



PROPANE DELIVERS GREEN HIGH-PERFORMANCE TO MICROGRIDS

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The fragility and vulnerability of the electric grid is a regular topic in energy industry circles, and rightfully so. A few years ago, the Department of Energy's Berkeley Lab **estimated** that sustained electric power interruptions – those lasting more than 5 minutes – cost the U.S. approximately \$44 billion every year. Berkeley's study points out that 97% of the costs are borne by the commercial and industrial sectors. On the residential side, we don't think as much about sustained power outages, because homes aren't normally the places where loss of power results in a mission-critical failure.

Another finding in Berkeley's study is that power customers who "take extra measures to ride-through power interruptions by installing backup generators" reduce the estimated cost of sustained interruptions by 18% – \$7.9 billion.

That big takeaway reminds us of the value of a stable grid, but also raises a great question: What are "extra measures?" We can assume that having candles and flashlights at the ready doesn't really cover the \$7.9 billion. What does, however, are microgrids.

Generically speaking, a microgrid is a shared source of energy for a group of homes or businesses that can either be connected to a main utility grid or not. The reason microgrids are built is so that the homes and businesses can reliably keep their power on, no matter what Mother Nature might throw our way in the form of hurricanes, fires or increased demand. Microgrids generate their own power, allowing them to support people and places away from the grid, and have a unique, environmentally-friendly attribute – precision energy control.

Because they're smaller, more flexible and more manageable, microgrids can be optimized to use a variety of low-carbon and renewable energy sources to keep the lights on while minimizing the carbon footprint.

STORED ENERGY IS THE KEY

There is a trick, however. A low-carbon microgrid can only perform if it can respond to sudden demand. Stored energy, then, is key to making a microgrid reliable. A near-instantaneous

switchover from intermittents – solar and wind power which aren't always available and continuously fluctuate – has to be engineered into the system in order to prevent outages. Stored energy runs fast-ramping generators that can supply power to keep the microgrid operating.

LOW CARBON IS THE BONUS

Diesel generators have performed this role for decades, but because of its environmental downsides, the days of diesel are coming to an end. Batteries are the shiny objects of our time, but their components are environmentally awful, and their **expense** is out of reach for most. To power a 2,200-square-foot home, you need two Tesla Powerwalls, which cost around \$13,500, not including installation. Blue Ion has a system that can do the same for approximately \$25,900, not including installation.

On the other hand, propane can fuel affordable generators and is easy and safe to store onsite. Propane also emits significantly less carbon and criteria pollutants than diesel-powered generators. **According** to the U.S. Energy Information Administration, propane is 16% cleaner than diesel when it comes to CO₂ per unit of energy. Particulate emissions (a significant health concern) are also significantly higher for diesel than propane.

PROVEN GREEN POWER

Propane generators are already being deployed in microgrids. **Southern California Edison** constructed a solar microgrid with a backup propane generator to supply power to operate a remote hydroelectric dam after an at-risk feeder was removed. Also, **Liberty Utilities**, in California's Sierra Nevada mountains, is building a 97% solar microgrid with propane generator backup to allow four miles of transmission line to be de-energized for public safety.

Microgrids are sometimes put into "island" mode, meaning detachment from the main grid. A literal island example of how propane pairs with solar to provide power and reliable energy to its people can be found in the **U.S. Virgin Islands**. Two separate electricity grids are at work there, and the generating units in use combine propane with solar power facilities owned by independent power producers (IPPs) and residential rooftop solar. The Energy Information Administration **says** propane use is expected to cut generating plant emissions up to 20%, helping the Islands meet clean air standards and cutting future fuel surcharges by 30%.

EDISON WOULD APPROVE

The **first** microgrid in the U.S. was lit up in 1882 by Thomas Edison via his Pearl Street Station power plant in lower Manhattan. His design combined heat and power and produced electricity and thermal energy. He'd likely be impressed to know that his original concept is still as valid today as it was nearly 140 years ago.

At some point in this century, a nearly 100% carbon-free grid may be a reality. In the meantime, low-carbon fuels like propane and renewable propane are available and ready to quickly pull our energy grid in a low-carbon direction. Through microgrids, we also build resilience into the system and create value that will, no doubt, show up in the next update of Berkeley Lab's research.

ABOUT THE AUTHOR

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Tucker is an engineer, entrepreneur, business leader, speaker and is now the president and chief executive officer of the Propane Education & Research Council. He has worked in the propane industry nearly his entire professional career, having served as the director of business development for Inergy, chief executive officer of Premier Propane, and the chief operating officer of Columbia Propane, a unit of the Columbia Energy Group. Tucker is also the former chairman of a PERC advisory committee on engine fuel matters and is active with the National Propane Gas Association and the Virginia Propane Gas Association.