



Leveraging IIoT Devices in the Power Gen Industry

OPPORTUNITIES & CHALLENGES



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Introduction and Summary

The Industrial Internet of Things (IIoT) is poised to seep into nearly every part of asset-intensive industries—including power generation. Even with the significant opportunities of IIoT, integrating distributed, intelligent devices into plants brings unique challenges. For the purpose of this white paper, “IIoT devices” refers to sensors which are not connected to an automation or control system. Often times, these are wired or wireless sensors that provide supplemental information for condition monitoring. Some common sensor types and use cases include:

Sensor Types	Use Case/Example
Vibration/Accelerometer	Predict Failure of Rotating Equipment
Acoustic/Ultrasonic	Leak Detection, Steam Trap Monitoring
Wireless Temperature	Health Monitoring of Transformer Bushings

How do IIoT devices complement the telemetry available from existing automation and control systems? How can my organization prepare to embrace this new wave of technology? These are just a few of the questions facing asset-intensive industries with the arrival of IIoT. To better understand these challenges and opportunities, this paper explores how IIoT devices can complement the existing industrial control systems of power generation facilities. Zpryme surveyed over 160 respondents from primarily North American organizations that provide power generation from sources such as wind, solar and natural gas.

Key findings include:

Approximately two-thirds of respondents rank **IIoT a moderate to high priority**—over half (56%) expect its importance to increase over the next 12 months

The **most significant benefit** of IIoT is **increased reliability and uptime**, followed by improved visibility into asset health

Over two-thirds of respondents (68%) agree that it is **important to combine IIoT data with automation** and control system data

RESPONDENT DEMOGRAPHICS

Below are a few details about our respondents.

Annual Revenue (USD)

\$1B+	38%
\$500M-\$999M	17%
\$100M-\$499M	20%
< \$100M	25%

Types of Power Generation

Natural gas	73%
Coal	41%
Nuclear	21%
Petroleum	21%
Hydro	41%
Geothermal	13%
Wind	46%
Solar	59%

Respondent Roles

Engineering	34%
Operations	20%
Maintenance	3%
IT	17%
Customer service	5%
Executive	14%
Finance	3%
Other	4%



IIoT and Power Generation

The transformation of energy is significantly influenced by the wave of digitalization sweeping across the energy value chain. A key component of digitalization is the Internet of Things (IoT), which creates operational and customer-facing efficiencies for utilities on the transmission, distribution and customer sides of the value chain, but what about power generation? Like power delivery, power generation depends on a large suite of assets to deliver their services everyday. The need to maintain the health of these assets has grown tremendously over the past few years.

How important is IIoT compared to other technologies for power generation? Approximately two-thirds of respondents rank IIoT as a moderate to high priority. (Figure 2) However, this is just the beginning of IIoT's importance for power generation. We also asked respondents how they expect IIoT's importance to change in their organizations over the next 12 months. (Figure 3) The verdict is that its importance is growing. Over half (56%) of respondents expect its importance to increase over the next twelve months. IIoT will eventually become a major player in asset health and maintenance in the coming years.

Figure 2. Importance of IIoT to power generation compared to other technologies

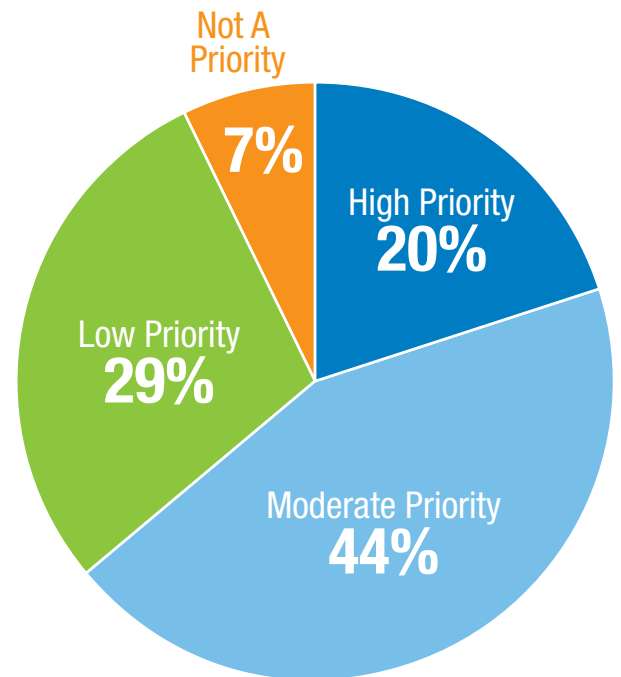
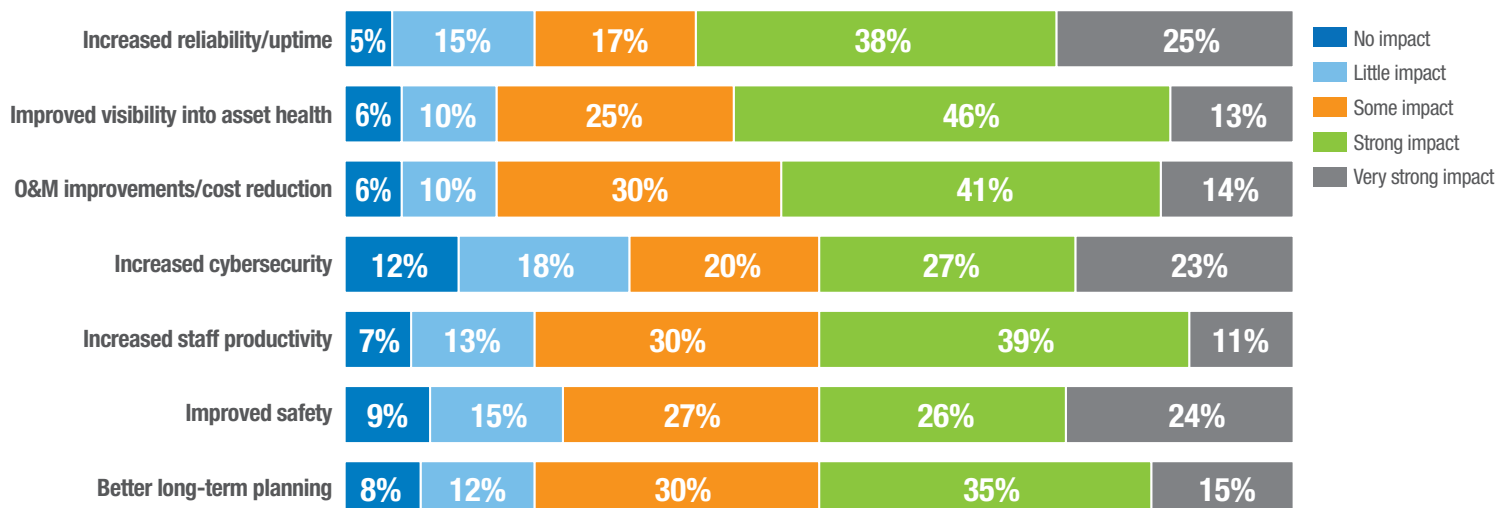


Figure 3. Change in IIoT importance over the next 12 months



Why are power generators focusing their resources on understanding and prioritizing IIoT? According to 63% of our survey respondents, the biggest reason to invest in IIoT is increased reliability and uptime. (Figure 4) Other significant IIoT benefits include improved visibility into asset health (59%) and O&M improvements leading to cost reduction (55%).

Figure 4. Most impactful benefits for power generation



State of IIoT Data Integration with Automation and Control Systems

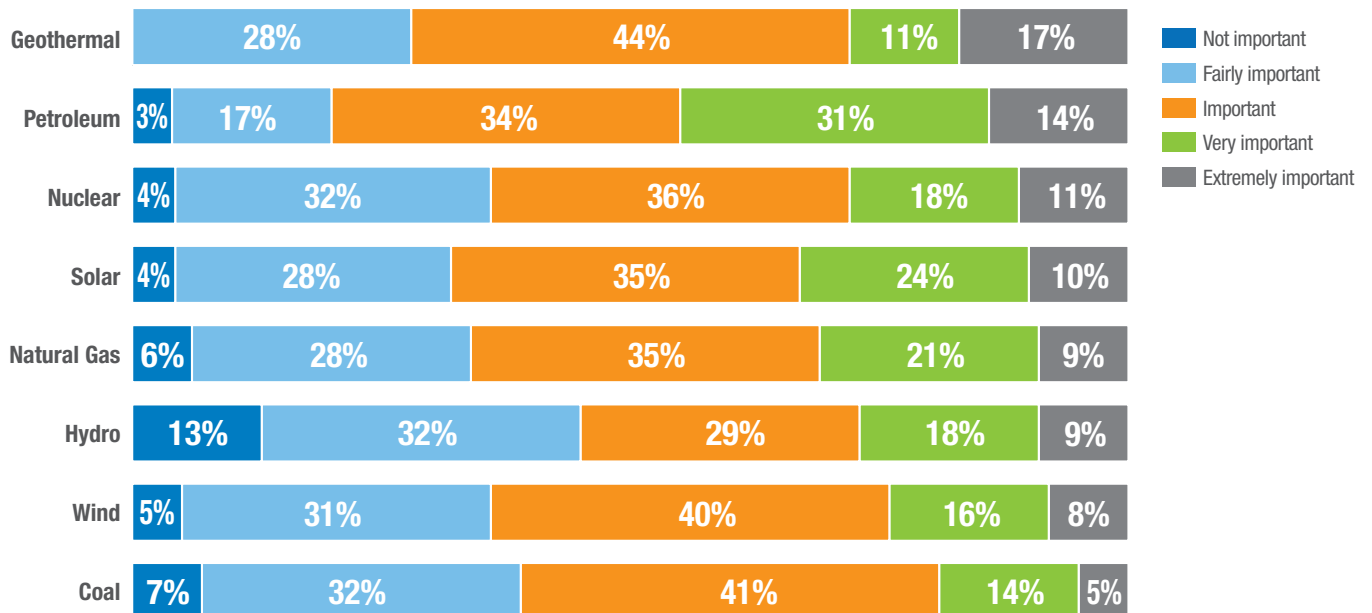
Power generation companies are improving their understanding of IIoT and starting to see how it could benefit their organizations. Cheap, intelligent, sensors can provide additional monitoring capabilities that can dramatically improve asset health and uptime. However, organizations need to consider how IIoT sensors will best work with their existing systems to ensure the value is maximized. An IIoT infrastructure includes asset health, process productivity, reporting, health and safety, energy efficiency, and quality tracking for all assets. For companies to avoid creating data silos, IIoT data needs to be effectively integrated with data from existing automation and control systems. Over two-thirds of our respondents (68%) agree about the importance of this data integration. (Figure 5)

Figure 5. Importance of integrating IIoT data with automation and control system data to manage assets



We compared the responses among different types of power generation and found companies with geothermal and petroleum power generation value this integration the most. Almost three-quarters of geothermal generation providers consider it important to integrate IIoT data and control system data. Solar and wind also value this integration. (Figure 6)

Figure 6. Importance of integrating IIoT data with automation and control system data to manage assets (by generation type)



State of IIoT Data Integration with Automation and Control Systems

These integrations are valuable and important, so how well are those data integration efforts going today? They are happening, but there is room for improvement. Approximately one-third of organizations integrating IIoT data with existing automation and control system data say the process is not going well at all. (Figure 8) Another 43% say it's going fairly well. There is certainly an opportunity for improvement with data integration efforts between IIoT and existing automation and control systems. In fact, 88% of organizations are expecting to make major upgrades and investments to accommodate IIoT data and devices. (Figure 10)

Figure 8. How well IIoT data integrates with automation and control system data

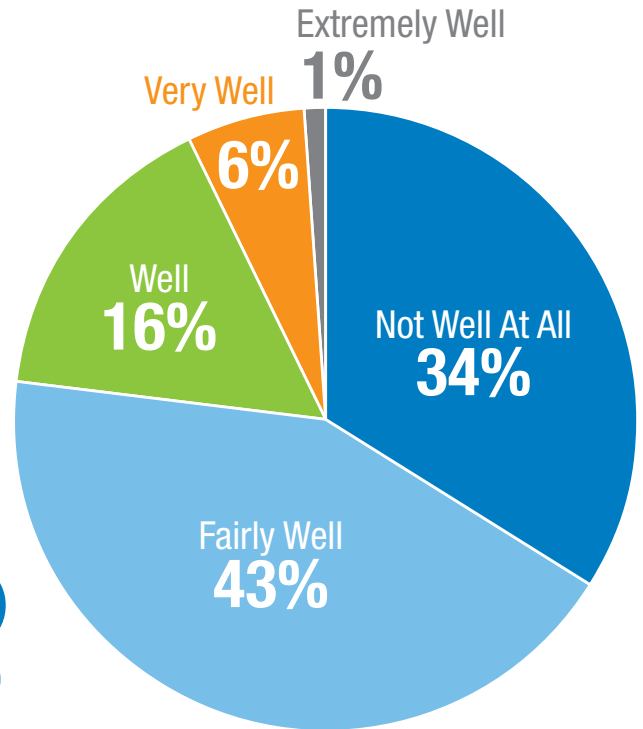
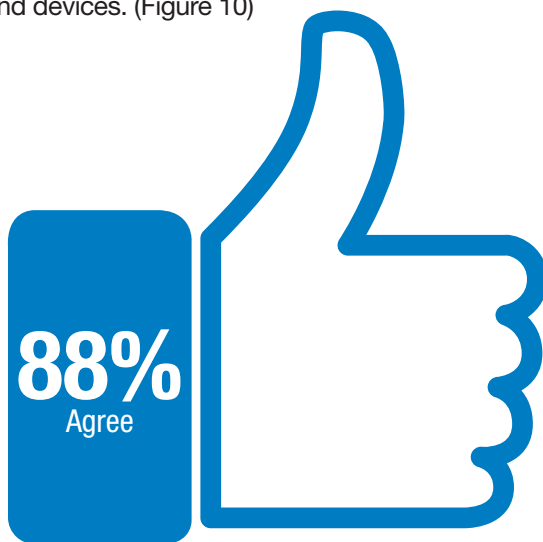


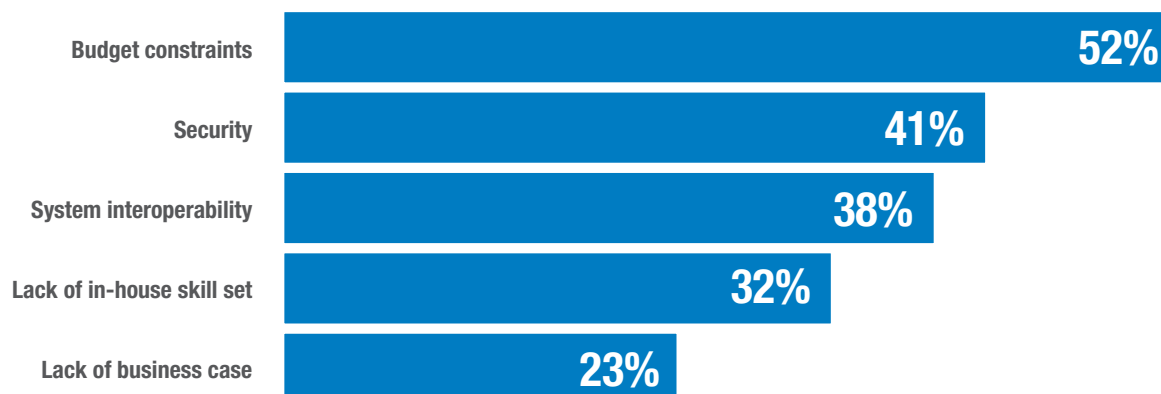
Figure 10.

"We will have to make significant upgrades/ investments to our existing automation and control systems to effectively use IIoT technologies."



Aside from system preparedness for IIoT data integration, power generators face additional challenges. The most significant challenge to overcome is budget. (Figure 11) Security and system interoperability also rise to the top as organizations begin developing strategies to leverage sensor data and increase connectivity among critical assets. Power generators are seeking a cost-effective way to implement a secure and integrated IIoT ecosystem.

Figure 11. Top five challenges integrating IIoT data with automation and control systems



Organizational approaches to IIoT

Lastly, let's look at how organizations are approaching the rollout of IIoT projects. What are the first steps organizations are taking today? Right now, we're only seeing small efforts by organizations to take on IIoT projects themselves. As Figure 12 shows, many organizations are not seeking to build in-house solutions for integrating IIoT projects—just 14% of organizations are building custom applications. Furthermore, regardless of company size, few companies have significant numbers of developers working on IIoT-related projects. (Figure 13) Overall, 47% of respondents have a handful of developers tackling such projects.

Figure 12. Organization's approach to rolling out IIoT projects

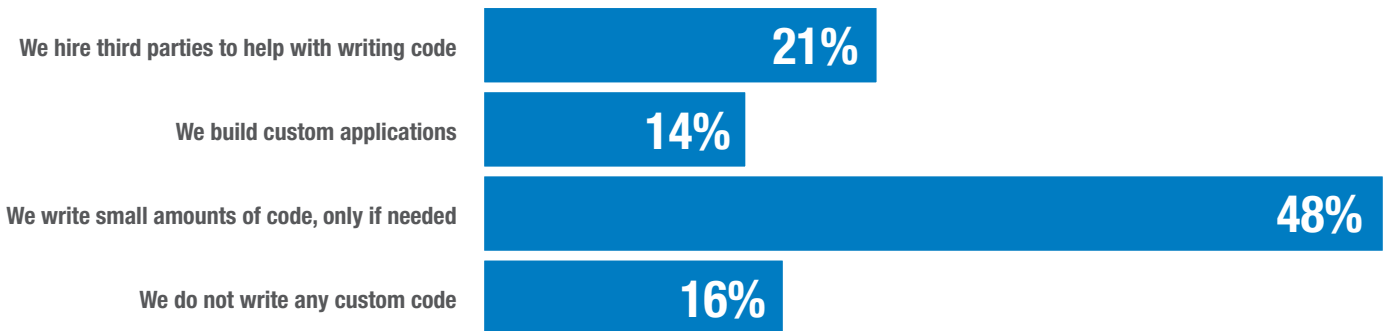
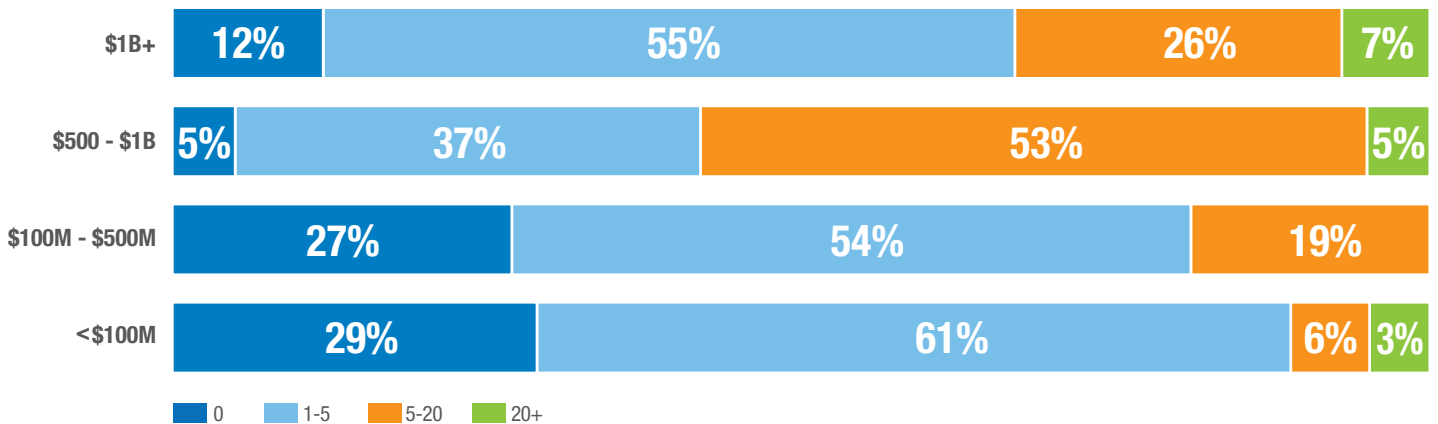


Figure 13. Number of developers at organizations working on IIoT-related projects (by company revenue)



Recommendations

IIoT is coming, and power generators are beginning to prepare for the future. IIoT devices are making it easier than ever to improve uptime and to gain additional visibility into asset health. Nevertheless, there is room for improvement, and now is the time to act. How can power generators best embrace the coming IIoT ecosystem? A couple of recommendations include:

Prepare now.

Thinking about integration from start will help you avoid pitfalls. To maximize the value of the additional monitoring capabilities provided by IIoT style sensors, you must have a plan to integrate this data with your existing control system data. Invest in an infrastructure to manage your IIoT data streams. Consider how you can best prepare your organization to adopt IIoT data on an enterprise-wide level.

Consider partnerships to alleviate pain points.

IIoT will push the boundaries of power generators' expertise, and many are not dedicating significant resources yet to tackle IIoT challenges and opportunities. Consider opportunities to develop partnerships with strategic vendors that will help your organization address skills and technology gaps to deploy a full-scale IIoT ecosystem that addresses security and interoperability issues.



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