EBOOK

Closing the Last Mile: Satellite for IoT for Oil, Gas, and Utilities

Connectivity has become a foundational part of energy operations, shaping how assets are monitored, how teams are deployed, and how decisions are made in real time. Across oil, gas, and utility environments, data drives everything from production efficiency to safety protocols. But the ability to capture and act on that data is not consistent across the full operational footprint.

Much of the industry's infrastructure exists outside the reach of reliable networks. Pipelines span remote terrain, wellsites are distributed across wide geographies, and assets move through regions where cellular coverage is limited or unpredictable. Even in areas with partial coverage, performance can vary, creating gaps in visibility that disrupt workflows and introduce uncertainty.

These gaps are not simply technical challenges. They affect how quickly issues are detected, how efficiently resources are deployed, and how safely operations are carried out. When connectivity drops, so does the ability to maintain continuous awareness of what is happening in the field.

Closing the last mile means addressing this disconnect. It is about extending connectivity beyond traditional network boundaries so that data, communication, and control are not limited by location. By introducing satellite as a complementary layer, organizations can maintain consistent visibility across remote and mobile operations, ensuring that critical information continues to flow even where terrestrial networks fall short.

This eBook explores how satellite IoT supports that shift, enabling more reliable monitoring, safer field operations, and more efficient management across energy, oil, and utility environments.

Where Connectivity Breaks Down

Energy operations don’t struggle at the center of the network. They struggle at the edges. Out in the field, where pipelines stretch across remote terrain, where wellsites operate far from infrastructure, and where assets move across regions and borders, connectivity becomes inconsistent or disappears entirely.

These gaps aren’t always obvious at first. Systems may work as expected in connected environments, but as soon as operations extend beyond reliable cellular coverage, visibility begins to degrade. Data arrives late or not at all. Assets go untracked for stretches of time. Field teams operate without a dependable line of communication.

The impact shows up in ways that are both operational and financial. Delayed alerts can slow response times. Missing data can complicate compliance and reporting. Lack of visibility can lead to inefficiencies across logistics, maintenance, and resource planning. In higher-risk environments, the absence of reliable communication can also introduce safety concerns, particularly for lone workers operating in isolation.

These are not edge cases. They are common conditions across oil, gas, and utility operations, where infrastructure is distributed by nature and often located in places where traditional networks were never designed to reach.

Closing these gaps requires a different approach to connectivity, one that is not dependent on proximity to infrastructure, but instead designed to extend beyond it.

What "Closing the Last Mile" Actually Means

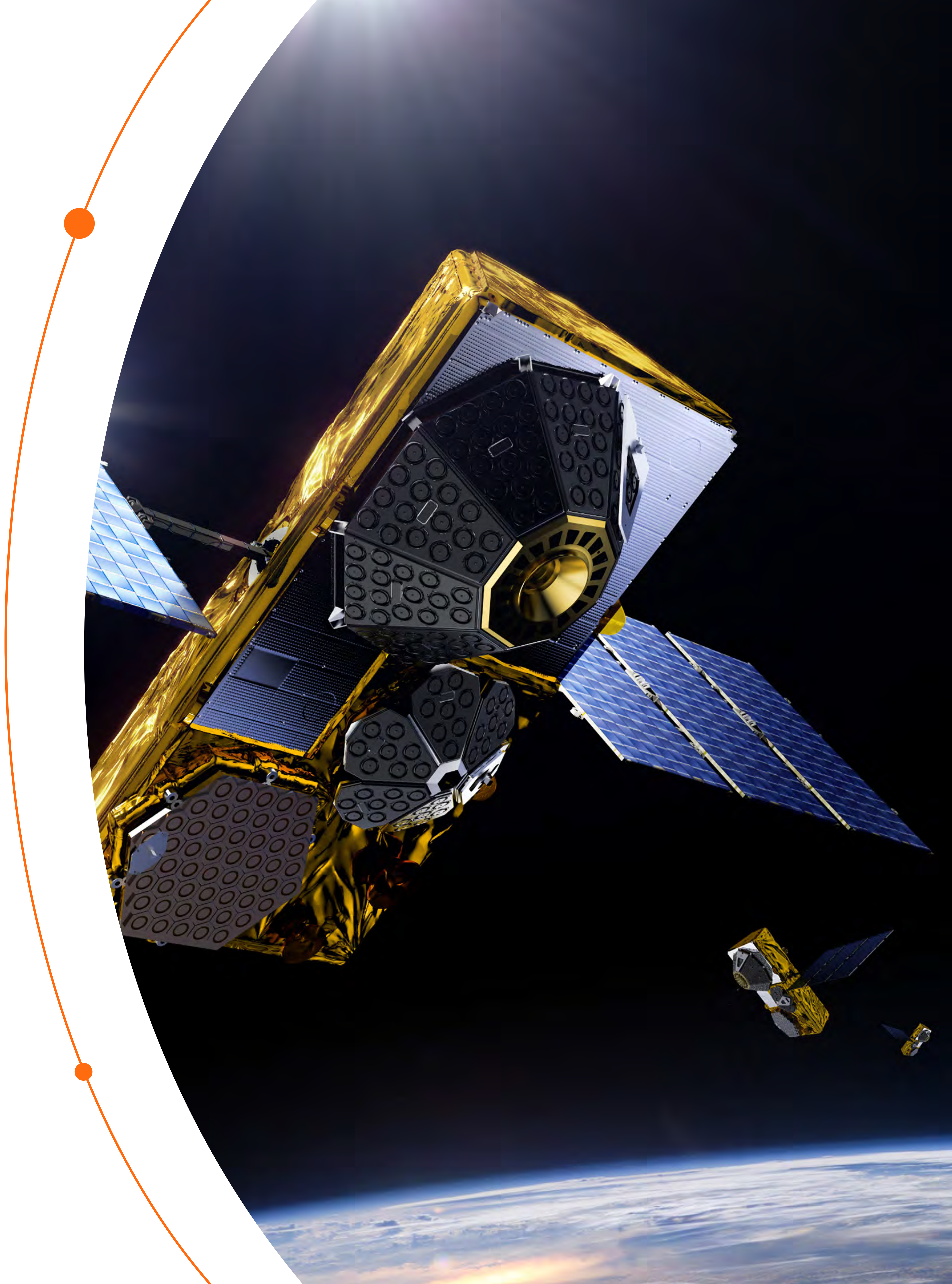
Closing the last mile is not about replacing existing networks. Cellular and terrestrial systems continue to play a critical role in energy operations, particularly in centralized and urban environments. The challenge lies in what happens when those networks end.

Satellite connectivity addresses this by extending coverage into areas where traditional infrastructure cannot reach or cannot be relied upon. It acts as a complementary layer, ensuring that devices, assets, and personnel remain connected regardless of location. Instead of designing operations around network availability, organizations can maintain continuity across both connected and disconnected environments.

This shift changes how connectivity is deployed. Rather than requiring new towers, backhaul, or regional agreements, satellite-enabled solutions can be implemented without dependence on local infrastructure. Devices can be deployed directly in the field, activated quickly, and integrated into existing systems without extensive redesign.

The result is a more consistent operating environment. Assets remain visible as they move in and out of coverage. Data continues to flow from remote locations. Field teams retain access to communication tools even in isolated conditions.

Closing the last mile, in this sense, is about removing uncertainty. It ensures that connectivity is not limited by geography, allowing operations to function with the same level of awareness and control at the edge as they do at the core.



High-Impact Applications Across Energy Operations

The need for reliable connectivity becomes most visible in the day-to-day realities of energy operations. Assets are distributed, environments are unpredictable, and many workflows depend on timely data from locations that fall outside traditional network coverage. In these conditions, even short gaps in visibility can have outsized consequences.

Consider pipeline monitoring. The U.S. alone has over 2.6 million miles of pipeline infrastructure[1], much of it running through remote or sparsely populated areas where cellular coverage is inconsistent. Continuous monitoring of pressure, flow, and potential leaks is essential not only for operational efficiency but also for regulatory compliance and environmental protection. Without reliable connectivity, data gaps can delay detection and response, increasing both risk and cost.

At the wellsite level, operations are similarly distributed. A single operator may manage dozens or even hundreds of sites, many of which are unmanned. Without real-time visibility, routine checks often require physical site visits, contributing to the millions of annual "truck rolls" across the industry. These visits can cost conservatively $250 to $500 per trip[2], making remote monitoring not just a convenience, but a significant cost-saving measure.

Logistics introduce another layer of complexity. In oil and gas, the movement of materials such as sand, chemicals, and equipment is constant and highly time-sensitive. For example, sand logistics alone can account for a substantial portion of operational spend in unconventional drilling. Delays or lack of visibility into delivery status can disrupt production schedules. Similarly, chemical tote tracking is critical for both safety and compliance, requiring clear chain-of-custody visibility as materials move between locations.

In-transit monitoring and container tracking extend this challenge further. Assets often move through a mix of connected and disconnected environments—crossing rural areas, nearshore zones, and international borders. Cellular networks may drop out entirely, and roaming agreements can introduce inconsistencies in coverage and cost. Satellite connectivity ensures continuity, maintaining visibility regardless of geography.

Fleet operations face similar constraints. Vehicles supporting energy operations frequently operate in remote regions where coverage is unreliable. Without consistent tracking and communication, coordination becomes more difficult, and response times can suffer.

Perhaps most critically, field safety depends on reliable communication. Lone workers operating in isolated environments are particularly vulnerable when connectivity is unavailable.

According to the U.S. Bureau of Labor Statistics, hundreds of fatal work injuries occur each year in industries such as oil, gas, and utilities, many of them in remote locations. In these scenarios, the ability to send an SOS, share a location, or maintain regular check-ins can be life-saving.

Across these applications, the common thread is clear. Visibility, communication, and control cannot depend on whether a network happens to be available. They must be built into the operation itself.

What Makes Satellite IoT Work in These Environments

For satellite IoT to be effective in energy, oil, and utility operations, it must align with the realities of the field. These environments are not static, centralized, or easily serviced. Solutions must be deployable quickly, operate efficiently over long periods, and integrate seamlessly into existing workflows.

One of the key advantages is the ability to deploy without infrastructure. Traditional network expansion requires significant investment in towers, backhaul, and regional agreements. Satellite-enabled solutions remove that dependency, allowing devices to be installed and activated wherever they are needed. This is particularly important given that a large portion of the Earth's surface, often cited as more than 80 percent, remains outside reliable cellular coverage[3].

Ease of integration is equally important. Energy operations rely on a wide range of sensors, control systems, and data platforms. Satellite IoT solutions that support standard interfaces and APIs can be integrated without requiring extensive redevelopment. This reduces deployment timelines and allows organizations to extend existing systems rather than replace them.

Power efficiency is another critical factor. Many remote assets do not have access to continuous power, making low-power device design essential. Devices capable of operating for years on a single battery enable long-term monitoring without frequent maintenance visits, which is especially valuable in hard-to-reach locations.

Two-way communication further expands what these systems can do. While traditional monitoring solutions focus on transmitting data, two-way capabilities enable organizations to send commands, adjust configurations, and respond to conditions in real time. This shift from passive visibility to active management allows operations to become more responsive and adaptive.

Real-time visibility also plays a direct role in operational efficiency. Studies across industrial sectors have shown that improved asset visibility can reduce downtime and improve utilization rates, while also supporting compliance and reporting requirements. In energy operations, where downtime can cost thousands of dollars per hour, even incremental improvements in visibility can have a meaningful impact.

Finally, global connectivity ensures consistency. Operations that span regions or cross borders cannot rely on fragmented network coverage or complex roaming agreements. Satellite connectivity provides a unified layer, enabling devices to operate under the same conditions regardless of location.

Taken together, these capabilities address a fundamental challenge in energy operations: the mismatch between where assets are located and where networks are available. By removing that constraint, satellite IoT enables a more continuous, reliable, and scalable approach to connectivity, one that supports both visibility and control across the full operational footprint.

From Visibility to Control

For many energy operators, the first phase of IoT adoption has been focused on visibility. Knowing where assets are, whether they are operating within expected parameters, and when something goes wrong is a meaningful step forward from manual processes and delayed reporting. But visibility alone has limits.

When systems are designed only to observe, action still depends on human intervention. Alerts trigger responses, but those responses often require dispatching personnel, initiating manual workflows, or waiting for the next available window of connectivity. This introduces delays that can affect safety, uptime, and overall efficiency.

Two-way communication changes that dynamic. Instead of simply receiving data, organizations can interact with devices in the field in real time. Configurations can be updated remotely. Reporting intervals can be adjusted based on changing conditions. Commands can be sent to initiate or halt specific actions without requiring a site visit.

This shift moves operations from reactive to responsive. In pipeline monitoring, for example, an alert can trigger not only awareness but immediate adjustment or escalation. In logistics, assets can be rerouted or prioritized based on current conditions. In field operations, teams can remain connected and coordinated even in isolated environments.

It also introduces a level of adaptability that is difficult to achieve with one-way systems. Operational requirements are not static. They change based on demand, environmental conditions, regulatory requirements, and unforeseen events. Two-way systems allow organizations to adjust in real time, rather than relying on fixed configurations that may not reflect current needs.

The progression is subtle but important. Visibility answers the question of what is happening. Control enables a response to what should happen next. In environments where timing and coordination matter, that distinction becomes critical.

Building a Connected Energy Operation

As energy operations continue to expand across geographies and environments, connectivity can no longer be treated as a secondary consideration. It is a foundational element of how assets are managed, how teams operate, and how risks are mitigated.

Closing the last mile is part of that foundation. It ensures that connectivity does not stop where infrastructure ends, and that operations are not limited by gaps in network coverage. Instead, organizations can maintain continuity across their entire footprint, from centralized facilities to the most remote field locations.

This has practical implications across the business. Asset visibility becomes more consistent. Maintenance can shift from reactive to planned. Logistics can be coordinated with greater precision. Safety protocols can be supported with reliable communication, even in isolated environments.

It also creates a more stable operating environment. When data flows consistently and systems remain connected, decision-making improves. Teams spend less time compensating for uncertainty and more time focusing on performance, efficiency, and outcomes.

Satellite connectivity plays a specific role in enabling this shift. By extending coverage beyond the limits of terrestrial networks, it allows organizations to standardize how they approach connectivity across diverse environments. Rather than designing around constraints, they can design for continuity.

In the end, closing the last mile is not just about extending coverage. It is about enabling operations to function with the same level of awareness and control everywhere they operate.

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Get more information on how to close the connectivity gap with satellite.

Reach out to our team of experts.

1. https://www.phmsa.dot.gov/faqs/general-pipeline-faqs
2. https://www.sandc.com/en/gridtalk/2017/march/20/the-real-cost-of-a-truck-roll/#:~:text=Back%20to%20Top,orders%20that%20must%20be%20prioritized
3. https://www.gsma.com/newsroom/press-release/mobile-internets-usage-gap-is-almost-eight-times-the-size-of-the-coverage-gap-gsma-research-reveals/#:~:text=Share.,These%20include:

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