



## 5 steps to green energy independence through an IoT-enabled MicroGrid

Distributed renewable power generation through MicroGrids have long been seen as a tangible solution to the growing energy challenges that our world faces every day. Increasing demands on power grids around the world pose a risk to daily business operations while the increasing costs of energy have become one of the largest line items in most operational budgets.

In the U.S. in particular, Utilities offer what are known as Demand Response (DR) programs that allow customers to utilize onsite power generation sources to earn revenue for voluntarily going “off Grid” for a period of time or even selling excess energy production back to the Utility.

Traditionally, these programs have consisted primarily of traditional diesel backup generators as participants. Unfortunately, while very dependable, diesel generators pose obvious environmental emissions challenges that limit their use for energy production.

Renewable energy sources such as wind or photovoltaic, while generating no harmful emissions, pose a different set of challenges as the power generated is not predictable or controllable making it unreliable for business use without the introduction of an energy storage solution such as large scale batteries.

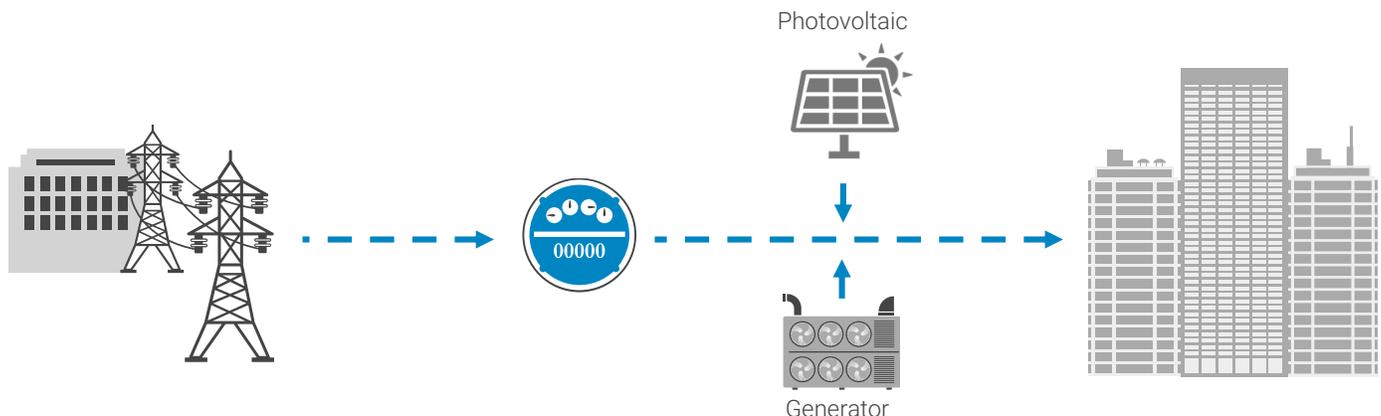
Development and implementation of a MicroGrid system that integrates renewable energy production, energy storage, generators and energy inverters that can compliment or even replace the utility grid provides the optimal solution to meet these energy challenges. Managing the energy assets and production requires a monitoring and control system, however.

A Micro Generation and Renewables Intelligent Distribution Controller (**μGRID** Controller) from ELM FieldSight based on the Dell Edge Gateway for the Internet of Things (IoT) provides:

- **Increased Renewable Asset ROI** – Since peak pricing makes up only 10% of your usage but 40% of your bill, renewable energy generation assets such as photovoltaic arrays can recognize a usability increase of over 100% when managed as part of a complete MicroGrid system that includes storage.
- **Increased Revenue through Demand Response** – Traditional facility assets such as backup generators can be incorporated with renewable assets in a MicroGrid to participate in revenue-earning utility DR programs that can earn more than \$75,000/Mega Watt Per Year.
- **Reduced Operations Risks** – Intelligent visibility and control of onsite power generation means that your operations are not held hostage by utility power interruptions and uptime can be guaranteed.

### Conventional Facility Power with Renewable

The following example illustrates a conventional facility photovoltaic and emergency generator configuration. Neither the solar or generator usage are being optimized to reduce grid stress or facility energy costs:



# Follow these 5 best practice steps to plan your MicroGrid implementation

## 1 | Develop a green energy plan

Government and Utilities offer significant incentive and revenue programs for reduction of carbon footprint, integration of renewable energy and participation in programs that reduce grid stress and load. These incentives and programs are location specific – identifying the options available for your facilities in different locations is critical to understand the potential ROI. If you aren't sure where to start, ELM has an energy engineering department with specialists that can help you understand the programs available in your region as well as the environmental requirements that need to be met at your specific sites.

Some questions to consider when developing your energy plan include:

- What are the renewable energy incentives available in your facilities location
- What demand response programs are offered from the local utilities
- What are your corporate objectives for carbon footprint management

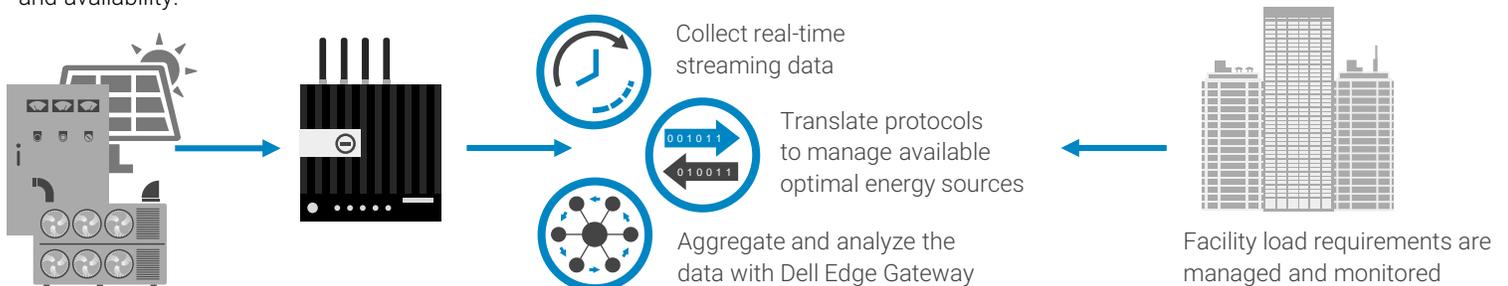
## 2 | Identify your distributed power generation potential

Many facilities already have backup power generators ranging from brand new to as much as 30 years old. These generators, coupled with the potential available space for solar or wind power generation assets and space for storage, add up to your distributed power generation potential. Comparing this power generation potential to the amount of energy utilized on a regular basis by the facility can be used to calculate the potential ROI. ELM FieldSight can complete a site audit and survey, resulting in optimization simulations and a recommendation report on your distributed power generation potential.



## 3 | Integrate power generation assets into a MicroGrid

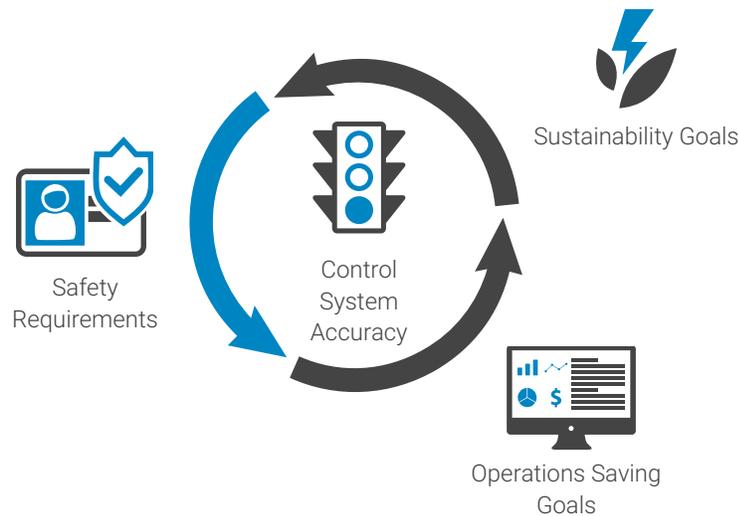
Once the distributed power generation plan is in place, the assets identified in the plan need to be integrated into a MicroGrid. This involves additional pieces of power equipment to be integrated including automatic transfer switches, power inverters that convert DC power to AC, energy usage monitoring devices and controls for each asset. Communication with this equipment as well as the power generation assets requires drivers that can communicate with the various machine protocols for each asset and component. This can all be accomplished on a Windows 10 IoT Enterprise LTSB environment operated on a Dell Edge Gateway 5000 that includes important security and protocol safety features vital to the operation of your MicroGrid environment. ELM's FieldSight Edge  $\mu$ GRID software running locally provides the protocol conversions necessary and manages the assets through direct communications to guarantee system uptime and availability.



## 4 | Deploy a Sequence of Operations (SOO) Control System

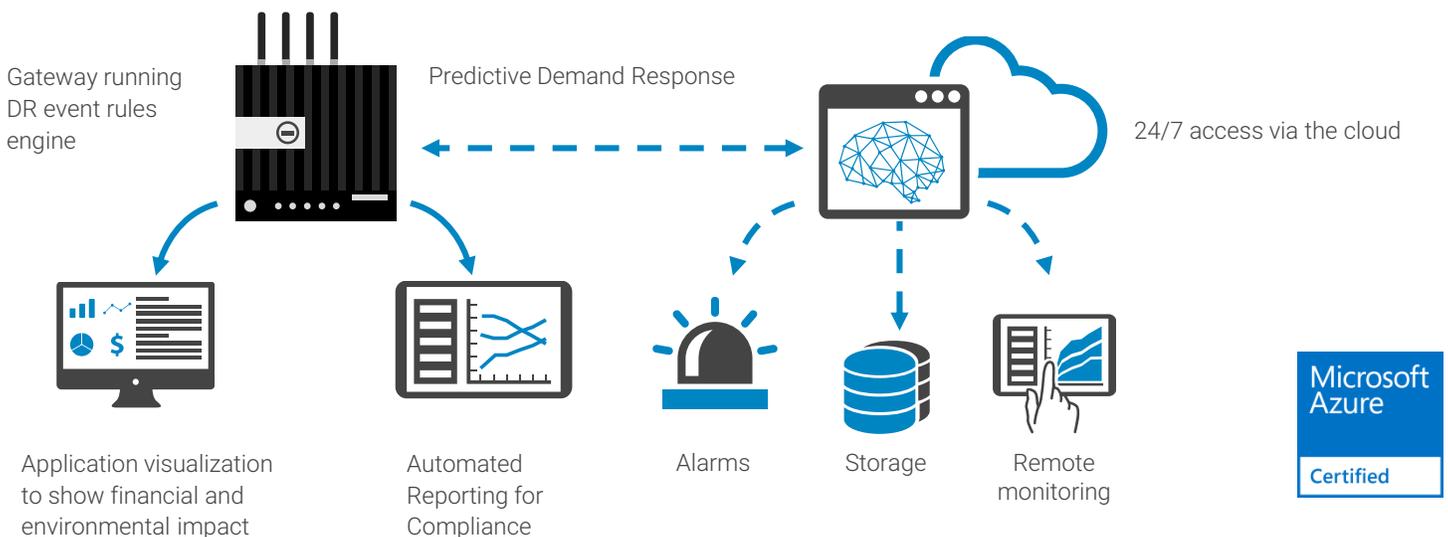
Once all of the assets are configured into the MicroGrid a Sequence of Operations (SOO) Control system needs to be implemented to optimize operation of the generating assets in a manner that meets your business and energy management goals and requirements. Additionally, this SOO is critical to the safe operation of all of the components and provides safeguards for the electrical functionality of the facility. The ELM FieldSight **μGRID** Edge offers Configurable Autonomous SOO Controls with optimization options available that range from maximum power availability to optimal renewable energy usage.

- Identify an SOO profile that achieves green energy or carbon footprint objectives
- Develop edge software that autonomously manages each asset in the MicroGrid structure
- Develop protocols that ensure safe operation of all assets in the MicroGrid
- Develop monitoring system that tracks facility energy requirements in real time



## 5 | Optimize and Monitor your MicroGrid ROI

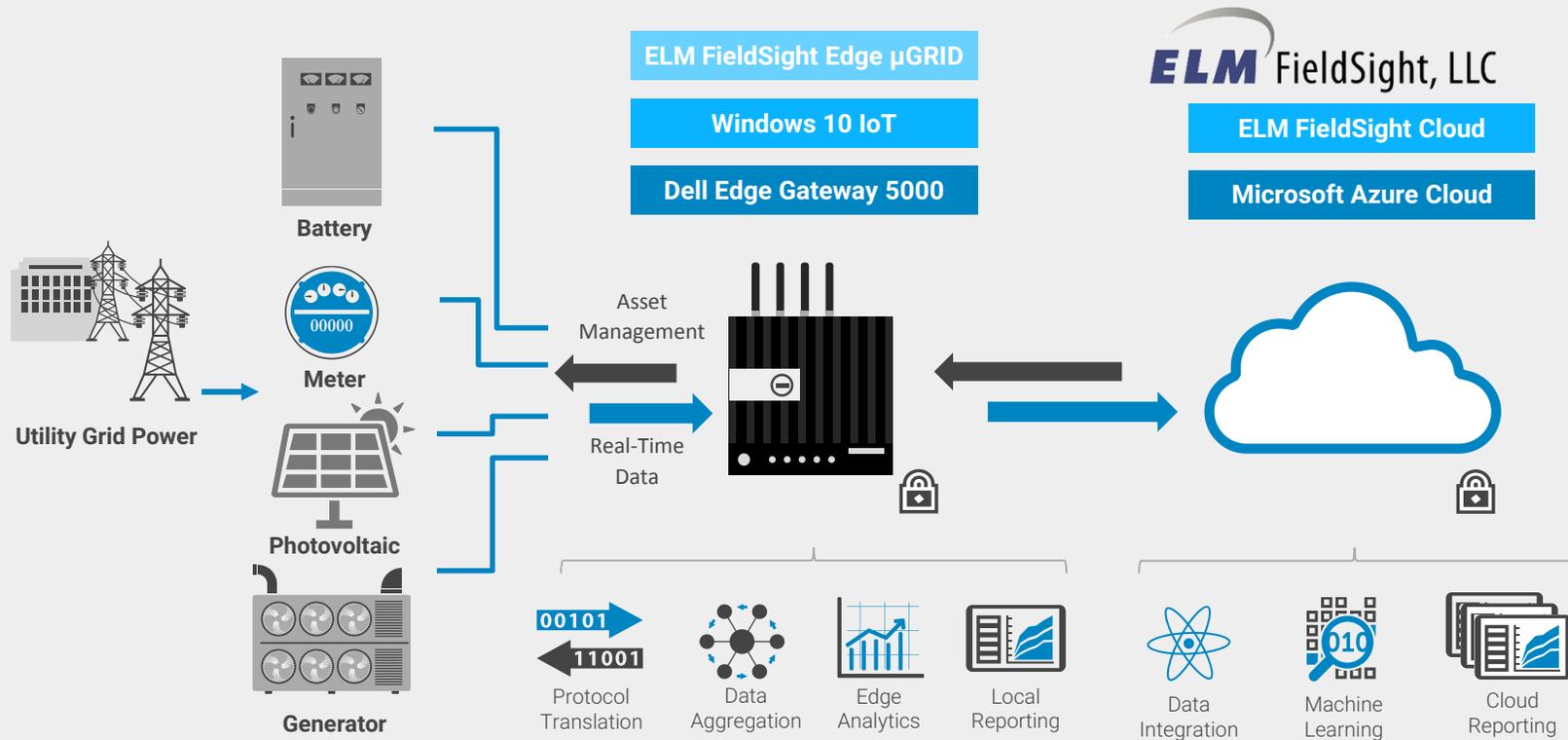
Once your SOO Controls are in place and the MicroGrid is up and running, continuous monitoring of the solution is critical for reporting, alerting and alarming on all of the components in the system. The ELM FieldSight Edge **μGRID** platform performs these actions locally with direct access through the local human-machine interface, but additional remote monitoring, reporting, data storage, alerting and alarming services are available through the ELM FieldSight Cloud hosted on Microsoft Azure. This service provides 24/7 access via any computing or mobile device on a secure cloud platform with 99.999% guaranteed uptime.



## MicroGrid Energy Management Solution Example

This MicroGrid energy management example represents a single solution provided by the industry leading partners below as a reference. Your specific MicroGrid application may involve a combination of these and other technology providers within our IoT Partner ecosystem.

To help create a blueprint for MicroGrid deployments, Dell has developed a flexible architecture centered around the Edge Gateway 5000 and integrating qualified partners for a complete solution. The [Dell Edge Gateway 5000](#) enables you to collect, analyze, relay, and act on real-time data from energy producing, distributing, consuming, and measuring equipment and sensors. A Windows 10 IoT platform running on the gateway offers manageability and enterprise grade security enabling device-to-device, sensor-to-device, and device-to-cloud communications. With ELM's FieldSight Platform also running on the gateway you get protocol translation that provides visibility to diverse data sets from utility grid power, meters, generators, renewable energy sources, and SCADA systems which provides the foundation for MicroGrid applications. FieldSight receives signals from the grid and offers local orchestration based on real time data from equipment and sensors, running on the Intel® Atom™ processor in the Edge Gateway. This generates alerts to ensure that perishable data is acted on immediately, and also only sends meaningful data to the cloud to minimize consumption of expensive network bandwidth. The FieldSight Cloud application runs in Microsoft Azure, enabling machine learning on the structured and unstructured data to identify even more granular patterns to predict energy efficiency improvements.



Along with our IoT Solutions Partners, we provide technology you can trust to help you get started quickly and efficiently.

Dell takes a pragmatic approach to the Internet of Things (IoT) by building on the equipment and data you already have, and leveraging your current technology investments, to quickly and securely enable analytics-driven action.

The Dell IoT Solutions Partner Program is a multi-tiered partner ecosystem of technology providers and domain experts to complement Dell's broad portfolio of IoT-enabling technologies.

To learn more visit us online at: [www.delliotpartners.com](http://www.delliotpartners.com)

Contact Dell Sales to learn more about the Dell Edge Gateway 5000, our ecosystem of qualified partners, and to deploy this flexible MicroGrid energy management solution today.



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