industry has embraced fuel cells as a backup power source for some time now. With great success and the promise of a cleaner and more cost effective solution, why has it not gone more mainstream?

The answer to that is complex, but overall, the market is recovering from a number of misconceptions, and truth



be told some realities that our industry had to address. Initially, the barriers to entry regarding mass production making fuel cells not commercially viable was a concern. This barrier has been broken with dramatic leaps in design and development as well as automated manufacturing and production advances.

Some fuel cell companies have tried, unsuccessfully, to launch without strong foundations in design and manufacturing or a clear understanding of the market needs. The infrastructure for fueling, a real concern, is changing every day. We can thank Toyota and other major automobile manufacturers of hydrogen fuel cell vehicles for the dramatic momentum in the availability (and planned availability)

backup power. Small cells are a critical link in the chain of not only a connected city — but a safe one. With unreliable grids to hurricanes to earthquakes, reliable backup power is not just a nice to have, but a need to have.

But how do hydrogen fuel cells play in the small cell market? Nicely, we believe. Consider these five critical decision making factors before you invest in your next large battery or diesel generator purchase.

## RELIABLE & PROVEN

Mission critical operations are happening every day in every major metropolitan city, worldwide. Can we afford small cell networks with anything less than highly reliable



HYDROGEN FUEL CELLS HAVE A RICH LEGACY IN WIRELESS APPLICATIONS

of hydrogen fueling stations to support the Mirai.

Thanks can be given to the fuel cell manufacturers who have addressed this issue with turnkey product and fueling options to meet customer needs. The U.S. government, as well, has several initiatives in place that support this greener power generation. The Department of Energy's Fuel Cell Technologies Office covers a comprehensive portfolio of activities with the ultimate goal of decreasing our dependence on oil, reducing carbon emissions, and enabling clean, reliable power generation.

## IT'S TIME TO CONSIDER, OR RECONSIDER HYDROGEN FUEL CELLS.

Hydrogen power generators come in many different shapes and sizes for a variety of applications from vehicles to data centers to telecommunications. The small cell market has unique requirements as it pertains to delivering

backup power?

Built correctly, fuel cells provide reliable power for extended runtimes. With rugged construction and simple maintenance routines, fuel cells can be far less susceptible to inclement weather and temperature extremes than legacy technologies.

The valve-regulated lead-acid (VRLA) battery commonly deployed to provide backup power at cell tower sites have limited runtime capabilities, with most deployments providing less than the FCC 8-hour minimum runtime requirement. Even when installed in multi-unit strings, VRLA batteries typically deliver up to four hours of performance. Batteries cannot store enough power to provide sufficient runtimes to adequately back-up critical systems.

Limited runtime capabilities can expose network performance to extended downtime, as the nation's

power grid has proven vulnerable to periodic longer-term outages. Diesel generators often are necessary to supplement battery backup power and provide runtimes of eight hours or more, particularly in high-value markets, and severe weather regions. Extended diesel generator use, however, has been shown to lead to mechanical failure, and adding diesel generators to the solution results in higher cost and larger footprint requirements.

Fuel cells have successfully performed through many natural disasters — uninterrupted. Through Hurricane Sandy, Hurricane Joaquin, and the Napa Earthquake, fuel cells have weathered the storms, while other legacy technologies failed. Telecommunications networks are modern in their technological advances, but still rely on antiquated backup power supplies, which have had little to no technological advances.

With applications in telecommunication, outside plant, critical infrastructure, emergency response and military and homeland security, fuel cells are proving themselves to industries who don't take risks regarding their uptime.

## CLEANER, GREENER POWER

Fuel cells are the cleanest backup power choice on the market with water as the only byproduct. Companies with sustainability goals can look to hydrogen powered fuel cells to dramatically reduce their carbon footprint. With small cells in large urban populations, the need to replace and recycle batteries can be a constant battle. Fuel cell systems eliminate this step, thus eliminating thousands of valuable man hours and budget dollars in maintenance.

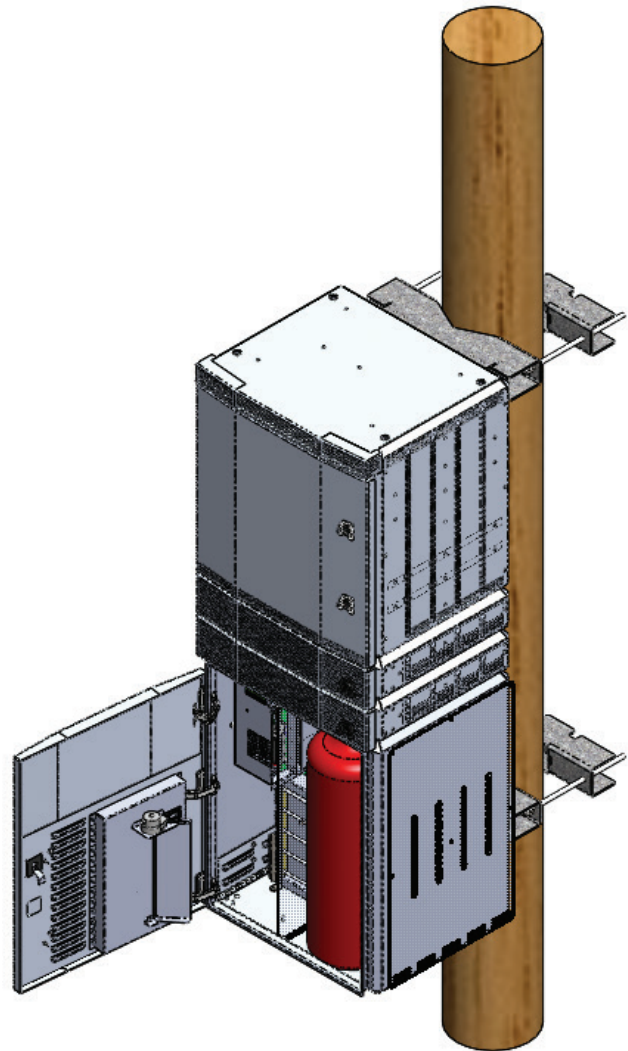
It is important to look for fuel cells which are CARB-certified (California Air Resource Board) which can dramatically simplify regulatory compliance and CSA certification to facilitate permitting and installation. While most small cell applications will likely consider batteries for backup power, it is important to note that diesel generators are still deployed in traditional cell tower installations.

Large urban cities already have enough to contend with regarding pollution. Many cities are putting regulations and policies in place to manage and control pollution with the goals of improving air quality and reducing noise levels. Diesel generators only exacerbate the problem

with dirty emissions and a noisy output which further pollutes the environment.

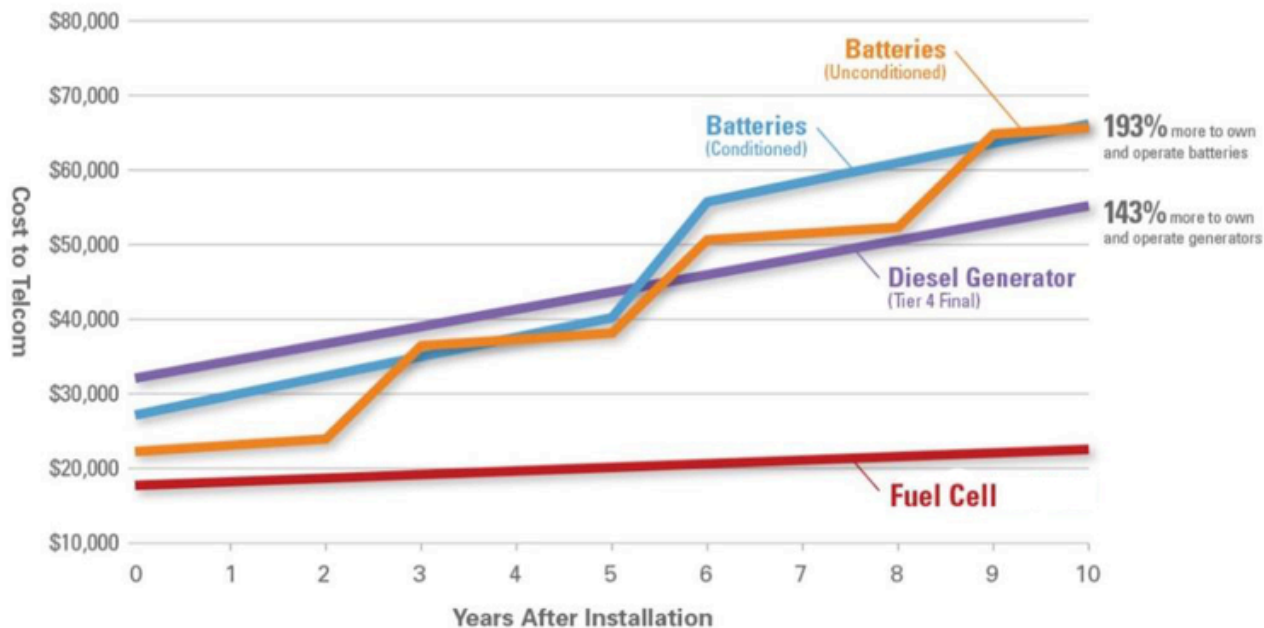
## COMPACT DESIGN

Advanced fuel cell design and engineering keeps in mind the need for small cell deployment to be compact and lightweight. Fuel cell deployment can be anywhere from rooftops to poles to wall mounted cabinets. Look for a company who has engineered the product with light weight as a key benefit to the system — not all fuel cell products are alike when it comes to size and weight. Understanding the need to fit into pre-designed cabinets is often a requirement fuel cell manufacturers are prepared to manage through with specific specifications



EXAMPLE OF AN ALTERGY FREEDOM POWER™ SMALL CELL APPLICATION WITH FUEL CELL AND FUEL STORAGE.





TCO based on a 5kW load, 8 hours of runtime. Battery quantities and size determined at end of the life (2.5 years). Generators are Tier 4 Final. Analysis includes, acquisition costs, plus permitting and installation costs, as well as ongoing maintenance (and battery replacement) costs for all three technology alternatives. Data sources for the analysis include research reports (Batelle, Battery Council International, etc.), Manufacturer data sheets, prices, white papers and Altery Systems information.

and designs from OEMs. Retrofitting existing cabinets where batteries are currently housed is another way fuel cells can be incorporated without redesigning or buying new boxes.

### LOWEST TCO

Small cell infrastructure’s cost must be realized at a dramatically lower cost than a traditional cell tower, thus the need to source suppliers to meet this need. With the right partner, fuel cells can now provide the lowest initial CapEx, and reduce total cost of ownership up to 60% over a ten-year period, when compared to legacy backup power technologies. With lower acquisition and maintenance costs than batteries or diesel generators, larger scale small cell deployment can be realized at a more rapid pace.

### FUELING OPTIONS

Sources for hydrogen are growing every day, so do not be surprised if your local gas station adds a pump next to the gasoline and diesel that says hydrogen. And not to belabor Toyota’s love of hydrogen, but there are rumblings that they are working on new technology where you can fuel your car in your own garage.

Look for a fuel cell company who offers a turnkey fueling option with your system. Deployment in small cell locations can be managed a number of different and cost effective ways based on customer requirements.

### SUMMARY

Small cell technology is delivering a more reliable network to customers. Hydrogen fuel cells support that network with the most modern, reliable, compact, clean and cost effective backup power solution on the market today. The benefits are clearly bringing positive results to a world in great need for alternate energy solutions.

Andrea Laughlin is the Director, Marketing and Branding. Ms. Laughlin brings over 15 years of professional business to business marketing to Altery from the manufacturing, hardware and software industry. Her assignments have included The Ardagh Group, Marco Plastics, Kazeon Software, Electronics for Imaging, Informix Software and Oracle Corporation. She holds a Bachelor of Arts degree in Communications, Arts and Sciences from the University of Southern California in Los Angeles and a Masters of Business Administration degree in Marketing from George Washington University in Washington. For more information visit [www.altery.com](http://www.altery.com).