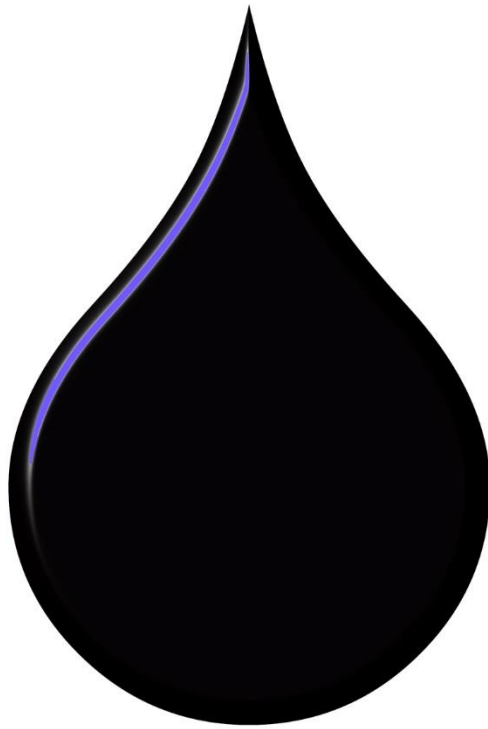


OIL & GAS



LPWA



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Executive Summary

Over the past 12 years, ON World has covered the impact of the Internet of Things (IoT) on the oil and gas industry. In the past two years, we saw growing interest in Low Power Wide Area (LPWA) network solutions such as LoRa^{®1}, Sigfox, LTE-M and NB-IoT and this trend continues. The multi-mile sensing and control capabilities provided by LPWA technologies is perfectly matched for oil and gas wellhead automation and pipeline operations as well as innovative solutions for asset tracking and logistics.

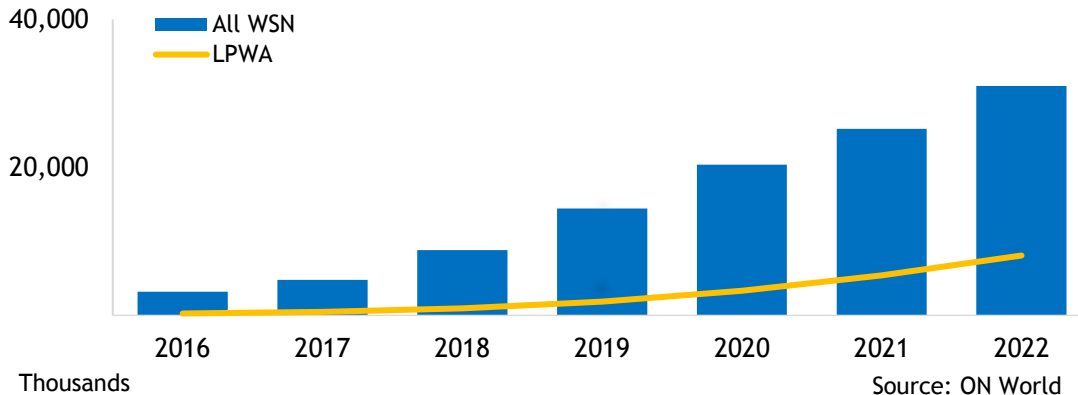
The US congress’s decision to allow oil and gas exports was a key decision that has enabled the US oil and gas industry to have a faster recovery from the 2014-2016 oil downturn. LPWA is the latest development that impacts this industry by solving complex and labor expensive monitoring and management of remote wellheads and assets. LPWA solutions move the networking and provisioning complexity to the in-premises or cloud network server. This lowers labor costs as routers and repeaters are not needed and development is primarily done in the cloud.

LPWA advantages for IoT solutions include the following:

- Communicate over multiple miles using a single gateway for tens of thousands of nodes.
- Nodes can run on battery powered nodes for 10+ years.
- Star based topology that is easier to manage and extend than wireless mesh networks.
- Device and gateway costs are relatively low and will trend lower as deployments grow.
- Network management can be handled in the cloud making it easier to provision devices.

By 2022, there will be 30 million wireless sensing, tracking and control devices in use worldwide for oil and gas exploration, production, pipeline operations, logistics and distribution. LPWA technologies will be the fastest growing and will enable millions of new connections that are not feasible with other technologies.

Figure 1: Global Oil & Gas Connected WSN Devices & LPWA Pen Rate (2016-2022)



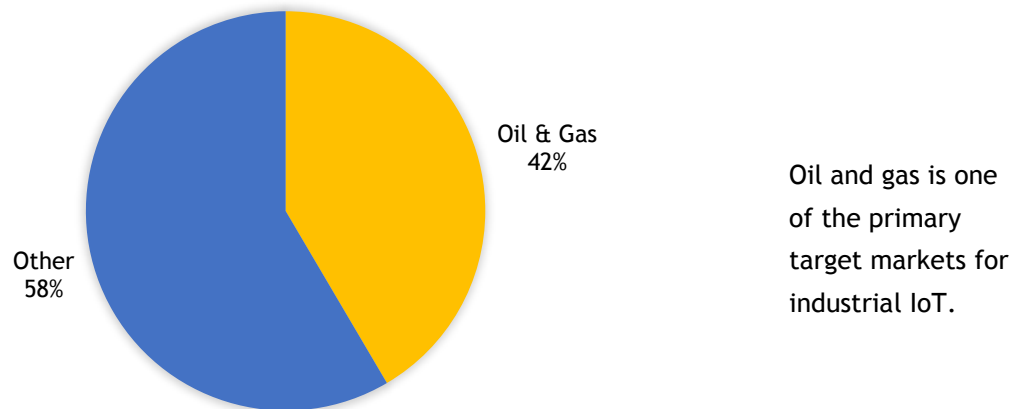
¹ *The LoRa[®] Mark is a trademark of Semtech Corporation or its subsidiaries.

The LPWAN ecosystem is rapidly growing with nation-wide networks rolling out across all the major continents and hundreds of companies participating in LPWA standards and alliances including the LoRa Alliance, Sigfox Partner Network, Ingenu's Machine Network, Weightless SIG, ETSI LTN and 3GPP.

The relatively low barrier to entry has drawn numerous new entrants including dedicated IoT network operators such as Ingenu, Sigfox, Senet and Thinxtra as well as IoT platform providers such as Actility, Carriots, Cumulocity, IBM, HP, OrbiWise and Stream Technologies.

Our latest phone interviews and surveys with 250+ industrial automation and IoT professionals found that nearly half are researching or developing LPWA networking solutions and 2 in 5 are targeting oil and gas markets.

Figure 2: Survey Respondents Targeting Oil & Gas



Source: ON World

Remaining challenges are lowering module costs, accelerating product development, hardening standards and overcoming security weaknesses, as well as involving more vertical solution providers such as Alizent (Air Liquide), OleumTech, WellAware and Zedi that currently offer LPWA systems.

In this report, we cover the growing LPWA market opportunities for oil and gas exploration and production, pipelines/storage as well as distribution/logistics. It includes 6-year market size forecasts (connected devices, annual unit shipments and breakdowns by market, application, technology, geography and equipment/services); the results from several surveys; technology evaluation; and analysis of the value system with 100 companies.



Methodology/Scope

This report covers the global market opportunity for Low Power Wide Area (LPWA) technologies for the oil and gas industry including wireless field instrumentation, network infrastructure, associated software and services. Our methodology emphasizes primary research with hundreds of individuals across the whole oil and gas value chain, an in-depth technology evaluation, weighted market drivers and a competitive analysis of 100 companies. The major components of our research include the following:

Data Collection/Investigation:

- 200+ surveys/phone interviews with professionals representing oil and gas companies, services companies, automation vendors, software platforms, systems integrators and component suppliers.
- Analysis of hundreds of financial, industry and technical reports.

Segmentation:

Geographies:	North America, Western Europe, Asia Pacific and Rest of World
Markets segments:	Exploration & Production, Pipelines/Storage, Logistics/distribution
Solutions:	Process monitoring and control; Machine health; Corrosion monitoring; tank levels and other asset monitoring; Asset tracking and location; Health, safety and environmental monitoring
Product segments:	LPWA equipment (End nodes, repeaters, gateways and associated software) and services (installation, maintenance and hosted/Web services)

Competitive Forces & Technology Dynamics:

- Product segmentation, value chain and business model analysis
- Distribution channels, product availability and vendor strength
- Standards developments, technology adoption and emerging technologies
- Analysis of 100+ companies (offerings, pricing, partners, financials and potential for disruption/sustainability)

Market Size Forecasts:

- **Market data:** Recent data is collected from vendors, suppliers and end users on unit sales, growth trends, applications, hardware/service pricing, distribution channels, etc.
- **Market drivers:** Analysis of the weighted driver impact for each solution/market.
- **Projections:** Using all of the above, we create data models from a moderate and aggressive viewpoint. Breakdowns are provided by target market, application, product segment, geography and technology. Revenues are for equipment and associated software/services.
- **Verification:** Forecasts are benchmarked with secondary sources and verified with market leading vendors and industry experts.



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