

THE INTERNET OF ENERGY

How the energy industry is harnessing IoT to build new revenue streams, reduce costs, and increase efficiency.



How IoT technology is revolutionizing the energy industry

Over the next 25 years, worldwide energy consumption is expected to grow by over 40%. The demand for smart and efficient energy systems is more prevalent than ever before to meet this growth. Thankfully, the energy industry is rapidly evolving and making shifts towards using IoT to build efficient energy management systems to upgrade outdated infrastructure.

The number of companies using IoT for smart energy applications is constantly expanding. According to Gartner, 30% of energy management systems will leverage IoT platforms by 2020. That's because many businesses have found success in using IoT applications for grid modernization programs and other energy services.

30%

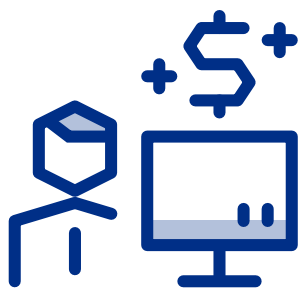


of energy management systems will leverage IoT platforms by 2020.

-Gartner

The benefits of IoT and energy

From smart wind turbines to efficient electric vehicles, IoT enables numerous opportunities to monitor and improve energy operations. Here are some of the main benefits we have seen from product creators and companies using IoT to modernize and improve modern energy systems:



Reduce costs

The majority of energy companies are using IoT to reduce operating costs to existing systems to improve energy production.



Increase efficiency

The majority of energy infrastructure is outdated. IoT offers companies an easy and modern mean to update outdated systems.



New revenue streams

Companies use IoT to deliver new features and services that allow them to build new revenue streams on top of existing business models.

Top industrial IoT use cases in energy

The Internet of Things gives companies opportunities to more intelligently monitor and control the performance and condition of energy control systems. Here are the five primary ways companies are using IoT to improve these energy systems:



Preventative maintenance – Energy appliances break constantly. IoT offer companies the potential to monitor and diagnose these systems wirelessly to prevent problems.



Energy system monitoring – Companies use IoT technology to monitor and log important system metrics such as health, performance, and efficiency. For example, an energy utility can monitor substation performance and preempt any issues brought about by weather.



Emission monitoring and reduction – Companies use IoT technology to monitor emissions in real-time. This enables oil and gas companies to comply with emission and waste regulations, while also cutting costs. In the past, a field agent would need to physically inspect an extraction or processing site to ensure regulatory compliance. Now, an IoT device can wirelessly monitor essential compliance metrics, such as oil leaks and emissions.



Grid asset management – IoT technology helps electric companies monitor grid topology by connecting systems and gathering data on usage and performance. Cellular sensors can send alerts when there are safety oversights and prevent the failure of important equipment. For example, EV charging companies can remotely monitor the performance of their EV charging stations.



Smart metering – Companies use connected sensors to monitor consumer utility lines in real-time and collect performance data wirelessly. For example, HVAC companies are able to counteract issues that can occur before service cycles, and repair them quickly.

How IoT tech is being used across the energy industry

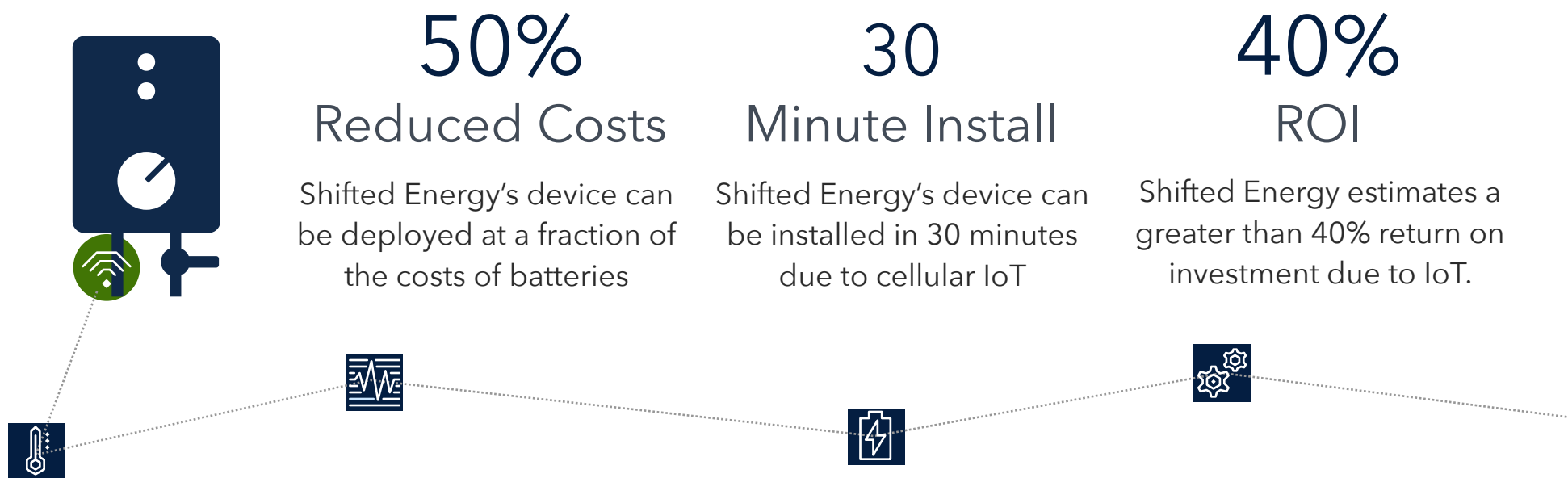
To further illustrate how IoT is impacting the energy, this paper will explore how IoT enables the above mentioned use cases in each sector of the energy industry. This paper will also shed light on Particle's approach to building an energy-related IoT product and how we have helped customers develop IoT solutions to improve energy production .

Renewable Energy

We've now reached a point where renewable energy generation is cost competitive, if not cheaper, than the generation of fossil fuels. The challenge facing companies now is to better manage and store this energy. That's why many organizations are connecting renewable energy assets to the Internet to better manage and control the generation of renewable energy:

Shifted Energy is driving the energy economy to 100% renewable

The biggest problem with renewable energy is storage. Unlike fossil fuels, renewables can only be generated at certain times of day – and these times do not line up with when this energy is needed.



Shifted Energy is transforming the way utility companies can generate and integrate more renewable energy with IoT. With the Particle IoT platform, Shifted Energy is retrofitting already deployed water heaters into energy storage units. A grid interactive water heater can essentially act as a battery to temporarily store renewable energy during the day. This temporarily stored energy can then be used by utility companies during peak hours to balance the grid and maximize efficiency.

Altrac is making wind turbine maintenance simple with IoT

Managing a wind farm may seem simple because wind turbines can operate independently, but they can often break or malfunction due to sensitive weather conditions. However, companies like Altrac, are using IoT technology to help wind operators better monitor and manage wind machines before problems happen. Each windmill is connected to the Internet via a cellular-connected sensor, which collects data on air temperatures, engine RPM, and fuel level. Wind machine operators can then monitor this data from their phones, which allows them to better manage these assets wirelessly.

Smart utilities

The utilities industry is rapidly ramping up digital initiatives. According to Gartner (2018), data analytics, artificial intelligence and the Internet of Things rank at the top of game-changing technology areas for utility businesses. The same study found that a significant proportion of digital initiatives in utilities have shifted from the initiation phase to the scaling phases. And most of these initiatives are optimizing existing processes for cost reduction and operational improvements.

“Data analytics, artificial intelligence and the Internet of Things rank at the top of game-changing technology areas for utility businesses.”

**Gartner
IoT Insights**

IoT implementation opens doors and opportunities

IoT creates opportunities to revolutionize the grid and open two-way communication into consumer's home. Companies are most commonly using IoT to monitor consumer use, collect performance data, and improve utility operations within the home.

For example, a typical HVAC system is subjected to maintenance every 3-6 months by utilities. But plenty of maintenance problems can occur between that 3-6 month timespan.

That's why many HVAC companies are using IoT to monitor these systems wirelessly. A connected sensor can monitor and diagnose issues before they become problematic, helping utilities reduce operating costs and save money by not having to send technicians out to monitor them.

Stronger customer relationships and cutting costs

By monitoring important utility assets wirelessly, companies can save operational costs and enhance customer relationships.

Utilities are prone to breaking, and many customers often do not have favorable opinions of their utilities. However, rapid maintenance and continual performance helps improve customer's opinions of their utilities and creates more satisfied customers.

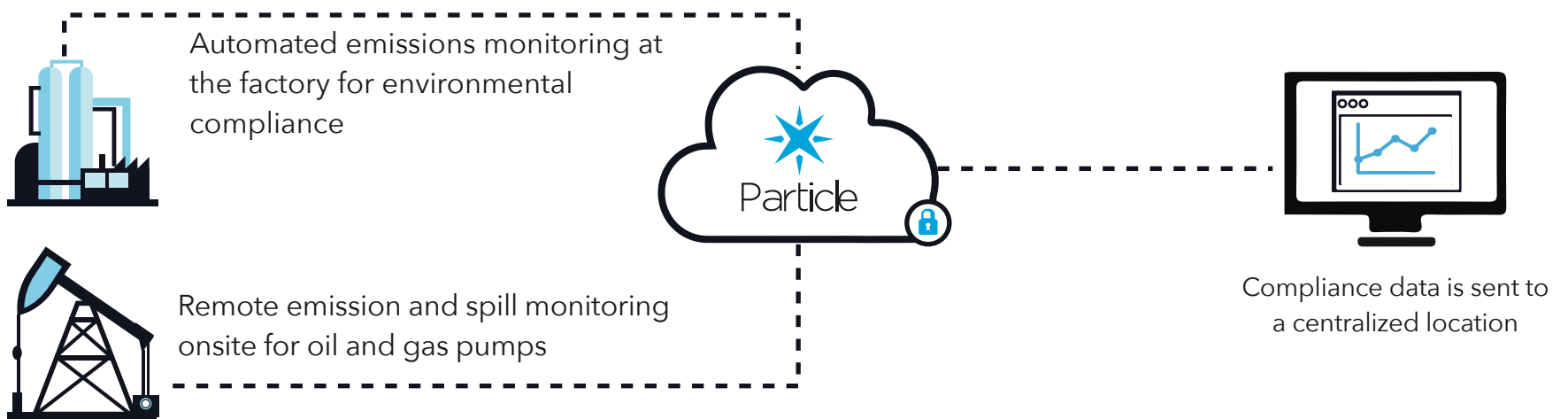
Oil and gas management

Oil and natural gas remain important energy sources, but require significant investment to improve operations and protect the environment. One of the ways IoT is helping in this area is helping oil and gas companies monitor and manage important gas pipelines.

Pipelines are prone to damage and leaks because fuel is typically transported under high-pressure conditions. According to PennEnergy, pipeline operators lose approximately \$10 billion per year due to pipeline leaks and fuel theft. This has led many operators to examine IoT monitoring solutions that can help them adequately maintain their pipeline infrastructure:

Remotely monitoring oil fields instead of site visits

With connected sensors, leading multinational operators are able to collect field data on pipeline pressure, temperature, and flow. This has helped them build a support platform to optimize their productivity and increase the safety of their oilfield operations. These sensors have also enhanced pipeline maintenance operations by enabling operators to detect pipeline malfunctions early on, preventing major problems before they occur.



Environmental monitoring and regulatory compliance

Another key benefit of using IoT-connected sensors is that it allows pipeline operators to adequately monitor environmental conditions and ensure compliance with regulations on emissions and waste, among other areas. In the past, a field agent would need to physically inspect an extraction or processing site to ensure regulatory compliance. Now, an IoT device can be deployed in the field to remotely monitor essential compliance metrics, such as oil leaks and gas emissions.

Electric vehicle charging

One of the biggest challenges related to electric vehicle (EV) charging is availability and the lack of infrastructure. According to McKinsey (2018), consumers rank not having enough access to efficient charging stations as the third most serious barrier to EV purchase, behind price and driving range.

While many automakers and third party network providers are racing to meet these challenges, the general installation and user-interface related to EV chargers also creates issues for consumers. That's why many companies are turning to IoT to create new solutions for these problems.

Key IoT features for EV charging companies



OTA firmware updates

Send new features updates to already deployed EV charging stations to improve efficiency.



BLE connectivity

Enable customers to manage their EV charging stations wirelessly with their phones.



Fleet management tools

Monitor your EV charging stations remotely and collect performance data wirelessly.

Top Industrial IoT use cases for EV charging companies

Here are some of the top ways companies are making EV charging stations more efficient with IoT:



Preventative Maintenance – Like any machine, EV charging stations are prone to breaking. Many EV charging companies use low-cost smart sensors to monitor essential performance metrics in real-time and send alerts the moment something starts to go wrong.



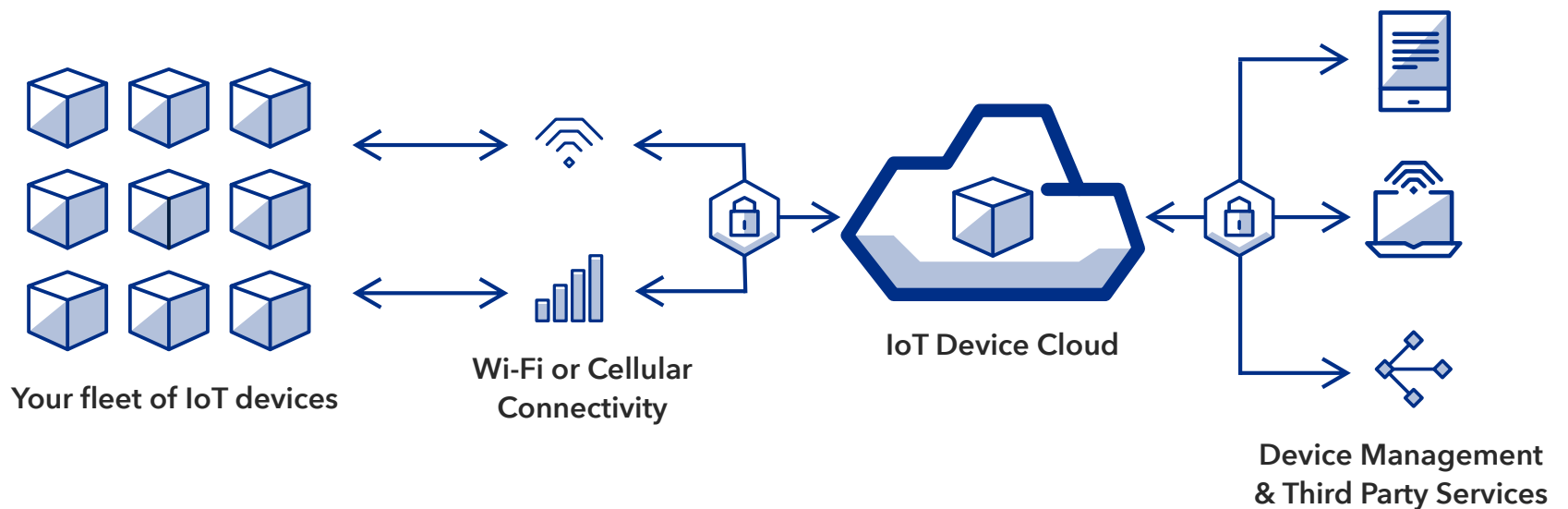
User control and device support – Companies use IoT tech to help customers setup and manage their EV charging stations after purchase. For example, companies like Andersen EV, have built BLE-connected EV charging stations so customers can communicate to the device over their phones.



Energy Monitoring – Companies can monitor energy usage and collect better data usage and cost available. The sensors can even communicate with a user's phone to report important vitals such as error warnings, and service reminders.

Developing your own energy IoT project with Particle

The energy industry is complex and varied, which means there is no one-size-fits-all IoT solution. However, Particle provides all the tools you need to develop a customized IoT solution that works for your specific business problem.



Particle provides your business with the **hardware, software, and network infrastructure** it needs to overcome the innumerable challenges of IoT.

Particle offerings

Particle provides everything you need to power your IoT product, from device to cloud:



IoT Hardware (Wi-Fi, Cellular, Mesh)

Connectivity hardware that is designed for building IoT products and devices



Developer Tools

Software development tools for every layer of your IoT stack



Device management

A web interface for managing and provisioning remote IoT devices



Device OS

An operating system that handles the complexity of IoT infrastructure



Device Cloud

A reliable gateway between your IoT devices and the Internet



Cellular IoT SIMs

Low-cost SIM cards designed for low-bandwidth IoT devices

Benefits of using Particle

Developing your own connected device has a few key benefits. First, you can easily customize and tailor a solution to meet your organization's specific needs. You will not be tied to a rigid system that cannot adapt to your fleet's evolution and shifting requirements. Second, you can scale new revenue channels by having open access to any business or performance data you need, and integrate these data streams into your existing analytics platforms. With this data, you can take action in the physical world using predictive analysis on both real-time and historical data, which, in turn, trigger actions on devices or through other web services

How Particle abstracts the complexity of IoT projects

Starting your own IoT project may seem challenging or near impossible (as a matter of fact, nearly three-fourths of self-initiated IoT projects are considered a failure, while a third of all projects were not seen as a success). The two biggest contributors to the failure rate are: lack of internal IoT expertise and platform (hardware/software) reliability. With Particle, you have full access to IoT experts, a large community of IoT enthusiasts, support services, and professional engineering services to help you get your IoT projects off the ground.

Create a brighter future with Particle for Good

If you're an organization, non-profit, or academic institution that is planning to or already creating a brighter future with IoT, the Particle for Good program can provide benefits to support your initiative.

At Particle, we see IoT as more than just a business opportunity. We see it as a way to make positive societal impact. The Particle for Good program provides qualified organizations with additional resources and benefits like discounted hardware and device cloud costs, priority support, and access to our private communities. If you're interested, you can learn more about the Particle for Good program [here](#). You can also start prototyping your project now or talk to our team of experts by checking out the links below.

Check out the Particle store



Start your IoT journey by checking out our industrial hardware on the [Particle Store](#).

Contact our experts



Contact our team of experts at [Particle.io/sales](https://particle.io/sales) to get a personal demo of the platform.