

An oil pumpjack (jack-o'-lantern) is the central focus, painted in a teal color with a yellow counterweight. It stands in a lush green field filled with numerous bright red poppies. The background is a clear blue sky with scattered white clouds. A dark blue semi-transparent rectangle is overlaid on the left side of the image, containing the title and subtitle text.

Enabling Energy's Next Era of Environmentalism

How enhanced connectivity powers
Oil & Gas sustainability initiatives

The logo for RAJANT features a stylized blue Wi-Fi symbol above the word "RAJANT" in a bold, blue, sans-serif font. The logo is contained within a white rectangular box.

RAJANT



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Introduction

Current pressures on oil & gas enterprises

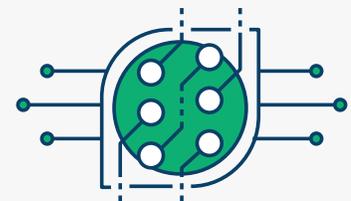
Oil and gas (O&G) corporations face many pressures today—an uncertain market, increasingly stringent policies for decarbonization, a push to transition to cleaner energy, and the need to be more efficient overall.

Amid a global energy transition, the challenge for the industry today is to engage and adapt to a constantly changing landscape, and evolve into forward-focused organizations working to optimize productivity while helping to significantly decarbonize the energy system.

Utilizing technology as the catalyst in generating more efficient, cleaner operations allows O&G companies to effectively reduce emissions and waste. More efficient operations mean less environmental impact—and make it possible to prepare for the **next era of environmentalism**.

This white paper will cover what O&G operations can do today to ensure a brighter future of production efficiency and will detail how they can leverage enhanced connectivity to boost their sustainability initiatives.

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Environmentalism in the Industry Today:

Abating emissions is top of mind

Throughout the past few decades, there has been much attention and emphasis on the environment by society—from environmental agencies across the globe to large corporations to the general public. Emissions and greenhouse gases resulting in climate change are the environmental topics at top of mind for O&G leaders.

According to the EPA's 2020 Inventory of US Greenhouse Gas Emissions and Sinks, in 2018 (the most recent year of data), total U.S. emissions increased by 3.7 percent from 1990 to 2018 and emissions also increased from 2017 to 2018 by 2.9 percent. Many long-term trends, including population growth, energy market trends, technological changes, and energy fuel choices influence these numbers. The oil and gas industry's operations account for 9 percent of all human-made greenhouse-gas emissions.¹

The **oil and gas industry's** operations account for

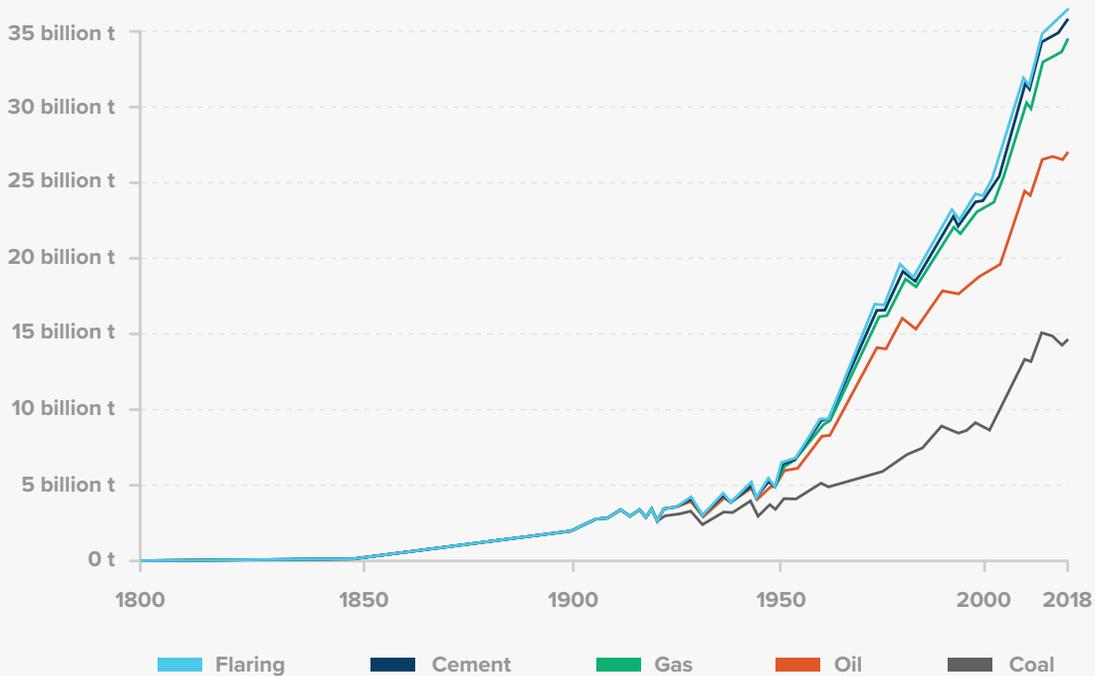
**9% of all
human-made
greenhouse-
gas emissions.**¹



National environmental regulations, such as the Greenhouse Gas Reporting Program (GGRP) which requires reporting of greenhouse gas (GHG) data from fuel and industrial gas suppliers in the United States, as well as international frameworks like the Paris Agreement to combat climate change globally, have been increasing in number and stringency in recent years to respond to and prevent further emissions growth. For example, in May 2016, the EPA finalized the first ever national rule to limit methane emissions from oil and gas operations in order tackle climate pollution—with the goal of cutting emissions by 40 to 45 percent from 2012 levels by 2025.²

CO₂ emissions by fuel type, World

Annual carbon dioxide (CO₂) emissions from different fuel types, measured in tonnes per year.



Source: OurWorldInData.org



Where to Focus: Three Key Areas

For a healthy enterprise & a healthy environment

It is clear that in order to maintain healthy operations in the future, O&G enterprises must commit to lowering emissions and focusing on sustainability today.

While investments in low-carbon businesses represent only <1% of oil and gas companies' capital expenditure today,³ environmentalism in the O&G sector has been picking up. IHS Markit tallied more than 45 announced projects in its oil and gas field-based Renewable Energy Database in the past three years, and these projects are expected to avert more than 3 million metric tons of annual CO₂ emissions combined.⁴

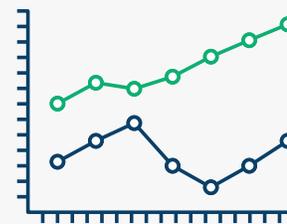
So what should O&G focus on immediately in order to better prepare for sustainability tomorrow?

Overall, industry leaders can focus on three key areas:

1 IMPROVE OPERATIONAL EFFICIENCY

McKinsey has estimated the O&G industry's performance gap at \$200B due to production inefficiencies.⁵ These inefficiencies not only result in lost revenue for the corporation, but they cause an increase in emissions and negative environmental impacts. There are cost-effective interventions that can be made to close this gap, mainly using new digital technologies to enable asset optimization. And, as studies have shown, a 10% increase in production efficiency delivers on average a 4% reduction in emission intensity.⁶

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2

IDENTIFY AND ABATE CAUSES OF HIGH EMISSIONS

The EPA estimates that there are 2.1M unplugged orphan wells in the US alone, which emit 9.5M metric tons of carbon dioxide per year.⁷ Implementing remote monitoring networks for these wells, to quickly identify and remediate those emitting greenhouse gas levels that are out-of-range, could create a significant reduction in carbon footprint for the enterprises that own them and the industry as a whole. Flaring is another area that can be improved upon using tools such as predictive analytics to enhance equipment reliability and reduce nonroutine flaring. These are just two examples of known emissions culprits that can be better managed through the use of technology.

3

PUSH TO TRANSITION TO CLEANER ENERGY

Directly and indirectly, the O&G industry accounts for 42% of global emissions, and they must reduce emissions by 90% by 2050 to help mitigate climate change.⁸ Transitioning to cleaner energy can—and must—help. According to Dr. Fatih Birol, Executive Director of the International Energy Agency, no energy company will be unaffected by clean energy transitions and they must play their part in the effort. “Every part of the industry needs to consider how to respond—doing nothing is simply not an option.”⁹ Technology also plays an important part in this evolution to enable new innovation within a mature industry.

**Only after addressing these key areas
can O&G companies be truly ready for
the next era of environmentalism.**

“No energy company will be unaffected by clean energy transitions. Every part of the industry needs to consider how to respond. Doing nothing is simply not an option.”

**—Dr. Fatih Birol,
IEA Executive Director**



Preparing for the Next Era, Today

The role of technology & enhanced connectivity

The future holds a much more efficient gas and oil industry—and this isn't just a lofty and hopeful goal; it is a necessity and certainty.

McKinsey noted in its article on “*Oil and Gas after COVID-19: The day of reckoning or a new age of opportunity?*” that another wave of efficiency efforts and hard work is needed to wring out every last cent of value from optimizing refineries and their supply chains, and this will likely be the industry response.¹⁰

O&G organizations looking to evolve into a more sustainable enterprise of the future should consider an effective, technology-focused process that will optimize their current operations and move them toward energy efficiency. **Here are the steps to take.**

1 IMPLEMENTING THE RIGHT NETWORK FOR ENHANCED CONNECTIVITY

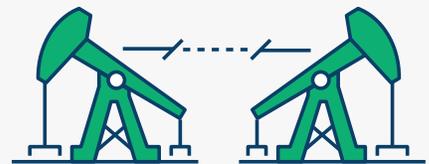
Systems and equipment to improve efficiency and sustainability and are only as good as the network they run on. Typically, oil and gas fields are scattered across remote and rugged terrain, in areas without existing infrastructure or in hard-to-network environments. In fact, many mature onshore sites are poorly connected, with 40% of production covered by outdated technology that experiences significant reliability and bandwidth issues.¹¹

Enhanced connectivity—marked by high bandwidth, mission-critical resiliency, and scalability to support many data-intensive applications—has the potential to boost performance across the O&G value chain by enabling optimization and automation. How? It allows operators to access more data and analyze it faster for immediate action. It also enables semi-automated and autonomous machines to be remotely managed, and allows the machines to monitor themselves and share data in real-time with the control center.

It will be critical for O&G operations to assess their existing network infrastructure to determine where enhancements will be needed to effectively support new efficiency-driving applications. McKinsey found that O&G operations can reduce costs by 20-25% per barrel using enhanced connectivity to deploy digital tools & analytics¹²—which require real-time speed, mobility, and high availability to effectively run.

Many mature onshore sites are **poorly connected**, with **40% of production covered by outdated technology**

that experiences significant reliability and bandwidth issues.¹¹



2

ANALYZING CURRENT OPERATIONS FOR INEFFICIENCIES

The next step O&G leaders need to take to ensure they are future-ready is to assess their operations, processes, procedures, systems, equipment, and tools to see where improvements are needed to become more efficient. Luckily, with constant advances in meters, sensors, and other digital tools, more cost-effective devices are available than ever to monitor and capture the data needed for optimization.

O&G operators can equip legacy fields with new sensors that are networked for monitoring production and decline rates, emissions, leaks, and failures. However, this begs the need to transmit more data from remote sites more frequently, so ensuring real-time, reliable access to information is crucial.

Enhanced connectivity has the ability to empower all oil and gas sustainability initiatives. Leveraging the right network infrastructure can help O&G transition from traditional manual, non-integrated processes to an automated, integrated workflow that gives workers new levels of insight to make decisions resulting in increased operational efficiencies.

For example, drilling processes can be optimized to reduce labor and costs. Today, up to 25% of well development time is spent on non-productive drilling time—the time needed to solve various problems encountered.¹³ Rather than teams needing to dispatch technicians to the drill rig to diagnose and resolve problems *after* they have occurred, network-enabled cameras and sensors deployed on downhole drilling equipment allow teams to remotely monitor drilling operations and proactively identify potential problems *before* incurring production losses. In fact, studies have found that advanced analytics have helped O&G operators increase drilling speed by 25% and in turn reduce emissions tied to drilling by nearly 10%.¹⁴

Not only will more efficiency go a long way towards offsetting the impacts of operating in a volatile market, but it will also ensure the organization is equipped to meet current and future environmental regulation demands.



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3

TAKING PROACTIVE STEPS TO ENSURE SUSTAINABILITY

O&G enterprises must focus on being proactive in order to tackle future issues before they happen. Enhanced connectivity can ensure crucial information is delivered that allows O&G operations to instantly identify changes in normal conditions and flag potential future issues. Real-time insight provides the visibility for rapid response to address failures that could cause environmental harm. For example, real-time remote well sensors can passively monitor site conditions on an ongoing basis and automatically send alerts to key personnel if any set monitoring thresholds move out of range. This also saves the time, labor, and fuel required to dispatch technicians to the location to manually gather this data – and avoids delays in identifying time-sensitive issues like gas leaks. Further, a high-bandwidth, low-latency network can enable a predictive maintenance model, allowing operators to pull telemetry from site equipment and perform preventative fixes before breakdowns occur.

Big data and predictive analysis is projected to revolutionize oil and gas exploration, extraction, and production. Having the network capacity to support heavy data volumes demands and to generate accurate reports, with no gaps in data, is essential to giving O&G teams the strategic intelligence needed to achieve future organizational and environmental objectives. This data is also an essential enabler of the energy transition – aiding companies to leverage existing site intelligence, combined with their supply chain and market development expertise, in pursuing low carbon energy options.





More Efficient Operations = Reduced Environmental Impact

Connectivity for change

After working through the future-focused process and ensuring the right network is in place to allow more efficient operations, a path to decarbonization becomes clear and O&G organizations should be well on their way to meeting the requirements of the next era of environmentalism.

Enhanced connectivity advances these initiatives as an ultra-reliable conduit for the field data required to make better decisions. Wireless mesh falls into this category because it boasts a decentralized topology for inherent redundancy and increased capacity. However, not all wireless mesh systems are created equal. Traditional wireless networks are distributed but still driven by a controller node; if that controller goes down, so do all the nodes connected to it, potentially wiping out a large swath of the network.

Rajant Kinetic Mesh®, a wireless mesh network with a peer-to-peer architecture, is a superior connectivity solution for mission-critical O&G applications because it has no single point of failure. Each node is engineered with full routing capabilities, so if any node in the network goes offline, the network will immediately self-heal by routing around the outage. This provides an unmatched level of reliability that ensures complete, 24/7 visibility into remote operations, accurate reporting, and more.

Additionally, because each Kinetic Mesh network node can hold multiple connections over multiple frequencies simultaneously, it has hundreds of potential paths over which to direct traffic: enabling low-latency transmission of more data, even for bandwidth-intensive applications. This combination of features makes it the enhanced connectivity choice for O&G leaders around the world today.

Rajant Kinetic Mesh® Enhances Connectivity to Advance O&G Environmental Initiatives

The oil and gas sector must reduce emissions by 90% by 2050 to play its part in mitigating climate change. Rajant's network helps O&G optimize performance while enabling a smooth transition to cleaner exploration and production.

Kinetic Mesh delivers enhanced connectivity that offers:



High bandwidth to support real-time access to large and diverse volumes of field data from remote sites.



Industrial-grade reliability to function without fail in rugged environments, keeping mission-critical insights flowing.



Full mobility to enable autonomy and the nonstop performance of automated equipment and machinery.



Multi-application capacity to run all technologies and systems from remote well monitoring to predictive analytics to automated emissions reporting on one network.



Summary

A clear path to cleaner energy

To thrive in the next era of oil and gas environmentalism, it will be imperative for O&G operations to consider how the right technology can help optimize their current operations to meet future sustainability initiatives. Throughout the process they should focus on three key areas: improving operational efficiency, identifying and abating causes of high emissions, and transitioning to cleaner energy.

Enhanced connectivity will play a critical role in enabling the technologies that drive value for the enterprise and, in tandem, support a cleaner environment. With a reliable network in place, O&G leaders will be able to analyze their current operations for inefficiencies and take proactive steps to ensure sustainability. Enhanced connectivity successfully advances environmental initiatives by providing reliable access to the data O&G need to make better decisions—now and in the future.

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