

Programming reliability, from reservoir to market

**How Baker Hughes is delivering a more
resilient natural gas supply chain**

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and Matthias Gatzen



EXECUTIVE SUMMARY

Baker Hughes believes natural gas becomes more resilient when managed end-to-end—from reservoir to market. By thinking in systems rather than silos, the industry can turn operational data into decisions that deliver tangible financial and performance gains.

This matters because natural gas is set to remain a foundational energy source this decade and beyond. Abundant, energy-dense, dispatchable, and compatible with low-carbon pathways, it complements renewables, provides a scalable base for hard-to-electrify industry, and supplies dependable power for an increasingly data-driven world.

Yet upstream, midstream, and downstream function like a relay: when any handoff falters, the system underperforms. Integrated digital workflows that connect wells, fields, networks, and plants can unlock value by strengthening supply consistency.

Digitally enabled solutions for well construction, intelligent completions, and field-level optimization help reduce variability, accelerate cash flow, and stabilize production volumes. Predictive maintenance extends the life of rotating equipment and supports gas deliverability. A vendor-agnostic solution with open architecture—designed to integrate with existing hardware and remote control capabilities—boosts uptime, lowers unit costs, and reduces emissions intensity. This transforms the gas value chain into a high-performance operating system built for resilience.

This white paper demonstrates how rigorous planning and digitally enabled execution can make reliability programmable, from reservoir to market. It also sets out how Baker Hughes, the only provider spanning the full gas value chain, operationalizes this approach.



Introduction: Why gas is pivotal

Governments increasingly view natural gas as a long-term anchor of energy supply. Energy policies in place today suggest global gas demand will rise by around 6% between 2023 and 2030—reaching 4,430 billion cubic meters a year by the end of the decade.¹ Abundant, competitive, and reliable, gas strengthens energy security and complements renewables. Combined with methane management, carbon capture, and hydrogen integration, it provides a potent, lower-carbon energy solution for electricity generation, industry, and buildings. In certain markets, it can also provide firm, around-the-clock power to data centers. Gas-fired electricity plants can be

brought online within minutes, providing the flexibility grids need to integrate intermittent wind and solar. Gas can power and decarbonize hard-to-electrify heavy industries, such as steel, cement, and fertilizers. Liquefied natural gas (LNG) expands access: any buyer with regasification infrastructure can source supply. This has created a more fungible global gas market and expanded demand for North American unconventional gas.

Digitally powered, systems-based planning sharpens business models throughout the gas supply chain. Connected digital technologies are no longer an incremental improvement but a strategic enabler for upstream reliability, supply-chain predictability, and commercial resilience.

POWERING PROGRESS: THE STRATEGIC ROLE OF GAS



6%

estimated rise
in demand
by **2030**

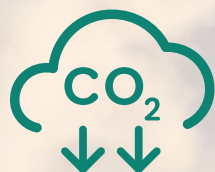


LNG

expands
global access



Complements
renewables



**Lower
carbon**

energy solution for
electricity generation,
industry, & buildings



Provides
around-the-clock
power
to data centers
in certain markets



Strengthens
**energy
security**

¹ International Energy Agency. World Energy Outlook 2024. Paris: IEA, 2024. Table 3.2, p. 144.
Available at: <https://www.iea.org/reports/world-energy-outlook-2024>.

An interdependent **value chain**

The gas business comprises an interdependent sequence of activities. Strengthening each leg of the relay increases system resilience. Above all, efficient, reliable upstream operations enable midstream and downstream actors to plan investments and manage assets with confidence. Conversely, delayed wells, extended commissioning timelines, and non-productive time (NPT) translate directly into deferred revenues, contract penalties, and spot-market exposure to cover sales commitments.

In capital-intensive LNG, the stakes are magnified. Once trains are commissioned, utilization and cash

generation depend on reliable feedgas; interruptions depress utilization and idle expensive assets. With limited storage, floating liquefaction and regasification units are even more exposed to variability.

The wellhead, in other words, is not just a technical milestone—it's the keystone of system performance. Strong upstream reliability helps investors carry capital-heavy midstream and downstream assets through price cycles and secure better commercial terms—underpinning gas's long-term role in the energy mix.

From reservoir to market: Strengthening the gas supply chain



Upstream



Midstream



Downstream

Each handoff matters.
When one link falters, the whole system underperforms.

The keystone: upstream consistency

By anchoring midstream and downstream projects at the wellhead, operators gain control over the earliest and most variable part of the supply chain.

Control starts with a deep understanding of the reservoir. Physics-based simulations of wellbore geometry and mechanical loads, and advanced, real-time navigation tools can improve well-placement decisions, maximize reservoir contact, and deliver better, faster wells.

During drilling, physics-based, AI-powered automation and analytics standardize drilling and completions—improving precision and consistency while reducing operational risk, NPT, and delivery costs.

At TotalEnergies' Fénix gas field offshore Argentina, Baker Hughes implemented closed-loop automated

drilling and real-time performance analytics across three consecutive wells. These measures increased on-bottom ROP and reduced W2W time, enabling completion 15 days ahead of plan. Similarly, in an onshore Middle East program, real-time data analytics helped cut W2W times by 20%, increase ROP by 5–15%, and saved about 15 drilling hours per well, despite complex geology and extreme downhole dynamics.

Those drilling gains matter for the obvious reasons: lower costs and earlier production. But predictable, high-quality wellbores also create strategic value by converting variability into consistency—the keystone for network balance, credible nominations, and high midstream and downstream asset utilization.

Predictable, high-quality wellbores convert variability into consistency—driving network balance, credibility, and asset utilization

FÉNIX GAS FIELD, OFFSHORE ARGENTINA

 **Increased**
on-bottom ROP

 **Reduced**
W2W times

 **15 days**
finished ahead of drilling plan

MIDDLE EAST PROGRAM, ONSHORE

 **5–15%**
ROP increase

 **20%**
reduction in W2W times

 **~15 drilling hrs**
saved per well

From steady wells to **steady trains**

With drilling optimized, digitally enabled production sharpens reservoir control. Intelligent completions use zonal sensing and remotely actuated valves to balance flow, manage water and gas, and optimize drawdown in real time—lifting rates, slowing decline, and increasing recovery. High-quality wells and completions need fewer interventions and produce longer, reducing OPEX, accelerating payback, and delivering steadier, bankable volumes.

Forecastable production is vital for downstream planning, too. As new flows become available, operators must ensure there is sufficient pipeline and compressor capacity to move gas to market. Accurate and reliable upstream data is the key to optimizing networks so that the right capacity is ready when volumes arrive.

Field-level optimization then sustains uptime and reduces failures—essential for maximizing production from North American unconventional fields, where reservoir pressure typically drops rapidly. Production-optimization strategies include electrical submersible pump (ESP) management, chemical dosing, and exception-based surveillance.

This interconnected sequence of digital technologies delivers valuable payoffs that ripple through the value chain. Repeatable, high-quality wells accelerate commissioning, stabilize volumes, and improve nominations, gas-quality forecasts, and maintenance planning. Together, this keeps pipelines balanced and LNG trains closer to nameplate capacity.

Further downstream, condition-based maintenance on plant-level compressors and turbines raises fleet availability and lowers OPEX. The net effect is earlier cash flow and higher utilization, with fewer surprises.



Integrating intelligence

To maximize impact, digital solutions must plug into existing systems without major infrastructure spend and move beyond point solutions to create end-to-end workflows that break silos and promote collaboration.

Powered by physics-based and AI models, plant asset performance management (APM) systems can predict failure modes in compressors, turbines, and pumps; rank risks; and assign crews and parts to the highest-impact tasks—cutting unplanned outages, extending asset life, and lowering operating costs. In an integrated

system, APM “knows” the upstream: field data relating to volumes, composition, ramp-ups, workovers, and downtime inform decisions about operating windows and maintenance timing—keeping equipment ready when feedgas is flowing and planning outages when it isn’t.

Centralized condition monitoring and remote expertise, meanwhile, raise uptime, reduce site visits and emissions, and free engineers from manual data work to focus on planning and optimization.

Baker Hughes: An end-to-end digital stack

From well placement to asset performance, Baker Hughes operates across the full gas value chain, with integrated digital offerings that underpin and connect field hardware. Upstream, the **JewelSuite™** ecosystem of subsurface workflows reduces uncertainty in reservoir behavior and improves well planning. **i-Trak™** drilling automation services and **Corva** digital drilling applications deliver high-quality, repeatable wells. The **Leucipa™** automated field production solution maximizes flows and ultimate recovery, and pushes rolling volume and composition forecasts downstream to align nominations, gas-quality, and maintenance windows.

Further down the value chain, **Cordant™** delivers vendor-agnostic APM, while **iCenter** digital services—powered by Cordant—optimize Baker Hughes turbomachinery for maximum uptime and efficiency. By combining customer data with decades of global operational insights, iCenter enables advanced performance modeling using AI, ML, and deep equipment expertise. This connected, vendor-neutral stack strengthens gas ecosystem resilience—aligning supply, gas quality, and maintenance to ensure consistent delivery across the value chain.

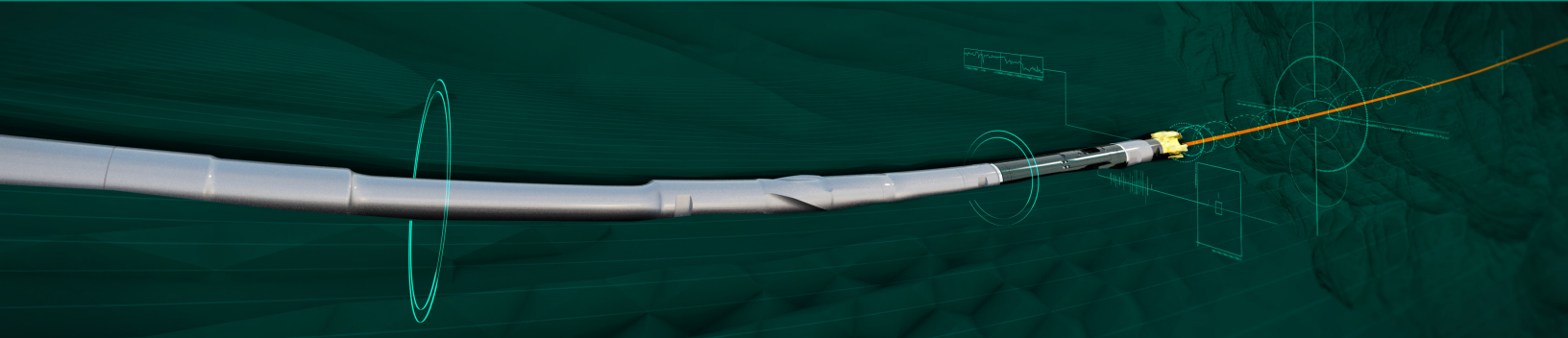
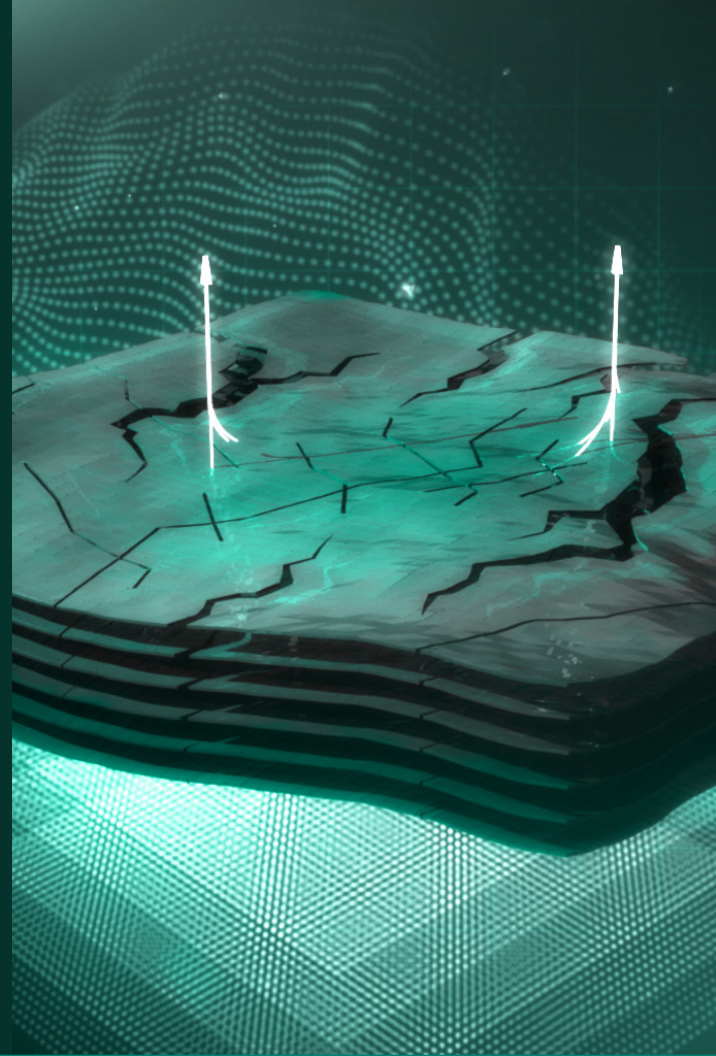
The following are selected technologies from the fully integrated Baker Hughes digital value chain, with examples of how they deliver measurable benefits.



Superior reservoir insights

By improving reservoir understanding, JewelSuite applications facilitate precise well placement and steering—the first step in establishing stable, forecastable gas flows.

- JewelSuite Well Engineering uses physics-based simulation of wellbore geometry and mechanical loads to plan and execute fast, accurate directional drilling
- JewelSuite Reservoir Navigation Services produces detailed 3D reservoir visualizations, updated in real time during drilling, to place wells for maximum reservoir contact and production



Better, faster, and more consistent drilling

As TotalEnergies' Fénix project demonstrates, i-Trak and Corva have combined to deliver significant campaign time and cost savings.

- i-Trak leverages physics-based and AI models to standardize drilling and completions. Steering with optimum precision and speed enhances consistency while reducing operational risk, NPT, and delivery costs.
- During execution, Corva apps monitor key drilling parameters and turn live data into actionable KPIs. With real-time analytics delivered via easy-to-configure dashboards, Corva spotlights risks such as hazards, invisible lost time, or stuck-pipe, and identifies opportunities to improve performance.

Smarter completions, more control

From well placement to asset performance, Leucipa intelligent completions integrate real-time downhole data, advanced analytics, and automated workflows to optimize zonal flow control. Closed-loop management of pressure, temperature, and flow profiles increases recovery, reduces interventions, and delivers steadier, composition-aware volumes that support precision downstream planning.



Production and network optimization

Once upstream assets are online, advanced Leucipa workflows maximize production and support midstream and downstream gas-supply planning.

- Across 2,500 onshore wells in Australia's Cooper Basin, Leucipa optimization technologies delivered \$2 million in value in 90 days—end-to-end from reservoir to point of sale

- In the U.S.'s Permian Basin, Leucipa deployments have delivered 5–8% production uplift while reducing ESP failures and chemical consumption
- Integrated Leucipa workflows accurately forecast pipeline capacity needs, streamlining investment decisions in infrastructure

Leucipa™

automated field production solution

INTEGRATE, OPTIMIZE, FORECAST

COOPER BASIN, ONSHORE AUSTRALIA



\$2M
in value across
2,500 wells
in
90 days
end-to-end from
reservoir to point of sale

PERMIAN BASIN, ONSHORE U.S.



5–8%
production uplift while
reducing
ESP failures and
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Smoother operations across the value chain

Once a network of wells is feeding midstream pipelines efficiently, digital capabilities midstream and downstream can further increase uptime, ensuring consistent, predictable, and reliable delivery to consumers.

- Cordant ingests rolling production forecasts from Leucipa, enabling more accurate nominations and gas-quality forecasts
- Cordant and iCenter use physics-based and AI models to help predict failures and enhance maintenance strategies—supporting compressor, turbine, and pump efficiency
- Across global compressor and turbine fleets, Cordant and iCenter delivered multi-million-dollar gains by boosting uptime, fleet availability, and centralized monitoring. In 2024 alone, iCenter generated over 19,000 actionable insights to prevent trips, reduce risk, and enhance performance
- **CarbonEdge™**, an end-to-end digital platform powered by Cordant software, allows customers to plan, manage, and assure CCUS project performance and long-term CO₂ containment

iCenter™
digital services

19,000
actionable insights
generated in 2024 alone



Conclusion

Reliable, on-spec upstream feedgas is the organizing signal that enables midstream and downstream businesses to plan, invest, and operate with confidence and efficiency.

As in a relay, reliability is won at the exchanges. Consistency starts at the reservoir and is carried through well construction, intelligent completions, and field- and network-level optimization. Working in sync, these digitally powered processes reduce variability and stabilize production. Downstream, that improves nominations and gas-quality forecasts—keeping networks balanced and LNG trains utilized.

From placement to performance, Baker Hughes's connected, vendor-agnostic stack operationalizes

this model, so assets run harder, longer, and cleaner: JewelSuite™ for subsurface insight and real-time navigation; i-Trak™ and Corva for automated, repeatable well construction; Leucipa™ for production optimization and reliable nominations; Cordant™ and iCenter™ for condition-based maintenance and higher fleet availability; and CarbonEdge™ to plan, manage, and assure CO₂ storage performance across the full CCUS project lifecycle.

When the handoffs are clean, the system gets stronger: accelerated cash flow, steadier throughput, lower OPEX and emissions intensity, and more efficient, more profitable assets. That's how gas anchors energy security while supporting decarbonization: disciplined execution, digitally enabled.

ABOUT THE AUTHORS



Sebastiano Barbarino

**Executive Director,
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Sebastiano Barbarino is the Executive Director, Digital Production Solutions Business.

Sebastiano leads Product Development & Engineering for Leucipa, Baker Hughes's autonomous production optimization solution. With a focus on modernizing production technologies, Sebastiano drives the development of digital applications that enhance efficiency, predictability, and performance across global operations.

A seasoned Production Engineer with 28 years of experience and a background in Computer Science from Universidad del Zulia, Sebastiano has spent the past 17 years pioneering digital solutions in the production domain. He has successfully implemented Digital Twin applications powered by automated engineering workflows for multiple operators worldwide.



Daniel Funes

**Director of Digital Completions,
Intervention & Measurements
Business**

Daniel Funes is the Director, Digital Completions, Intervention & Measurements Business.

Daniel leads the digital strategy for the Completions, Interventions, and Measurements segment, focusing on integrating measurement technologies with digital platforms to deliver enhanced reservoir insights, improve operational efficiency, and drive performance across the energy value chain.

With 20 years of international experience across six countries, Daniel began his career as a wireline field engineer and has since held multiple leadership roles across various product lines, including Baker Hughes's consultancy organization. His exposure to a wide range of subsurface challenges has shaped a cross-domain, holistic perspective spanning oil & gas, geothermal, and CCUS projects.

Daniel holds a B.Sc. in Petroleum Engineering and an Executive MBA from the Frankfurt School of Finance and Management.



Matthias Gatzert

**Executive Director,
Digital Well Construction
Business**

Matthias Gatzert is the Executive Director, Digital Well Construction Business.

Matthias is accountable for the segment's digital business, which is built upon a suite of applications such as Drilling Automation Services, next generation Well Engineering applications, and Advanced Analytics offerings for customers worldwide. His focus is leveraging digitalization to drive efficiency, predictability, and safety.

Previously, Matthias spent numerous years in global engineering and commercial roles. He started his career with Baker Hughes Drilling Services in Germany in 2010 as a research and development engineer working on the development, field introduction, and marketing of innovative downhole technologies.

Matthias holds a PhD in Engineering from the Leibniz Universität Hannover, Germany.

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