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TECHNICAL PAPER

Why Open Source Works for the Renewable Energy Sector

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According to the Center for Climate and Energy Solutions, renewable energy is the fastest-growing energy source globally where 24 percent of the energy generated in 2015 came from renewable sources such as biomass, geothermal, solar, hydro, wind, and biofuels. This is expected to increase to 31 percent by 2040 and will heavily depend on a number of factors, including the development of technologies to make this energy source cost-effective. A number of smaller companies and newer entrants to the overall renewable energy sector are doing just that — building scalable software solutions with the use of open source tools to help optimize day-to-day operations and reduce costs.

Energy operators have turned to technology years ago to help them better understand how their process, devices, and overall businesses are doing. In particular, they try to understand:

- The overall level of energy generation at all times in order to determine whether they can fulfill supply and demand
- The energy generation level of each device and why (state of the device, what kind of maintenance is required to perform at optimum levels, the impact the current conditions have on the device)
- The reasons for service degradation, which in some cases may still need to be discovered with the use of data already collected or with data that still needs to be collected

Renewable energy challenges

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Operators have always known that in order for equipment to run optimally, data is required. This is especially true when working with nature as the energy source. Energy such as wind, hydro, and solar are not constant and therefore require operators to adapt their equipment regularly to the changes in the environment. For example, wind turbines in colder climates may need to be shut down from time to time in the winter months due to the accumulation of ice on the blades. And once the conditions improve, legislation dictates that a successful visual inspection is required before they can be turned back on. If, however, the turbine isn't performing as expected after turning it back on, operators can rely on the data collected to help determine whether it was ice, the forced shutdown, or any other moving parts that caused the failure.

This is just one example of the challenges that renewable energy operators are faced with, while other things that they need to contend with include and are not limited to:

- **Device Location**. Energy generating devices are often in remote, and geographically dispersed areas. They don't want to send out a technician everyday to check how the devices are doing and prefer to send the technician out only when service on a particular device or part is needed.
- **Data**. They need to collect data - a lot of data - per device, at precise time intervals and at precision levels that may vary from device to device. They need to be able to store all this data forever for historical analysis or production forecasting, and they need to be able to do this in an instant. More often than not, data is not readily accessible, and is stored in remote storage requiring the person hoping to do any kind of analysis to physically go get the data.
- **Rudimentary tools**. A lot of data is still collected by a human walking the field. Often this data is stored in spreadsheets or on paper.
- **Equipment**. Renewable energy equipment is expensive and fragile, making it even more important to be able to protect assets as well as maximize usage.

To contend with these challenges, many renewable energy operators relied on technologies created and distributed by their equipment manufacturers. This was problematic since the solutions were built with a perspective of managing a piece of equipment and not the overall service/solution. These solutions are not extensible or scalable, based on unsupported operating systems and come at a hefty licensing price. This is naturally less than ideal since many of the installations are on a smaller scale, distributed, and come with smaller budgets.

Interestingly, with smaller budgets comes the need to fully maximize equipment and the willingness to find new ways for optimizing operations, including trying open source solutions. Previously, open source held the stigma of being the cheap alternative to proprietary software but open source solutions

have come a long way. Today, open source is at the heart of innovation in organizations, as it allows developer teams to quickly bring ideas to fruition faster.

For many renewable energy operators, companies like Factry and Sudokrew are helping them to exchange expensive legacy systems with solutions based on popular open source projects like InfluxDB. The following shows a few examples.

A&S Energie

A&S Energie is a Belgian biomass plant that supplies electricity to 55,000 households by burning 180,000 metric tons of non-recyclable wood per year. At its maximum output, the plant generates 26 megawatts of power and has been operational since 2010. A&S Energie presented a classic industrial IoT challenge involving high-cost, confined industrial equipment requiring a useful life of many decades. They relied on a largely manual, error-prone, and time-consuming process, where Operators wrote counters on paper, Management reporting was done in Spreadsheets, and their existing Historian was underutilized. In addition, they use a SCADA systems which was used to archive sensor values, setpoints, and alarms for later analysis and real-time trending.

Factry replaced A&S Energie's historian solution with Factry Historian, which has an open-source time series database from InfluxData at its heart and supplies an open source dashboard to management and the individual operators. The fact that the plant's existing historian had been collecting data since 2010 required Factry to build a custom tool to migrate this data from the existing system to the new one. Despite this, data migration took roughly only a month, and once complete the old system was switched off and the new Factry Historian was operational. Data from their SCADA system was readily available for only 3 months. Anything older than that had to be placed on an external physical medium and loaded into the trending tools of the SCADA system. In contrast, today with the Factry solution in place, all data is always readily available.

This allowed Factry to provide dashboards to anyone in the company to conduct their own analysis against data that is relevant to their specific context. For example, the individual A&S operators can customize their own dashboards to drive even more insights from the data which leads to better plant production, better operator performance and higher work satisfaction. This has already led to detect early signs of tank leakage, which prevented costly unplanned downtime. Adding to this, management is already saving about 30 minutes per day on reporting.

BBOXX

BBOXX (pronounced "Bee Box") develops and manufactures products to provide affordable, clean solar energy to off-grid communities in the developing world. The name is short for "Battery Box." Their systems comprise of a solar panel connected to a battery and a set of USB and DC connectors to power lights, radios, and low-powered televisions. The unit also includes a set of electronics to allow BBOXX to control it remotely.

Their service provides over 350,000 people across 35 countries with electricity — children are now able to study under good light without inhaling soot and fumes from burning kerosene. InfluxData is a core

part of their solution meeting their current needs of remote monitoring, billing, and alerting of their 85,000 units, growing to nearly 1 million by 2020.

The initial goal of becoming a data-driven business is a reality. They are now able to get insight into their data and are applying lessons learned from analyzing past data to develop new and exciting products that exceed customer expectations. Although gathering data was not a core part of their business plan, the insight it has created is a core asset to the business.

Blue Planet Energy

Blue Planet Energy sells a scalable energy storage unit that allows residential and commercial facilities equipped with solar panels to store energy for off-grid use. Their storage technology has been a key piece in the disaster relief efforts in Puerto Rico by powering an off-grid clean water pumping system for the Corozal and Isabela municipalities.

Sudokrew built Blue Planet Energy's web infrastructure as well as a suite of applications to service stakeholders within their chain of distribution and support. Blue Planet Energy's monitoring software was previously using a time series database built on a legacy system that encountered issues when scaling, which prompted the need for a replacement. Sudokrew replaced this legacy system with InfluxDB, which solved the product's scaling issues as well as improving the level of performance for their suite of apps. InfluxDB was able to improve the requests per second by a factor of 6X when compared to the legacy system.

There are several reasons why renewable energy operators may or may not succeed — ranging from blocks due to politics, economics, or even legal issues — but it is nice to know that with open source, technology no longer needs to be the impediment to increasing the production of green energy to the world.

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About InfluxData

InfluxData is the creator of InfluxDB, the open source time series database. Our technology is purpose-built to handle the massive volumes of time-stamped data produced by IoT devices, applications, networks, containers and computers. We are on a mission to help developers and organizations, such as Cisco, IBM, PayPal, and Tesla, store and analyze real-time data, empowering them to build transformative monitoring, analytics, and IoT applications quicker and to scale. InfluxData is headquartered in San Francisco with a workforce distributed throughout the U.S. and across Europe.

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