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Reinventing upstream oil and gas operations after the COVID-19 crisis

To come out of the crisis, the sector needs to change how it works.

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This has been a year of disruption for the oil and gas (O&G) industry—and not in a good way. The members of the Organization of the Petroleum Exporting Countries and others, including Russia (known as "OPEC+"), have found it difficult to create a common outlook on supply. At the same time, the COVID-19 pandemic has cut global demand sharply. In April, the price of Brent crude dipped below $20 a barrel, the lowest since the aftermath of 9/11 in 2001; it has since recovered to above $43/barrel.

Some of these challenges will pass or at least soften. Nevertheless, we think the O&G industry is at an inflection point: to sustain their businesses, operators and service companies alike will need to simplify their portfolios and establish new ways to create value.

Consider: at $25/barrel, conservatively, 2.5 million barrels a day (mbd)—some estimates are much higher— of global production would become uneconomic (Exhibit 1). With this in mind, many operators have cut spending and postponed work. These are on top of actions taken in the previous decade, which reduced unit-cost production by 30 percent.

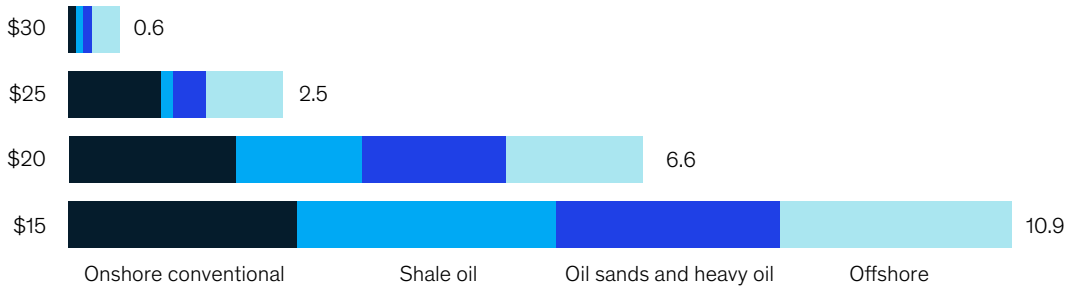
Such measures preserve cash in the short term but risk leaving significant resources stranded from 2025 through 2030. With the possibilities of external cost-cutting—for example, on contracting and leases—all but exhausted, O&G companies now need to look internally. That means reinventing their operating models to improve efficiency, extend asset economic life, create resilience, and reduce greenhouse-gas (GHG) emissions. O&G companies cannot assume that oil prices will bounce back; rather, they have to make decisions that will allow them to operate even if prices hover near $25/barrel.

In this article, we set out three scenarios for the near future. Then we suggest specific ways for upstream operators to improve through work and data-use innovations that optimize production.

Exhibit 1

At $25 per barrel, at least 2.5 million barrels a day of global oil production becomes uneconomic.

How different price scenarios, $ per barrel, **could affect existing production,** million barrels per day[1]



[1]Based on operating expenditures (excl selling, general, and administrative) and royalties, adjusted for cash flows from noncrude/condensates; excl government profit and income tax.
Source: Rystad; McKinsey Energy Insights

Supply, demand, and the COVID-19 crisis: Three scenarios and three archetypes

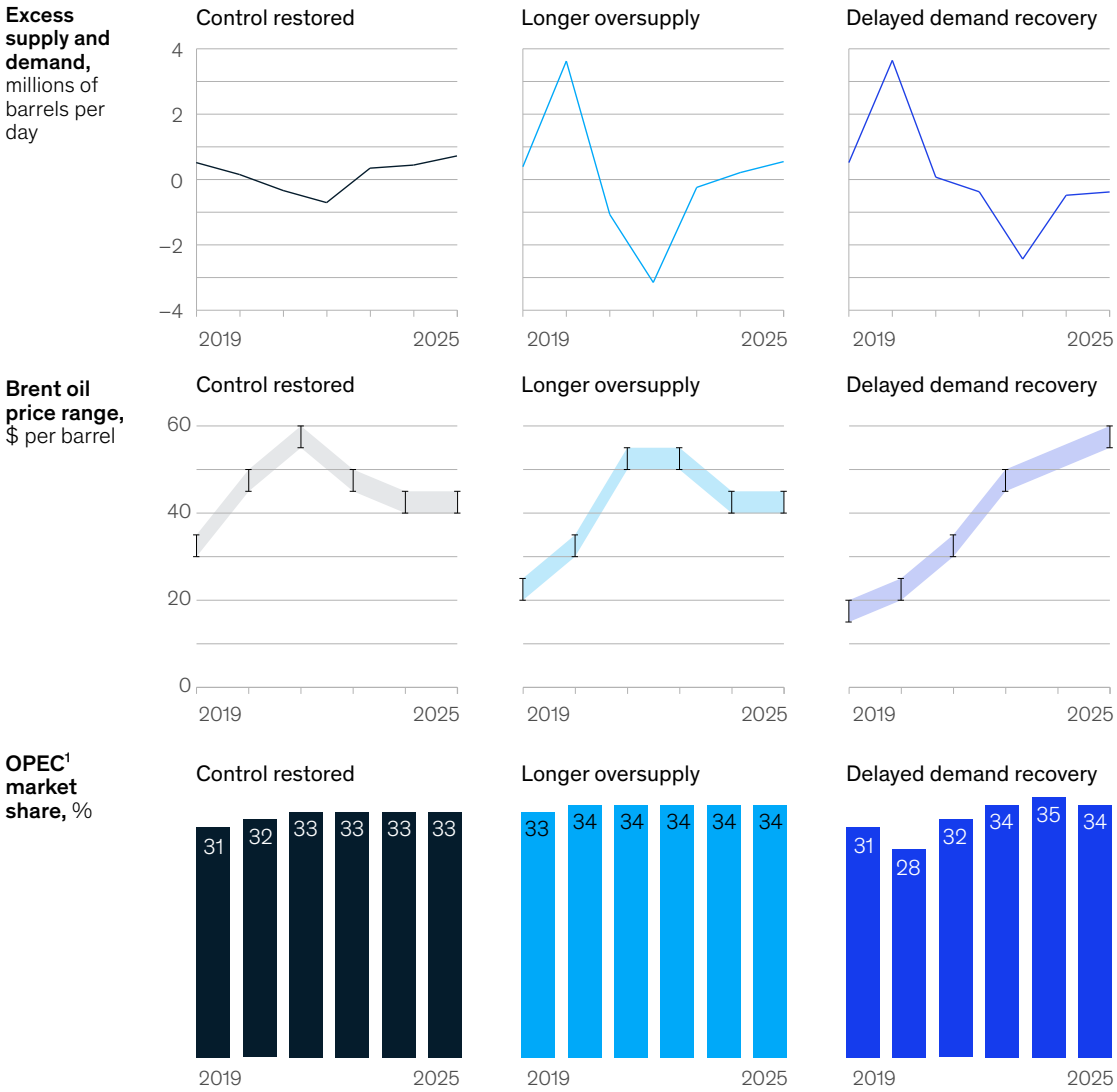
The outlook for the upstream sector depends greatly on two factors: how much the COVID-19 crisis will affect demand and how OPEC+ will respond. To evaluate this, we created three scenarios (Exhibit 2).

Scenario 1 is "OPEC+ control restored." This assumes that the virus is contained; however, given the fall in demand thus far, the projection is that there will still be an 8.3 mbd demand reduction in 2020 compared to 2019. It also assumes that OPEC+ agrees to production cuts in 2020 and that output is balanced in the market from 2021 on. On that basis, the price recovers to about $50 a barrel.

Exhibit 2

The outlook for the upstream sector depends greatly on two factors: How much the COVID-19 crisis will affect demand and how OPEC+ will respond.

How the market balances in the three scenarios



Note: Organization of the Petroleum Exporting Countries plus; countries include Azerbaijan, Bahrain, Brunei, Kazakhstan, Malaysia, Mexico, Oman, Russia, South Sudan, and Sudan.
[1]OPEC excl Iran, Libya, and Venezuela.
Source: EIA; IEA; Rystad Energy; McKinsey Energy Insights

Scenario 2 is "longer oversupply." This scenario uses the same demand-reduction estimate—8.3 mbd—but assumes widespread noncompliance with OPEC+ production quotas in 2020 so that first-quarter 2020 production is maintained. A balanced market is delayed until 2023.

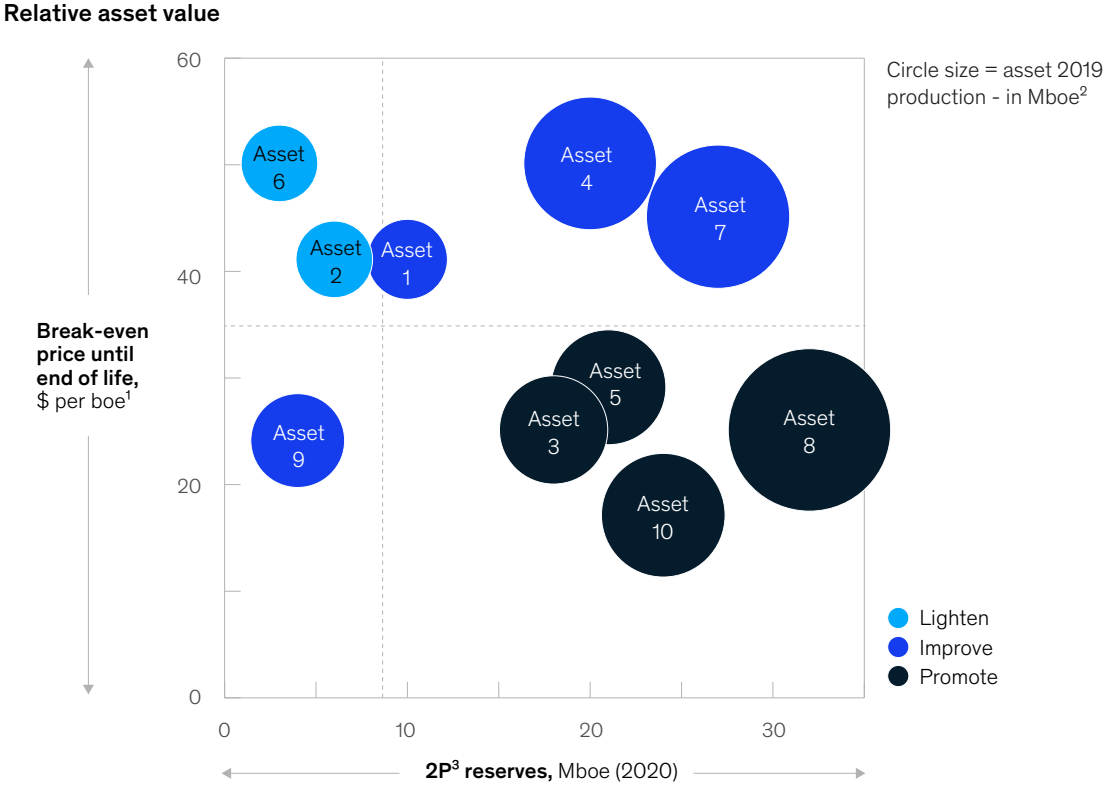
Scenario 3 is "delayed demand recovery." This assumes a longer, less robust recovery leading to demand reduction of 14.8 mbd in 2020, compared to 2019. It also assumes that OPEC+ agrees to and implements production cuts. The market doesn't balance until 2024, and prices stabilize at $50/barrel.

Before any operational actions can be taken, upstream operators must evaluate the value of each asset and then assign a strategic mission for each. This helps companies define which activities to focus on, including which development opportunities to pursue and where to invest. The cost of reducing GHG emissions should also be part of this analysis.

Relative asset value can be evaluated by considering the relationship between each asset's break-even price (in dollars per barrel) and the extent of its reserves (Exhibit 3). Companies can then look at different oil price scenarios and set targets that can deliver sustainable profitability. For the reserves, a threshold can be defined as the smallest level of reserves developed over the previous 24 months.

Exhibit 3

Evaluate relative asset value by considering the relationship between each asset's break-even price and the extent of its reserves.



[1]Barrels of oil equivalent.
[2]Thousand barrels of oil equivalent.
[3]2P is the sum of proved and probable reserves.

The analysis reveals that assets fall into three categories or strategic groups, based on what kinds of actions companies should take.

— *Promote:* These are assets with low break-even prices and high potential to increase reserves. Operators will want to concentrate on developing the field, changing the asset footprint, and finding more low-cost reserves in the same basin.

— *Improve:* This can describe two kinds of assets. The first has high break-even prices and good potential in terms of reserves. The other has low break-even prices but low potential in terms of reserves. For this group, the priorities are to improve operational efficiency and optimize production.

— *Lighten:* These are assets with low reserves and high break-even prices. Here the goal is to manage decline as gracefully as possible.

Once companies have identified which strategic group each asset belongs to, the next step is to set a "target state." For example, could an asset in the "improve" category be upgraded to "promote"? In making this determination, companies should take into account the long-term cost and development profile of each asset, including its decarbonization strategy.

The value of next-generation operating practices

By mixing and matching the following practices, depending on their circumstances, companies can reduce costs, enhance development opportunities, and reduce the carbon intensity of assets in each strategic group (Exhibit 4). Implementing the following practices could also improve the development of brownfield assets, considerably extending their useful life. In what follows, we explain each practice; describe the specific capabilities required to put them to work; and then offer an example of how each has been applied.

Exhibit 4

To reduce costs, enhance development opportunities, and reduce the carbon intensity of assets, companies can mix and match practices.

Possible actions to take, by asset category

Ways of working	Promote	Improve	Lighten	
Rationalize activity	↑	↗	↘	Reduce nonvalue-adding activity lists and frequency of each activity when it is not required
Simplify workflows and centralize activities	↑	↗	↘	Task delivery is improved through simplification. Centralizing onshore workflows enables dynamic resource allocation
Execute maintenance activities in campaigns	↑			Carrying out maintenance in planned campaigns increases flexibility
Transition into agile	↑	↗	↘	Agility allows onshore engineering support teams to work more efficiently, and to better allocate resources to requirements
Multi-skilling	↑	↗	↘	Maintenance hours and costs can be reduced by training workers in a variety of skills
Outsourcing and strategic partnerships with suppliers	↑	↗	↘	Outsourcing offshore FTEs[1] and strategic partnerships can reduce overall spending and increase resource flexibility
Data-driven production optimization				
Apply advanced analytics for maintenance	↑	↗		The use of analytics can cut losses through better equipment maintenance and productivity improvements
Improve well and reservoir management	↑	↗		Greater waterflood and gas-lift efficiency can increase production

[1]Full-time equivalents.

Deciding where activities should be executed (offshore/onshore) and which can be shared centrally can enhance operational efficiency.

Rationalize activity. Inertia is a powerful force, as activities can go on and on with no systemic consideration of their value. This wastes time and money, diverting resources from areas where they could be put to better use. The better approach, now being adopted by some operators, is to use simple time-based programs with clear deadlines to dictate the work. Two factors are required for successful rationalization:

— *Zero-based planning:* Scrutinize every planned activity in the field and prioritize them methodically, based on added-value potential.

— *High-quality data*: Establish live-streaming data capabilities to evaluate asset conditions; this allows for more targeted and efficient interventions.

An operator in Asia successfully rationalized its activity set on more than 100 normally unmanned installations (NUIs). It prioritized activities based on value and equipment condition, sorting them into three categories: fast fix (high value, poor condition), shut in (low value, poor condition), and optimize workload (good condition). Using these categories, the operator installed a zero-based planning system. The result: operating expenditures fell 15 percent and production rose 10 percent.

Simplify workflows. As workflows have become increasingly complex, the number of decision points has increased. This leads to less accountability and lower efficiency. Execution suffers. At the same time, it is clear what a good workflow looks like. In most plants, for example, emergency shut-down procedures are clear, rapid, and safe. There is no reason why other workflows cannot be developed along the same lines. To simplify workflows effectively, companies need to emphasize three elements.

— *Accountability:* Revise and rationalize decision points to establish clear, end-to-end accountability.

— *Automation:* Digitize workflows to reduce the time and effort required to complete each step.

— *Monitoring:* Track workflow compliance and flag potential bottlenecks.

One operator created a connected working platform using simple and standardized user interfaces that enabled workers to access a dynamic, integrated workplan that covered work requests, executions, and approvals. The effort reduced maintenance costs by about 5 percent.

Centralize activities. As operators buy and sell assets, over time, they may end up with an ineffectual kind of decentralization, with different processes and overlapping services. This can get expensive.

Evaluating and deciding where activities should be executed (offshore/onshore) and what activities can be shared centrally can enhance operational efficiency. There are good examples of companies that have moved toward centralizing onshore support for the offshore workforce. The best are characterized by real-time collaboration with frontline workers, who are able to communicate what is going on and identify emerging issues.

— *Technical capabilities:* Establish the right capabilities in the onshore central team, for example, rotating equipment maintenance skills. Be sure to include subject-matter experts (SMEs) in technical areas.

— *Digital enablement:* Provide effective and real-time collaboration between offshore and onshore teams, with the onshore team providing technical expertise and support.

One operator reduced its cycle time and improved its productivity through the introduction of "short interval control"—a factory-floor process for making production improvements through the continuous use of data. This facilitated real-time monitoring and the control of operator tasks by onshore technical authorities. It also allowed supervisors to get real-time reports and gain access to live 3D visibility of the plant, employees, and equipment. The result: production increased significantly due to low cycle and wait times and workforce productivity rose.

Execute maintenance activities in campaigns. Traditionally, routine maintenance activities, such as preventive maintenance of process equipment, have been poorly planned and executed, with little sense of strategy or urgency, leading to an increase in unit costs. Performing maintenance activities in campaigns (by sharing resources across all the assets) can improve efficiency so that companies transition from an "offshore heavy manning" model to one of "shared resource pools." This model would use waves of minicampaigns to optimize offshore manning across the portfolio through more detailed planning and resource management, using standardized procedures to fix all the equipment in a given area.

— *Activity oversight:* Establish a campaign war room to track everything from onshore activity planning to offshore execution, supporting the activities and clearing roadblocks. This oversight function requires establishing relevant performance indicators and ensuring frequent communication between onshore and offshore teams and the war room.

— *Standardization:* Deploy shared resources across all assets, executing with standardized routines that can be applied across the portfolio by equipment type.

— *Vendor relationships:* Collaborate with vendors to forge agreements that allow maximum flexibility and utilization of available resources.

A floating production and storage and offloading (FPSO) operator transitioned from a permanent heavy-manning model to a shared-resource system by standardizing activities and routines across assets. It also increased onshore oversight, with an emphasis on monitoring and work preparation. These efforts cut overall maintenance costs 25 to 30 percent and reduced the need for offshore personnel by 30 percent.

Transition into agile. Onshore structures are typically organized traditionally, with a number of discrete teams and multiple layers of hierarchy. There is often not enough focus on integrating to create value or accountability for end-to-end-delivery. The results: longer-than-necessary lead times, lower quality of output, and limited sharing of best practices.

Deploying "agile" teams—groups that can quickly reconfigure strategy, structure, processes, people, and technology—can increase organizational efficiency and decrease reaction time. The core principle of agility is to transform traditional teams into cross-functional squads, each with a specific business focus and a value-creating mission.

— *Empowered teams:* Ensure leaders act as advocates for agile, empowered cross-functional teams with the mandate to make decisions quickly and with considerable autonomy.

— *Value-focused:* Encourage teams to focus on end-to-end value delivery, with detailed and comprehensive goals.

— *Organizational capabilities:* Identify high performers and assign them to agile teams early on to act as change champions.

A North Sea operator created and authorized agile teams to prioritize three fast-impact areas: production optimization, engineering and integrity and maintenance. Within six months, the teams reduced the maintenance backlog by 30 percent.

Multiskilling. Functional organization models consisting of numerous separate teams have contributed to offshore inefficiencies, increasing the maintenance workload even of routine activities and thus decreasing the attention given to more critical tasks. Recently, efforts to "upskill" workers so that they can complete tasks previously considered beyond their scope have shown promise. For example, production technicians have been trained to perform first-line maintenance tasks and managers to oversee a broader range of activities.

— *Competent workforce:* Understand the current competencies in place and identify gaps; this is the foundation for multiskilling programs.

— *Mindsets and behaviors:* Promote change in work routines by incentivizing people to broaden their skills by, for example, defining skill-progression paths and including skill progression in performance reviews.

— *Onshore support:* Use onshore technical expertise to support offshore execution and to ensure that work is done safely and to high standards.

One operator in the United Kingdom Continental Shelf (UKCS) that faced higher operating expenditures and an unmotivated workforce, redesigned the team structure, redeployed existing competencies, and set up an onshore support hub with multiskilled employees. By doing so, it cut maintenance hours by 25 percent.

Outsourcing and strategic partnerships with suppliers. Outsourcing is often seen as the natural go-to method for quick cost reduction. However, outsourcing an inefficient process will not necessarily improve it if it doesn't address the elements that make it inefficient, such as complex workflows and lack of accountability. Thus, this should be the last lever to pull in terms of improving ways of working.

Effective outsourcing requires building differential, strategic partnerships within the supply chain (specifically with oilfield services and equipment, or OFSE, suppliers) and exploring the use of third-party vendors for support functions. The former is a longstanding practice in other industries, such as car manufacturing. Recently, however, it has become more common in O&G, such as outsourcing operations and maintenance (O&M) management of a facility or "turnkey" well work.

Outsourcing an inefficient process will not necessarily improve it if it doesn't address the elements that make it inefficient.

— *Production enhancement:* This refers to an agreement where the service company takes over O&M for a field (typically a mature one) on behalf of the operator. Compensation is based on a charge-per-barrel basis.

— *Well operations:* This refers to an agreement with OFSE companies to carry out turnkey drilling and completion activities and, in certain instances, well interventions. This can also be applied to well decommissioning, where the service company takes ownership of the process on a lump-sum turnkey basis.

— *Decommissioning:* This refers to an agreement with companies to take over production of mature assets; they are expected to optimize production while also preparing for decommissioning. Ensuring that the process is managed by a single party can reduce complexity and increase efficiency. Such agreements are growing in popularity, especially in the North Sea where partnerships between O&G and service companies are being established to manage late-life assets.

There are two key success factors when thinking about outsourcing:

— *External incentives:* Create incentives to ensure that the operator and the service company have the same goals.

— *Internal expertise:* Appoint experts to serve as advisers and partners to the outsourcing entity; they should be responsible for assessing the quality of work and participate in selecting contractors.

Selecting the correct outsourcing opportunities depends on the asset strategic group and objectives. In general, the results can be significant, with a 30 to 50 percent cost reduction; there is also potential to increase productivity. In Asia, one operator cut costs by 60 percent, while tripling the rate of execution, when it outsourced its well operations.

Apply advanced analytics for maintenance. The upstream O&G industry has tried different maintenance strategies for different equipment types. However, normally this remains time-based, meaning that it follows a set schedule that does not adapt to changing equipment conditions. The risk is that maintenance is conducted when it is not required or that there are unplanned deferrals on production-critical equipment.

Other industries, including cars and aerospace, are using real-time analytic-based predictive models that can assign a probability of failure to a piece of equipment at any given time. Extending this approach to upstream O&G operations could decrease maintenance activity and drastically reduce unplanned deferrals on critical equipment. It could also provide increased visibility on potential failures so that operators can fix problems sooner rather than later and improve planning and preparation.

An operator applied condition-based, analytics-enabled maintenance to reduce downtime of gas compressors. By collecting data and identifying weak spots, the operator developed a model to spot early warnings of failure. Better planning and preparation—and in some cases intervention prior to failure—reduced average downtime from 14 hours to 4.

Improve well and reservoir management. Creating an end-to-end production optimization model can provide real-time recommendations to the operations team to maximize recovery and increase production. Initially, this can be developed for sub-surface conditions, such as gas lift and waterflood, and then be extended across the production system.

One operator increased production by developing an end-to-end production optimization tool that provides real-time and automated recommendations to optimize production. Through the analysis of real-time pressure, injection, and choke data, it increased production of under-performing wells by 5 percent and reduced "water cut" (the level of water content of crude oil) by 40 percent.

It is uncertain when the current "perfect storm" impacting oil and gas operators will pass or if prices will rebound to the precrisis levels in the medium term. What is certain, however, is that only innovative operators with superior operating models will come out of this crisis prepared to cope with volatility and to sustain future growth.

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