



Re(de)fining resilience

Connecting and optimizing
refinery operations



Oil and gas refiners—regardless of whether they are pureplay operators or downstream segments of integrated oil companies—are under siege from all sides.

They have been struggling for years with business and operating models that haven't changed in generations. As the global energy system expands and the energy transition accelerates so do the challenges they face.

Overcoming the obstacles in their path requires a new operating approach aimed at building resilience—and maintaining relevance—in the energy transition. There are **several ways** refiners can boost their resilience in a notoriously low-margin business environment. These include

revamping their demand-forecasting capabilities and diversifying their portfolios to better respond to market volatility. While such tactics are worthwhile and effective, there's another resilience play that is specifically geared to building a long-lasting competitive edge. It involves using digital technologies in new ways to collaborate, connect and integrate their operations.

The promise of data and digital technologies is often dismissed by downstream players today—primarily because they look at the power of data and collaboration in isolation, not fully leveraged across the workforce and the operating model. It's time to shelve that limited-view approach. Truly connecting and optimizing operations will distinguish the downstream winners in the years ahead.

When COVID-19 emerged, the downstream oil and gas market faced a significant one-two punch—a simultaneous collapse in demand for refined products and an overabundance of supply. But neither the pandemic nor the behavioral changes it provoked in consumers caused the industry’s disruption. COVID-19 simply revealed the industry’s vulnerability to volatility and amplified the pressures that have been simmering in the background for years

(Figure 1).

Given the growing global population and expanding economies, oil is expected to continue being a significant energy source until 2050 and long after. It is estimated that demand for energy will grow by ~50% over the next three decades to sustain increasing levels of prosperity.¹ But fossil fuels’ share of the energy mix will drop from ~85% today to ~65% by 2050. Oil demand is expected to peak at the end of this decade.²

Figure 1.

The energy system continues to expand. So do the consequences of rapidly growing and accelerating disruptive forces.



Source: Accenture analysis.



Even without the impact of COVID-19, refiners have been forced to respond to global trends and growing pressure on margins, as refining capacity, especially in advanced economies, has allowed supply to overtake demand. While the global pandemic has increased pressure on refining margins since mid-2019, the modest recovery seen in early 2021 will face continued headwinds as consumer behaviors shift toward lower-carbon alternatives.

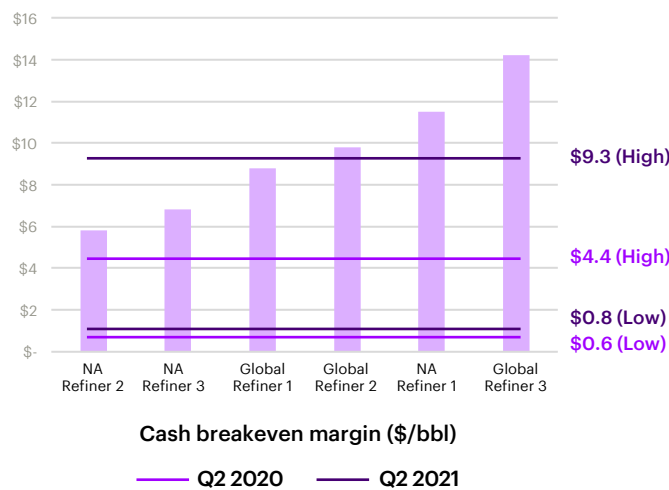
Just consider the role of oil in the light-duty transportation sector. Already in Europe and other high-tax areas, it's more economical to buy an electric vehicle (EV) than one powered by an internal combustion engine (ICE).

The tipping point in the United States is expected to come before 2030³ (Figure 2). While demand for oil in this sector won't collapse overnight, its decline will accelerate in the coming years.

All of these challenges will affect refiners around the world to varying degrees and along various timelines. But there's no escaping the fact that the industry as a whole is facing systemic and structural change. Its operating environments will likely be characterized by increasing pressure on margins, operational performance and safety, as well as diminishing talent pools—and existing workforces pushed to their limits. How will winners stand out?

Figure 2.
Refining companies are not immune to financial distress.

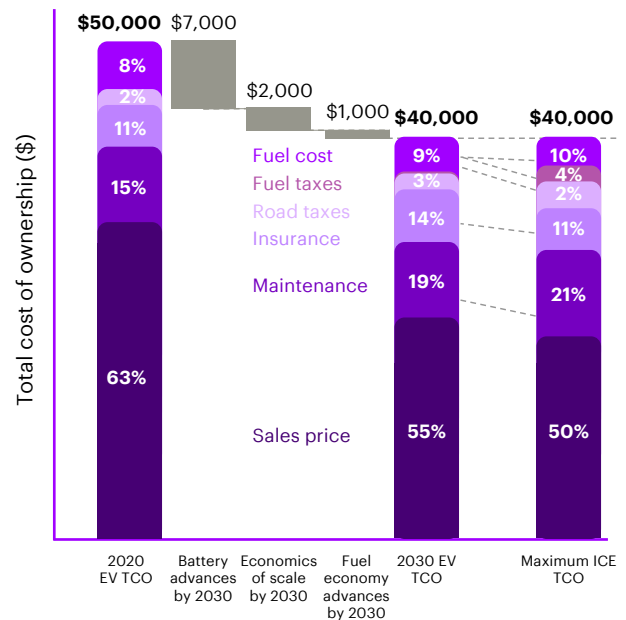
Refining margins (\$/bbl*) are not enough for all players to break even



* Barrel of oil equivalent

Source: Accenture analysis.

Total cost of ownership (TCO) for EVs will drastically fall by 2030



Source: "Decarbonizing Energy: From A to Zero," Accenture 2020.





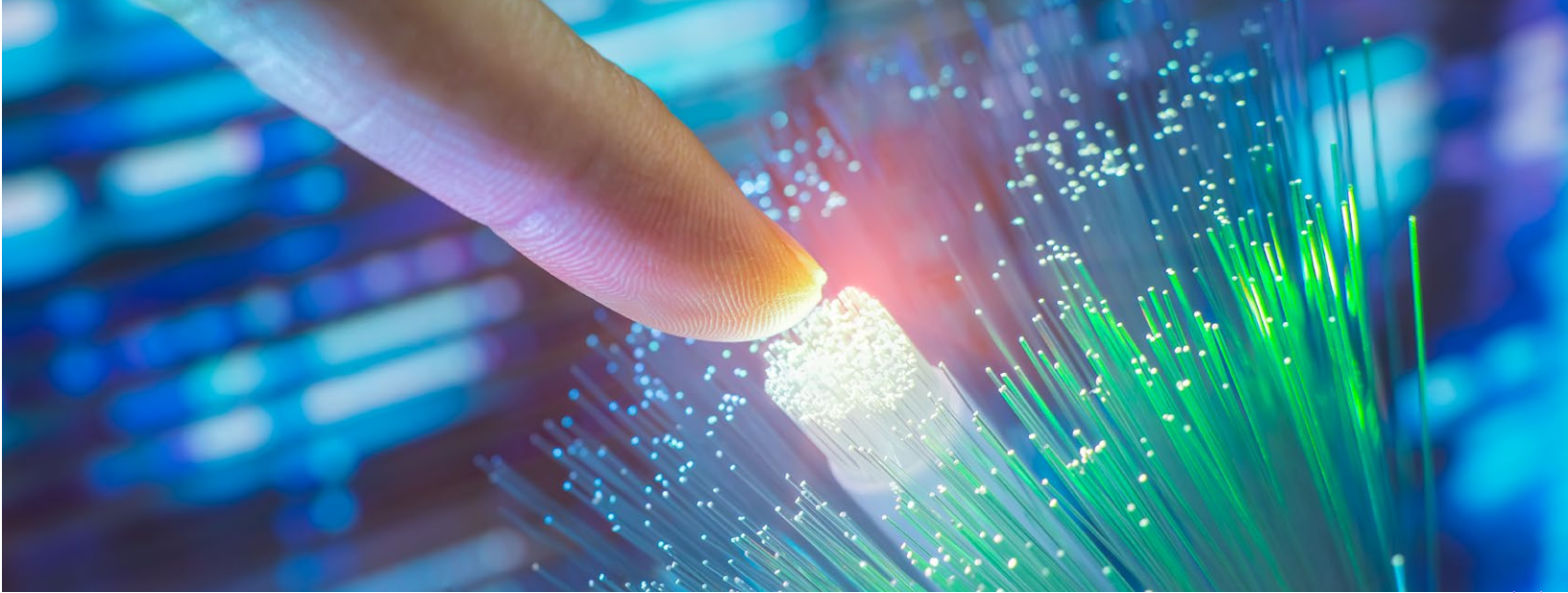
The future-ready refinery

Resilience will be a defining characteristic of energy companies that successfully navigate the energy transition. Resiliency in business is a particular strength, denoted by an organization's adaptability to market changes and customers' demands its ability to recover quickly from disruptions and its willingness to pursue and capitalize on new opportunities—or even a new purpose when conditions warrant. Agility, data-driven insights and a culture of collaboration are all needed to achieve resilience. Together, they help refining companies prepare for the future by reducing costs, extending into new options across the value chain and protecting and improving margins.⁴

Resilience = Adaptability + Responsiveness

A resilient refining business is able to quickly adapt to new conditions and demands, and also identify and take advantage of new opportunities to grow and thrive in the new energy future.





Refiners should get four things right to help them achieve the resilience that's now needed.

1. Asset and operational optimization.

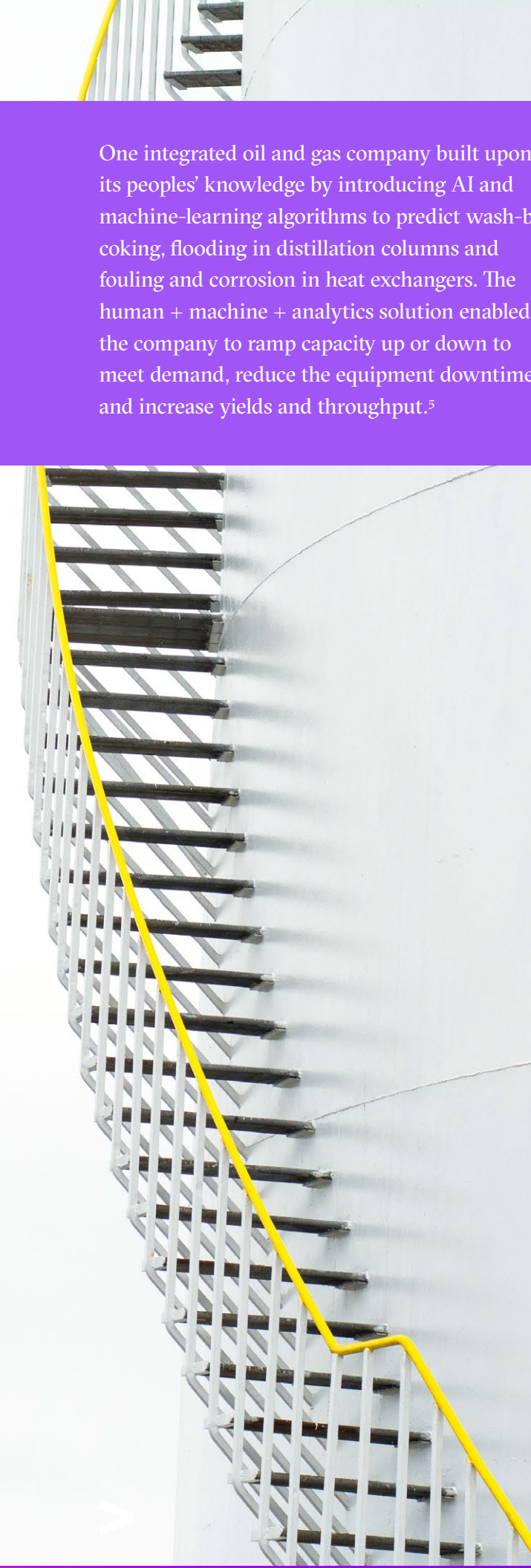
Resilient businesses use real-time performance data to get the most from their assets. Many processes, like asset health monitoring and refinery linear programming optimization, are in place. But in most cases, refiners are not fully leveraging the power of data and analytics. To build resilience, operators must take the use of data and analytics to new frontiers.

2. Active cost management. Resilient refining companies focus on highest-value production, while minimizing operational costs to fund future investments. To that end, they apply real-time insights and data-driven process improvements to keep costs down and asset utilization up. A data-based analytics approach can provide the visibility that's needed to pinpoint cost-reduction opportunities that, in turn, translate into bottom-line impacts. For example, the execution of turnarounds can be significantly improved by increasing visibility of workers' productivity.

3. Optimized workforce that is as productive as it is efficient. Resilient organizations have the right people in the right roles, doing the right things with the right tools. Importantly, they augment their human capabilities with analytics, automation, artificial intelligence (AI) or other technologies to continually drive performance improvements.

4. Commitment to change. Leaders not only understand the potential value at play, but also are willing to invest in building resilience. Their enthusiasm is well founded. Our analyses have found that strengthening, connecting and optimizing operations can deliver margin improvements of \$0.5-1.5/bbl, which translates into yearly profitability gains of \$60-180 million for the average refiner.





One integrated oil and gas company built upon its peoples' knowledge by introducing AI and machine-learning algorithms to predict wash-bed coking, flooding in distillation columns and fouling and corrosion in heat exchangers. The human + machine + analytics solution enabled the company to ramp capacity up or down to meet demand, reduce the equipment downtime and increase yields and throughput.⁵

In our work, we've seen resilient refining operations generate value in multiple ways up to:

10%

improvement in asset utilization

20%

reduction in asset lifecycle costs

10%

improvement in production yields

15%

increase in energy savings

20%

improvement in working capital

15% and 5%

reduction, respectively, in raw material and spare parts inventories

20%

reduction in maintenance costs

10%

reduction in product quality giveaways



The road to resilience

Connected and optimized operations

A number of downstream businesses have claimed to be building a resilient, future-ready organization. While they are improving pockets of operations through predictive maintenance or digital-enablement initiatives, few are taking the end-to-end approach that true resilience requires. **Competitive advantage emerges when resilience is embedded in the fabric of the organization.** That's when performance transformation in one area of the company drives and builds on transformation in others.

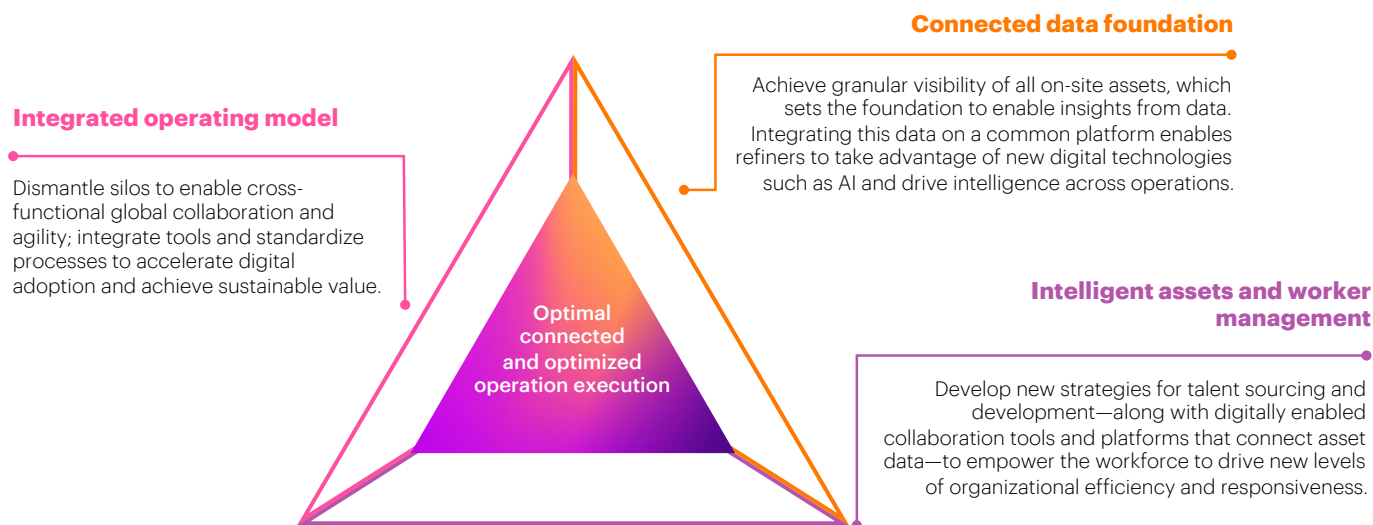


There are three primary components that underpin a fully connected and optimized refinery (Figure 3).

The first is a **connected data foundation**. Resilience depends on granular visibility into the performance of on-site assets. That visibility—and the insights it enables—can only be gained with a mature data foundation. Cloud technologies, artificial intelligence and other digital solutions now allow disparate systems to share and manipulate data across silos, thereby creating a truly “intelligent” refinery platform. That means business leaders, managers and engineers have more information at their fingertips to ensure they are making the right decisions. Asset utilization, maintenance execution, integrity management and real-time worker safety are just a few of the areas that benefit from a connected data platform.

While refineries have millions of historical data points and constant streams of near real-time data at their disposal, most have not established a connected data foundation. There are several reasons for this. Some believe that their aging assets and brownfield legacy systems prevent them from advancing a digital agenda. Others think it will simply be too difficult to gather and harness the power of unstructured data buried in spreadsheets, engineering drawings or paper-based reports. And others believe that legacy architectures, incomplete asset hierarchies and other data integration challenges present unresolvable obstacles to effective data management.

Figure 3.
Essential components of a fully connected and optimized refinery



Source: Accenture analysis.



These may have been valid reasons for inaction in the past. But not anymore. The Industrial Internet of Things (IIoT), AI, cloud platforms, robotics and other cutting-edge digital technologies are increasingly available to help refiners untangle their data complexity. In many cases, investments in digital data solutions pay for themselves within 12-18 months.⁷ Our research revealed that 80% of refiners find that digital investments add up to \$50 million in value to their business.⁸

The second component of connected and optimized operations is an **integrated operating model**. Historically, refiners have resisted modifying their operating models in a holistic, digitally-enabled way for a variety of reasons. A lack of confidence and an embedded culture of resistance to change top the list. Those who have tried to make the necessary changes have often failed because of their inability to dismantle organizational silos and invest adequately in change management.

When it comes to organizational structures and processes, resiliency leaders have little use for functional silos. They are moving toward fully connected operations with standardized processes and centralized functions.

Access to integrated data and digital tools plays a big role in ensuring collaborative ways of working. For example, different shifts of refinery workers often believe their approaches to managing day-to-day operations are better than those of other workers. An integrated operating model ensures the best approach— validated by performance data—will be used by all teams.

Finally, a new approach to **intelligent assets and workforce management** is required to fully connect an organization's value sources. Intelligent workforce management calls for a refreshed talent strategy, including new skill sets to drive new levels of organizational agility, digital enablement and operational responsiveness. Yet the oil and gas industry as a whole is facing a significant talent shortage. Making matters worse, oil and gas careers are no longer attractive to many young people, who believe the industry is not doing enough to reduce carbon emissions and lacks innovation, empowerment and creativity. To ensure refiners have the workforce that can underpin an integrated and intelligent operating model, they will need to invest in talent strategies that will attract and retain the best and brightest.

Connected data, connected results

Using data from sensors in the refining process is not new; electronic signals and data process analysts have existed for over decades. A resilient refinery, however, links real-time information and predictions on equipment performance to the impact on their planning and scheduling activities. This enables more insightful and profitable decisions to be made much faster. In fact, our 2019 Digital Refining Survey found that nearly 60% of refiners see the highest benefits from digital when applied to production planning and execution.⁶



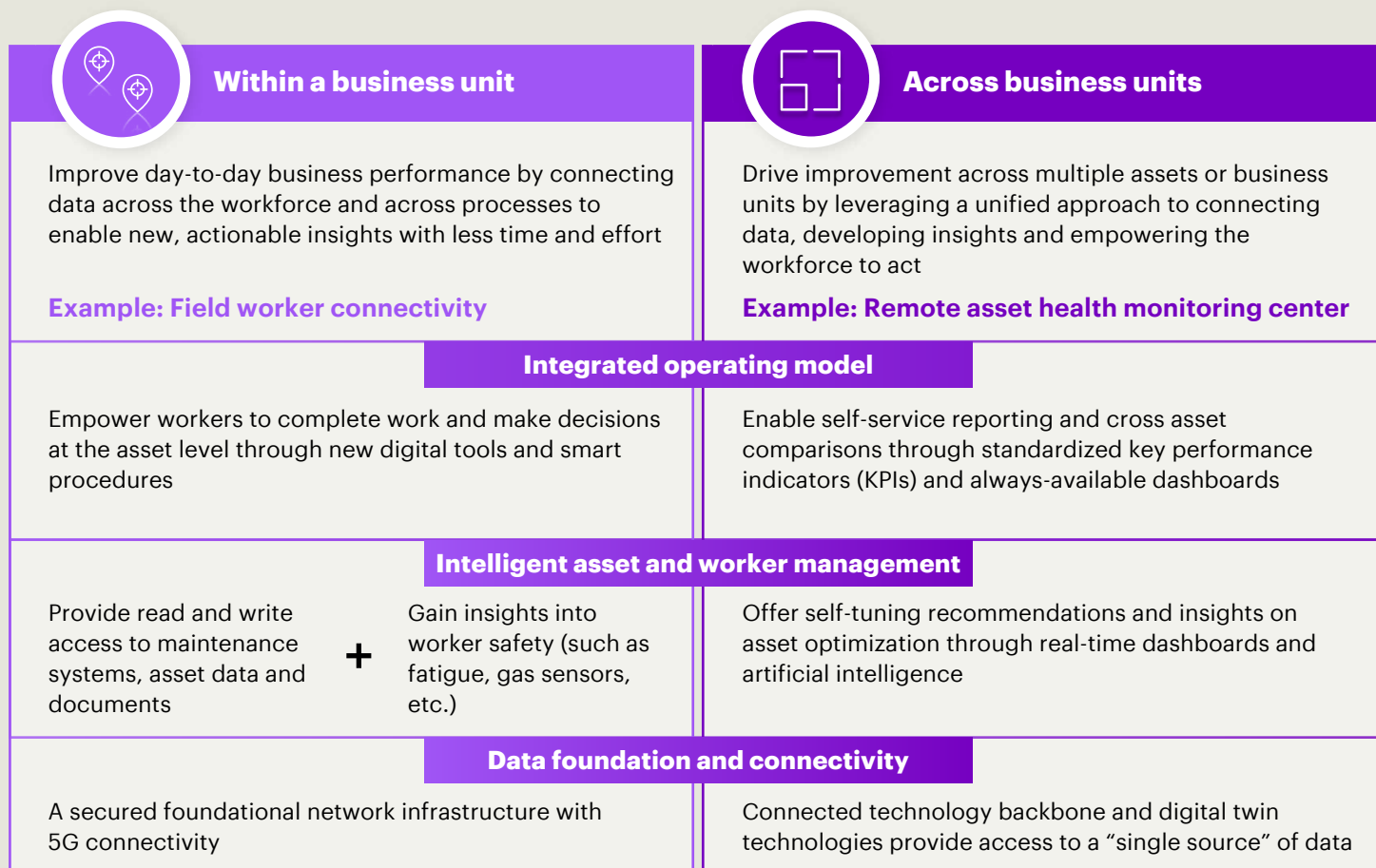


Aside from existing talent pools, there are several overlooked sources of talent that refiners can tap. The use of low-cost (often remote) workforces for both technical and administrative types of work can boost the bottom line without sacrificing performance—these savings can unlock funds for additional investments in growth. Another source of value is a trusted network of partners and alliances; leveraging ecosystem partnerships can give downstream companies access to new capabilities, talent, innovations and even new sources of diverse data.⁹

Regardless of how refiners source their future workforce, it will be necessary to ensure that everyone is able to connect via digital platforms, collaborate across global teams via cloud-based collaboration tools and participate in training delivered via remote coaching or augmented reality.¹⁰

Data foundation and connectivity, intelligent asset and worker management and an integrated operating model are all necessary to establish a connected and optimized downstream operation. None of these components on their own will deliver the transformation that's needed. Rather, they must be developed and deployed in unison and tightly integrated. And they must work together across the entire organization (Figure 4).

Figure 4.
How the essential components of a fully integrated and optimized refinery work together



Source: Accenture analysis.





Where to go from here?

Connecting and optimizing operations can't be achieved overnight or with a single silver bullet. Like building muscle, building resilience takes time, focus and commitment. And like the digital transformation upon which much of a connected and optimized enterprise rests, the process must be continually evaluated, revised and improved.

Transformation tip:

While planning to launch your transformation to connected and optimized operations, keep financial viability, cultural mindset and technical maturity in mind. Consider how these factors will come into play when scaling the transformation over time.



We believe refiners that are embarking on their journey to resilience should take the following six steps:

1. Reestablish their core purpose. Given the tumult in the industry, refiners need to ground their strategy and operations in their purpose and their approach to creating value. What will your business stand for in the new energy future? What purpose will galvanize your employees— and bring value to your stakeholders, customers and operating communities?

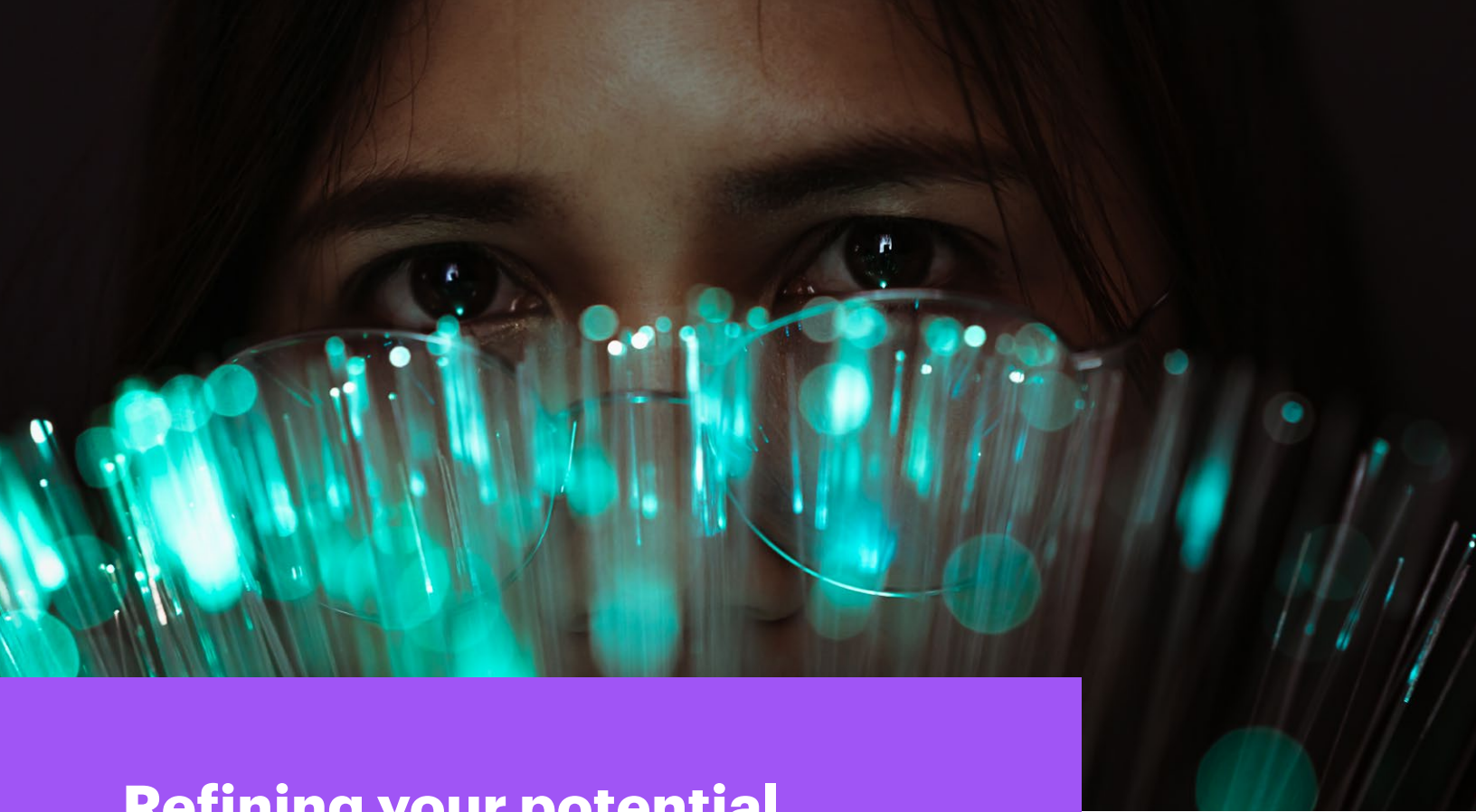
2. Set a vision for what can be accomplished. What are your goals? What outcomes do you hope to achieve in each of the three resilience areas: Integrated data foundation, integrated operating model and intelligent asset and worker management? How can improvements in one area support or accelerate value in the others?

3. Assess the transformation requirements. What is needed to establish a strong data foundation? What should the new asset integration architecture look like? What changes to the current operating model or ways of working will need to be made? What digital investments will be required? Are these new requirements realistic for all assets? Can they be addressed in a phased approach over time?

4. Conduct a reality check. Are your organizational leaders on board? Is your culture ready and willing to pursue this type of connected change? Can your existing technology landscape support the new digital solutions and ways of working? What is the budget for connecting and optimizing your operations? How soon can you deliver measurable business results?

5. Assess your talent needs. What skills do you have in-house to launch and maintain the journey to resilience? What technical and “soft” skills will be required to sustain momentum? Is your talent strategy appropriately geared to secure the digital skills that will be needed? Do you have ecosystem partnerships that can be tapped for insights, innovations and new sources of talent?

6. Identify your starting point. In which area can you likely achieve fast momentum? Are there “quick-win” opportunities that can galvanize the organization and create enthusiasm for what’s to come? Do you have what it takes to kick off this project? For example, a company may feel that improving predictive maintenance will deliver large returns on investments by minimizing downtime and increasing reliability of equipment. However, the company recognizes it doesn’t have access to the right data to allow intelligent systems to offer insights for operators and, therefore, changes its “starting point” to first improve field data connectivity.



Refining your potential

Shifts in energy demand patterns, the decarbonization of the energy ecosystem and industry volatility will only accelerate.

While the repercussions of these trends will vary depending on timing, location and other factors, there is one constant: The urgency with which refiners need to strengthen their resilience.

We believe connecting and optimizing operations is the prerequisite for the resilience that's now required to successfully navigate the energy transition. Leaders can't be content with incremental improvements; they need to take bold and comprehensive actions to realize the true value potential. Unlocking competitive advantage—and the full value potential of the organization—calls for an end-to-end approach. And it demands that refiners start taking actions today.



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