

Deloitte.

The future of energy

A novel approach to creating advantage in the face of systemic uncertainty, via scenario planning



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Energy is the pulse of our day-to-day life and how we create and use it is changing rapidly. What the future will look like is not certain, but what is clear is that we're well on our way to a new energy future. Imagine the possibilities—a world where energy is sustainable and abundant. Deloitte has invested in developing a perspective on scenarios for the Future of Energy that will allow us to connect for a new energy future, where we're all in it together, with a common purpose, and each with a clear role to create our new energy world.



The future of energy

The decarbonization trend is here to stay as consumers, companies, and entire countries drive new demand for lower carbon systems. But a massive amount of uncertainty still lies ahead for energy companies and the industries that rely on them—and that uncertainty extends far beyond the traditional focus areas of technology and policy.

A multitude of potential outcomes lie ahead as scores of driving forces shape the future in both predictable and unpredictable ways. Likely no single organization today has the resources to manage effectively the complexity in the face of such extensive, interconnected uncertainty. But the way any company acts today—as it looks to and through the energy transition—will almost certainly impact its degree of advantage tomorrow.

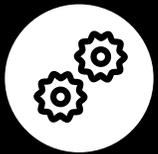
We understand the challenges and opportunities the Future of Energy brings and actively help our clients accelerate impact on their markets, stakeholders and society. Deloitte is ideally placed to take a leading role in connecting the ecosystem of businesses, innovators, regulators and thought leaders that will make this change possible. Through our scale and sector knowledge, we leverage the connected strength of our strategy, implementation, innovation and social solutions to create the right value balance for our clients.

To explore more, visit
www2.deloitte.com/FutureofEnergy

The big question—in focus

How will the energy system evolve by 2035, and how might that evolution affect the extended energy ecosystem?

It's a big question. Answering it involves layers of thinking around layers of topics, including:



Energy systems

The rapid and variable pace of change in the energy system (both end-use and demand systems and sources of supply... and their related ecosystems)



Energy producers

The impact to all sectors that produce energy (e.g., oil and gas, minerals and mining, power generation, etc.)



Energy consumers

The impact to all sectors that consume energy or energy feedstocks as a significant portion of their cost base (e.g., chemicals, industrial products and construction, transportation and hospitality, consumer products, etc.)



Geography

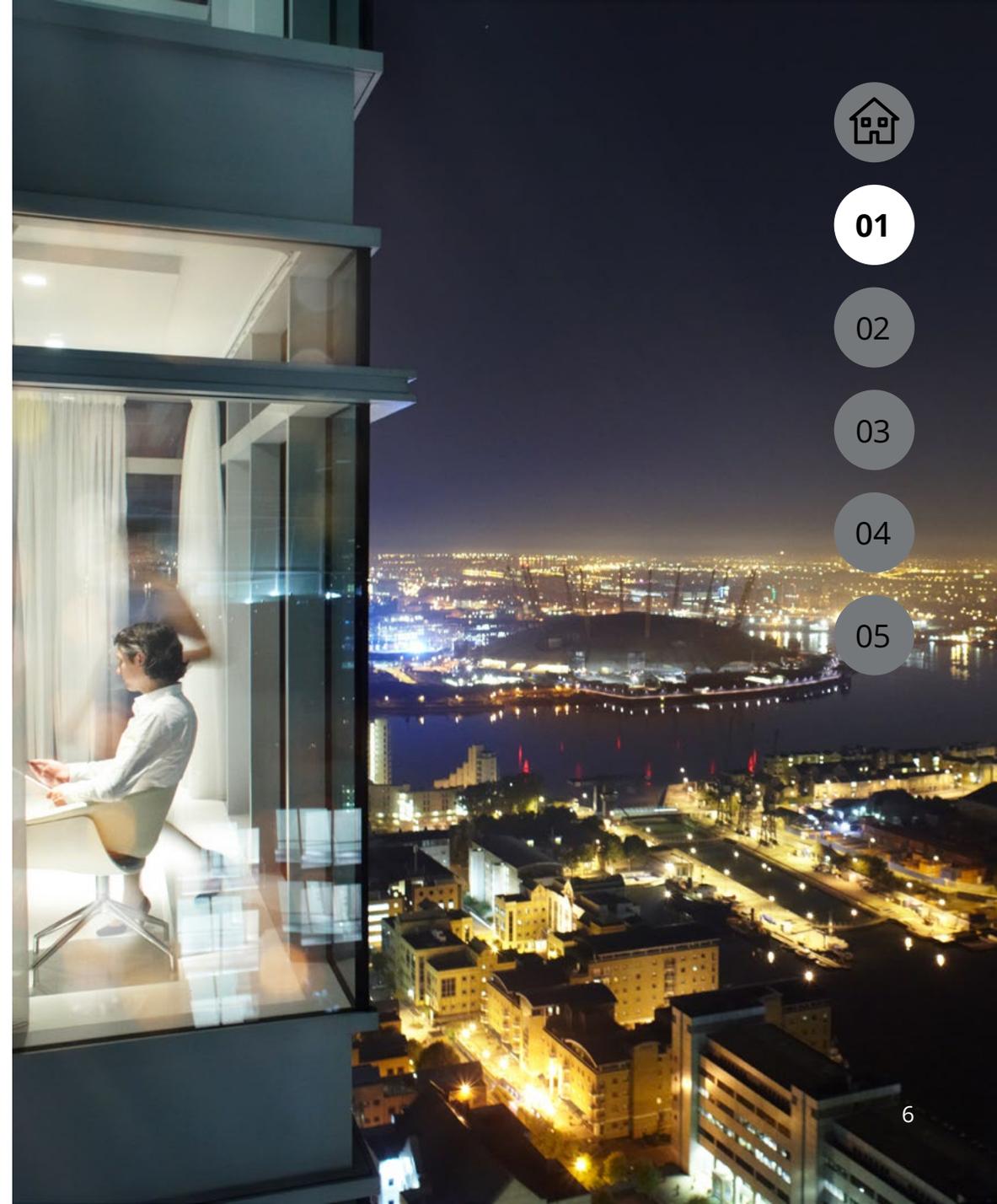
The variable impact across regions

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Why this and why now: A toolset for earning, learning, and influencing

Scenario planning is nothing new to the energy space. Industry leaders have been pondering and planning for scenarios for years. What does an effective strategy for thriving in the future of energy look like? Having a complete picture has always been important to planning. Unfortunately, many organizations have often chosen a handful of uncertainties to model—resulting in a low-resolution picture for planning for the future, which often means that companies adopt a “wait and see” mentality.



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At Deloitte, we have developed an effective toolset for creating a more complete, more detailed picture that organizations can use to manage their businesses in the face of uncertainty and—importantly—enable action today.

Our Future of Energy Scenario Planning toolset, which focuses on today through 2035, involves an extensively researched set of data-driven, reality-based insights that can help businesses place intelligent, informed bets on the future of energy. It's not about absolutes. It's about being absolutely prepared for the most likely outcomes—especially in the short term. And even as the COVID-19 crisis brings new questions: *How long will economic recovery remain in the front seat? Will organizations temporarily retreat from the green agenda? Will societal response to achievements in emission reduction accelerate or decelerate a call for change?*

This approach can serve as a flexible, durable resource to help prepare for major known and unknown forces ahead.

At its core, the approach has been designed to help an organization “earn, learn, and influence”—to earn profits amid constant disruption; to learn how the world is unfolding across leading indicators to better hone bets over time; and to influence the direction in which the world is going so that it is more advantageous to the business.

The future of energy is the future of your business

Regardless of the industry you are in, the evolution of the energy system over the next two decades will likely affect your business in powerful ways—strategically and operationally.

From producing industries to consuming industries, the future of energy is a shared future. The convergence we see across energy systems and sectors means that increasingly you need to look beyond the boundaries of your industry to assess and understand the implications of the evolving energy system, and all of the possibilities it provides. A clear view to likely futures should enable better decisions regarding asset investments, innovation portfolios, strategic positioning, and digital transformation...to name a few.



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Consider these factors



The overwhelming amount of data—with thousands of public-domain reports on the future of energy



Data of limited utility—with much of the work in the public domain being too narrow, anchored primarily in policy or technology



Projections and quantitative modeling providing an incomplete toolset for preparing for the future—and giving a false sense of security if decisions are made based just on what the models say about topics such as carbon regulation or renewables cost curves



The growing reality that the future is unknowable and that it is becoming less knowable as change accelerates and uncertainty proliferates

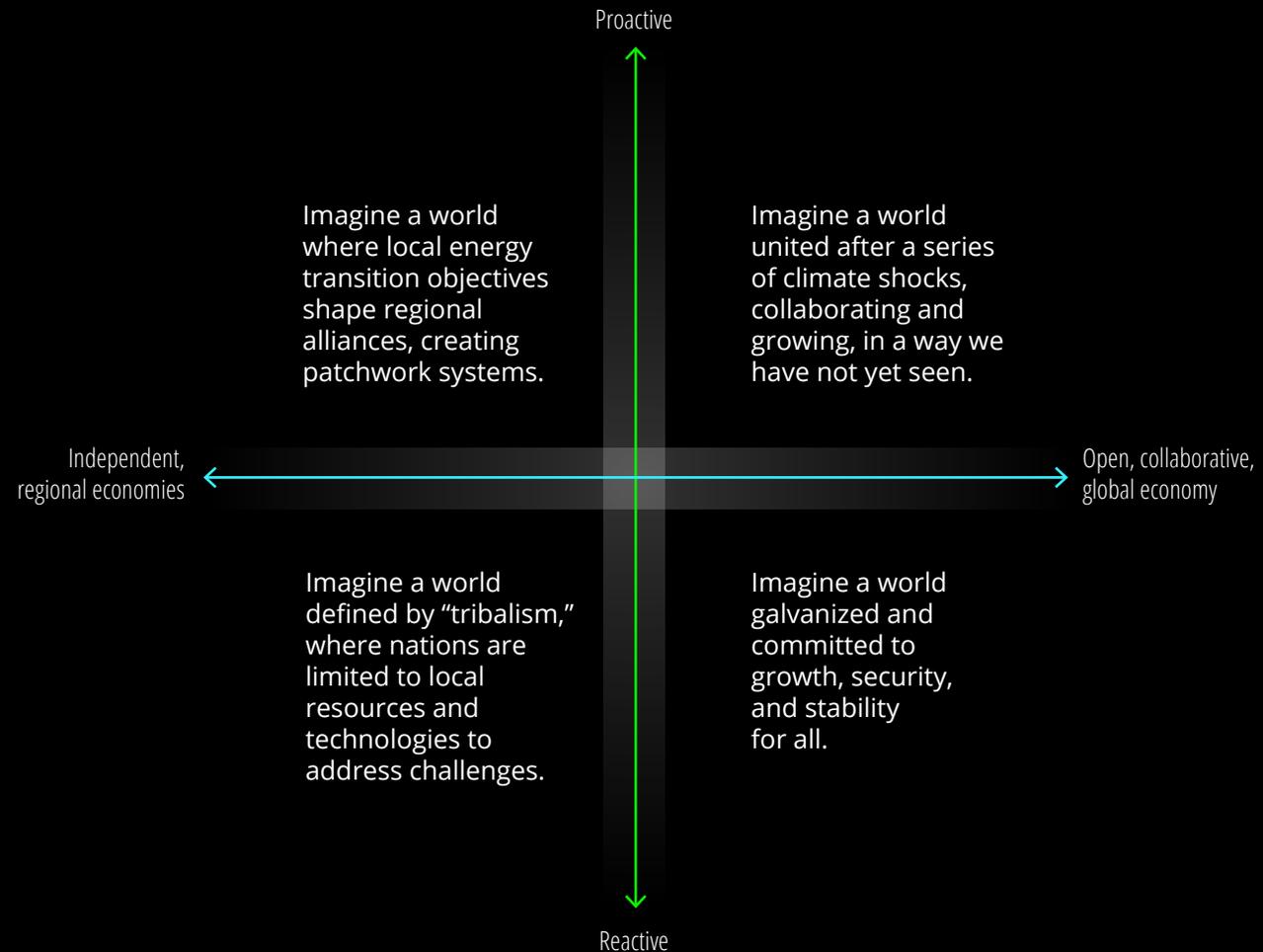
These factors and others all have hindered meaningful action. Most companies recognize the critical issues, but the complexity involved in predicting a range of different outcomes locks up the system. As a result, they monitor carefully and wait for more conclusive data to become available.

That kind of “wait and see” mentality simply will not suffice in today’s environment. As the pace of business disruption accelerates, getting ahead of scenarios becomes essential—and scenario planning still matters. So how can you do it better? How can you turn scenario planning into a tool that lets you prepare for a dynamic future of energy and make a greater impact on your business?

Our approach

The approach that Deloitte developed entails two axes—global dynamics and societal response to climate change—as the framing variables. Those axes demarcate four quadrants that reflect four scenarios—i.e. four high-relief, plausible, and divergent future worlds.

No single scenario is going to fully materialize for the future of energy overall. The scenarios are not clear-cut predictions. Rather, they are hypotheses in the form of data-driven stories about tomorrow—to help drive better decisions today. (Read the narrative for each one in “The four scenarios in focus” on page 17.)



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Seeing all the driving forces

The future is often shaped by policies and technologies. But when organizations plan for a future using only those two factors, the planning becomes too narrow to be useful in the face of a deeply complex future.



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The methodology



Addresses dozens of uncertainties simultaneously, as an integrative whole



Takes a systemwide view across the entire energy value chain



Focuses on a more balanced timeframe that is far enough out to allow for different outcomes, but near-term enough to be relevant for current planning periods



Puts humans at the center of things, as the primary mechanism for effecting change



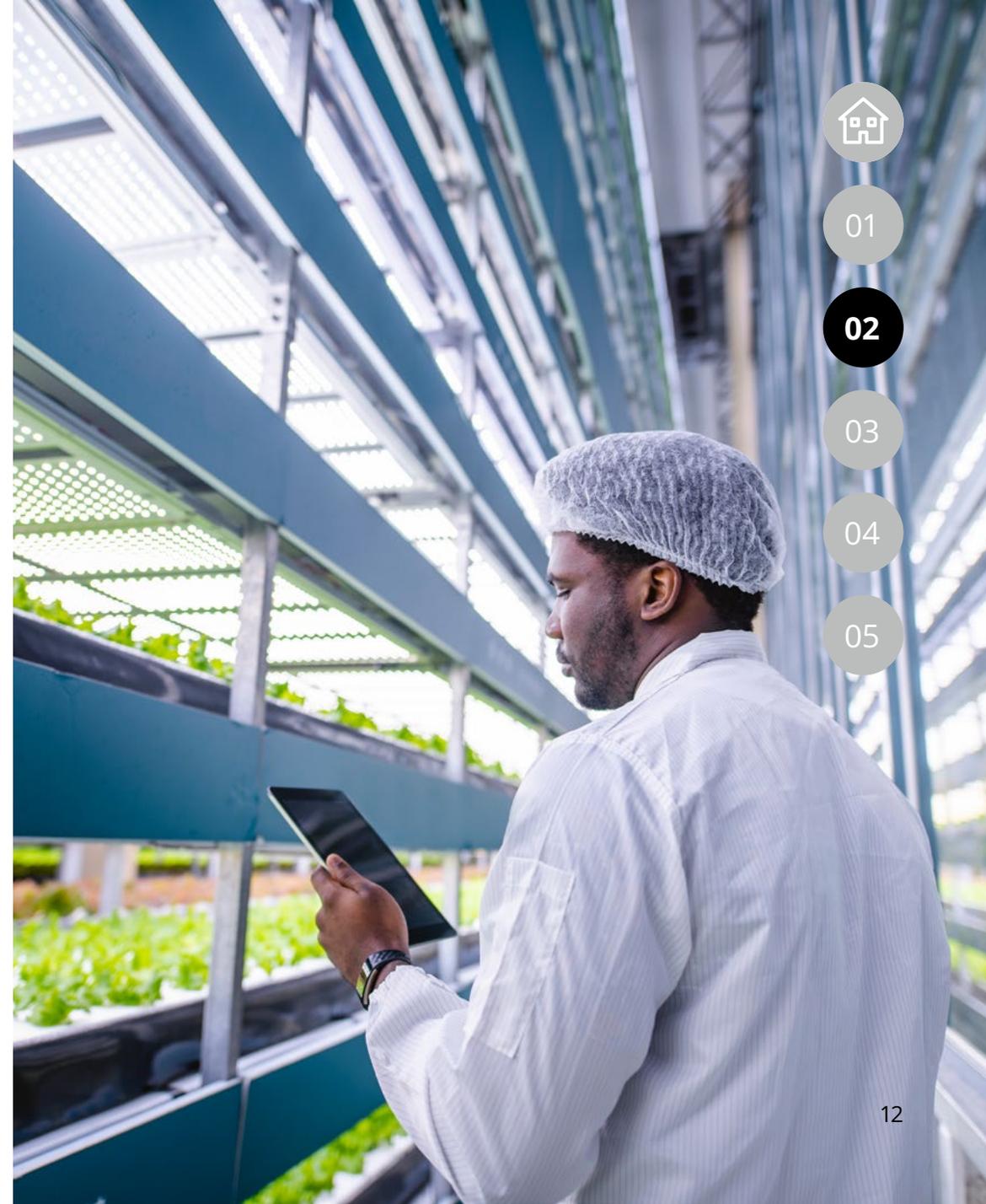
And, most importantly, focuses on enabling clients to take action in the short term—in a flexible way—to learn, evolve, and realize measurable value as the future unfolds

By extensively examining historical and current industry data, we identified 92 driving forces that can shape the future of energy in predictable and unpredictable ways.

That research guided the development of Deloitte's Future of Energy Scenario Planning methodology, a comprehensive approach for operating in the future of energy, using the tools of scenario planning.

Plotting the future by plotting plausibility

The 92 driving forces span social, technological, environmental, economic, and political dimensions—encompassing things like the rate of urbanization, the public’s view of the hydrocarbon industry, the monetization of data, and product differentiation.



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Plotting the future by plotting plausibility

As a whole, these forces provide the starting point for Deloitte’s “high resolution” scenario-planning approach. Through extensive research and analysis of those 92 driving forces, our team identified 19 major uncertainties—effectively collections of high-uncertainty and high-impact driving forces with similar attributes.

From there, we created four plausible scenarios—scenarios that can manifest at varying degrees, in varying combinations, at varying times, and in varying parts of your business.

The scenarios represent the best set of credible futures that industry and scenario planning experts can anticipate with today’s available information—all driven by qualitative and quantitative modeling on energy use and economic impact, and brought to life using narratives that address the implications for industry sectors.

Through extensive research and analysis, our team identified collections of high-uncertainty and high-impact driving forces with similar attributes.



19 uncertainties



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Deloitte clustered 92 driving forces into 19 major uncertainties—effectively collections of high-uncertainty and high-impact driving forces with similar attributes. We used these 19 uncertainties to develop four plausible and divergent scenarios for what the world might look like in 2035.



Social

- 1 Qualified talent
- 2 Society and the customer's voice
- 3 Energy access
- 4 Consumer behavior



Technological

- 5 Improvements in energy storage
- 6 Source of innovation
- 7 Carbon Capture Utilization and Storage (CCUS) technology
- 8 Influence of new processes and technologies on end-use demand



Environmental

- 9 Public and policymaker response to climate change
- 10 Relationship between GDP growth and energy related externalities



Economic

- 11 Hydrocarbon financing and access to capital
- 12 Price competition between energy carriers
- 13 Access to essential raw materials
- 14 Energy production
- 15 Energy distribution



Political

- 16 Geopolitical dynamics
- 17 Global relations
- 18 Sustained action to address climate change
- 19 Leapfrogging by developing countries to renewable

The four scenarios in focus

The future is coming fast. By 2035, organizations in every industry will be dealing with a vastly different energy landscape. What will that future look like? Plenty of uncertainties are in play, but four clear scenarios emerge based on Deloitte's research.



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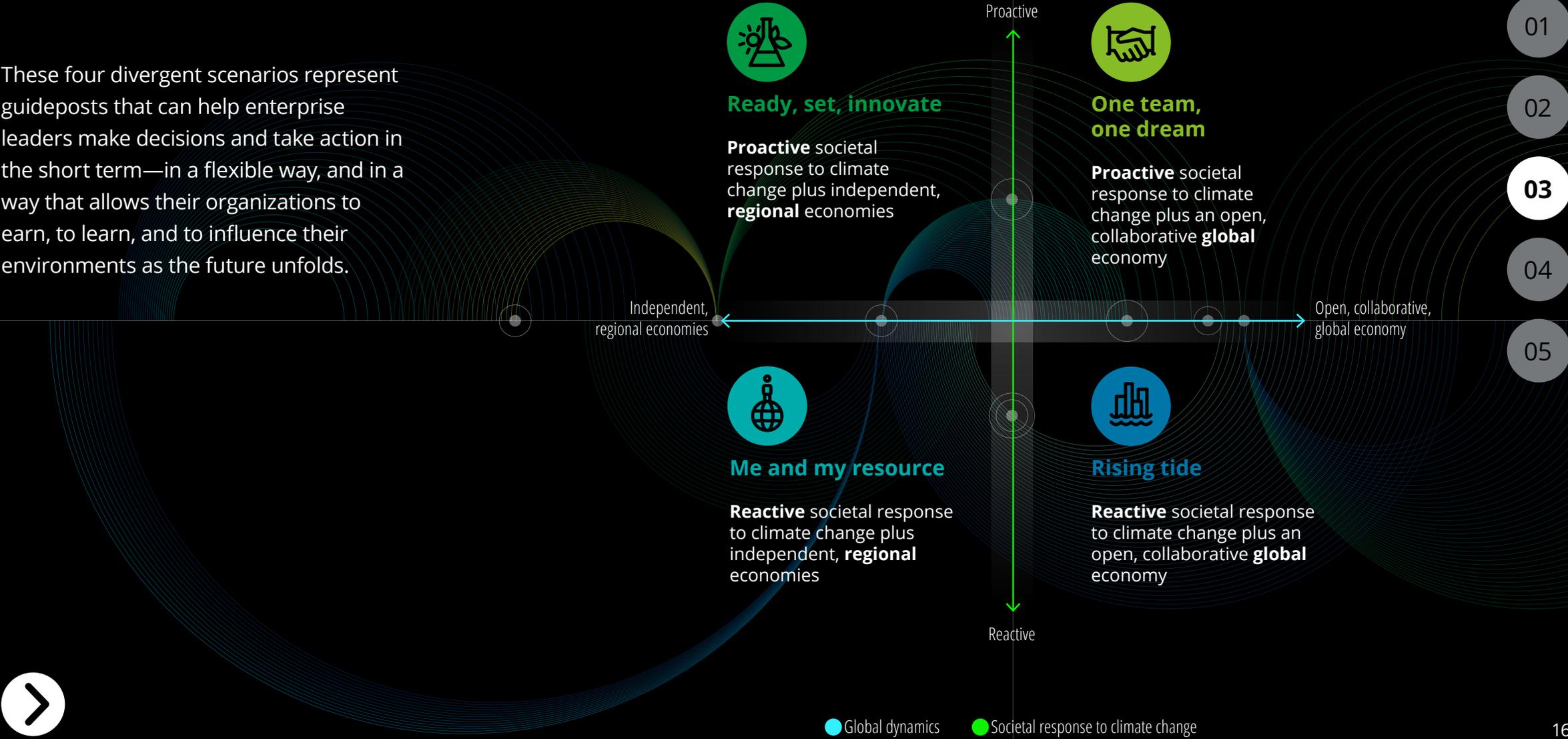
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Four scenarios

These four divergent scenarios represent guideposts that can help enterprise leaders make decisions and take action in the short term—in a flexible way, and in a way that allows their organizations to earn, to learn, and to influence their environments as the future unfolds.



● Global dynamics ● Societal response to climate change

One team, one dream

The vision

Imagine a world united after a series of climate shocks, collaborating and growing, in a way we have not yet seen.

In a nutshell

Global adoption of low carbon systems accelerates electrification and drastically reduces energy demand and emissions.

A closer look

Consumer behavior dramatically favors the long-term health, environmental, economic, and social benefit of the collective, triggering a globally collaborative atmosphere that successfully commercializes low-carbon technology and commits to drastic decarbonization. Fierce competition exists between energy companies to scale accessible, low-carbon technologies to meet consumer demand. Tech players invest in efficiencies up the value chain to reduce the impact of widely used products. Governments open borders to allow for a web of connected services and introduce a global carbon pricing mechanism.



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Ready, set, innovate

The vision

Imagine a world where local energy transition objectives shape regional alliances, creating patchwork systems.

In a nutshell

Private-sector leaders drive high electrification and adoption of renewables in select regions, leading to low energy demand and emissions.

A closer look

The failure of governments to globally address climate change leads private industry to take it upon itself to innovate to lower emissions. Companies recognize the risk that climate change poses to their businesses, and shift to meet consumer demand for low-carbon energy. The build-out of renewables relies on businesses, as there is limited coordination between nationalistic governments, creating hurdles for the scale-up of these technologies, especially in the developing world. Competition is fierce between government systems; trade is almost entirely closed within regional systems; developing and emerging nations partner.



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Me and my resource

The vision

Imagine a world defined by “tribalism,” where nations are limited to local resources and technologies to address challenges.

In a nutshell

Regionally disparate outcomes with high, hydrocarbon-based energy demand in some regions and leapfrogging to renewables in others.

A closer look

Protectionist policies that create trade barriers and limit technology/knowledge transfer prevail, limiting the movement of people and goods. Consumer activism, distracted by an economic recession, fails to trigger a sustained push for an energy transition, while governments compete for access to cheap and stable energy resources. Innovation focuses on development of local resources, whether renewable or hydrocarbon. Climate change responses are disparate, reactive, and focused on localized infrastructure projects versus abatement.



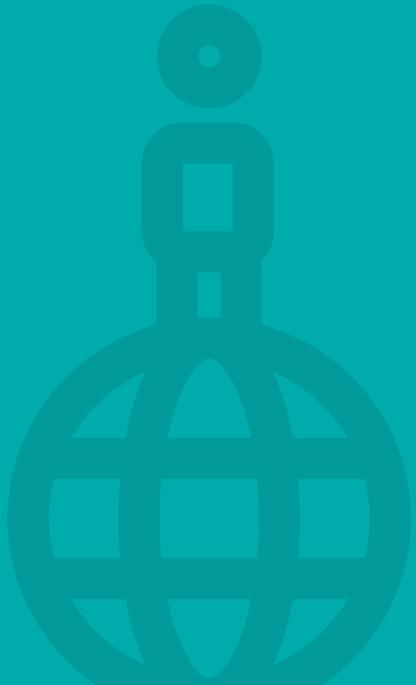
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Rising tide

The vision

Imagine a world galvanized and committed to growth, security, and stability for all.

In a nutshell

Emphasis on economic growth leads to high growth of energy demand and emissions and use of all available energy sources.

A closer look

Energy efficiency, affordability, and accessibility drive consumer behavior, resulting in the expansion of both renewables and hydrocarbons. Global powers share the priority of short-term economic growth, which leads to increases in wealth and quality of life for most. Advanced technologies create new options for addressing climate change, but given the focus on widespread economic growth, the social and economic “switching cost” slows the pace of innovation in favor of reactive, climate mitigation efforts.



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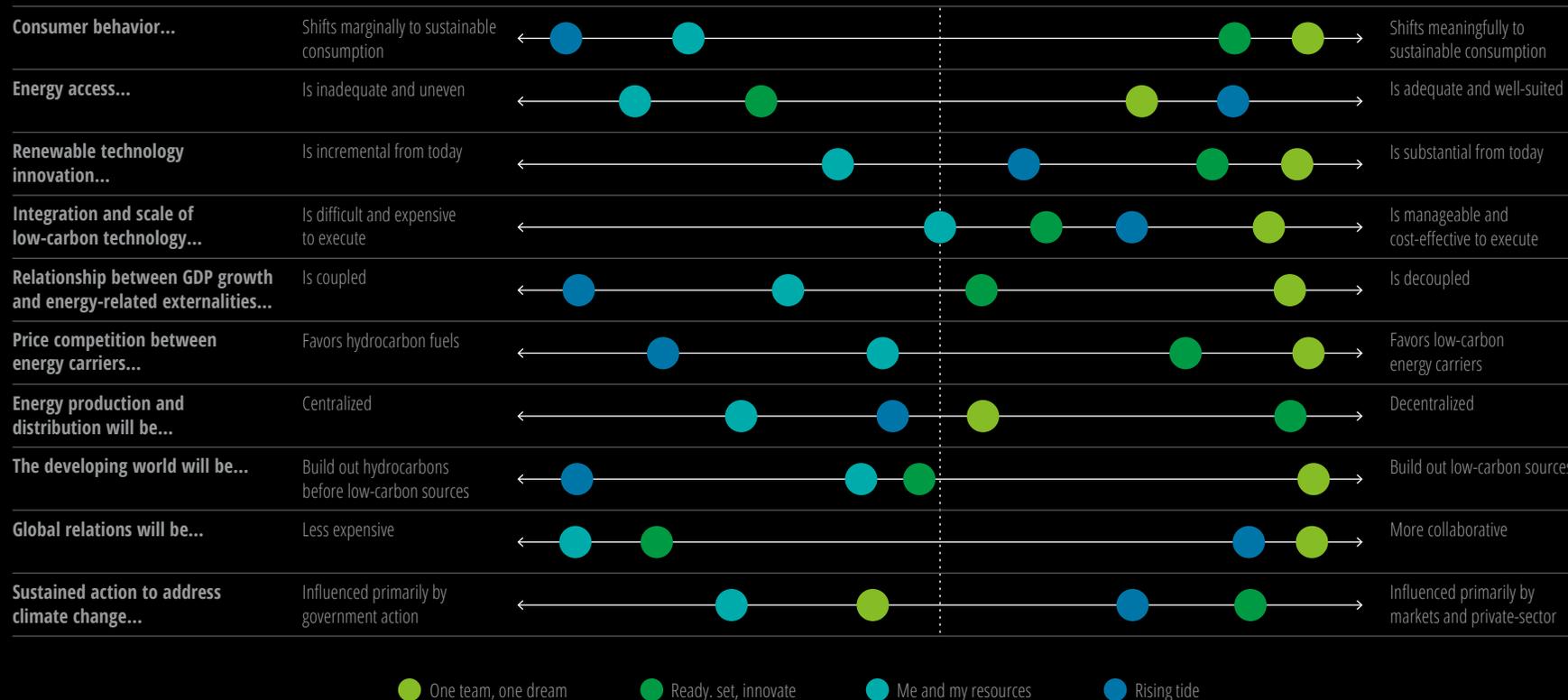
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Where uncertainties and scenarios meet—and play out

The future of energy will have many moving pieces: consumer behavior, innovation, global relations, and action on climate change—to name only a few of the areas of uncertainty. For each of these uncertainties, the impact will play out differently for each scenario. It's important to remember that each scenario is meaningfully different from the other scenarios, and across all four of them you could see the potential for dramatically variable outcomes.

The chart below can help you visualize how various uncertainties, if they become realities, relate to each scenario.



High-impact driving forces

As we move toward 2035, there are several macro trends that can be taken as “givens” across the scenarios:

- Global energy demand will increase
- Decarbonization will be a global imperative
- Emissions will slow, but not to target levels by 2035
- Technological innovation will continue
- Global economic and population growth will increase



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How to deliver value with the scenarios

Ultimately, organizations can use the scenarios to identify implications to their current strategies and to inform decision-making at multiple levels. They can begin to move beyond the immediate activity involved in monitoring how the world is unfolding. Instead, they can begin to build insights that drive a wide range of planning needs and actions—from near-term investment decisions and asset plays to digital initiatives, partnerships, and ecosystems—all grounded in the nature of a specific scenario, its likelihood, and your level of confidence.

For example, you might assess how well a strategy or tactic performs across each scenario, including modeling the impacts of each scenario on your asset portfolio. You could then assess key actions under each scenario and prioritize the scenario-specific measures to take—such as “execute now” or “evaluate and decide.” Think of it as creating a detailed, high-resolution playbook based on scenarios that have been developed through a high-resolution approach.



Sensing for insights

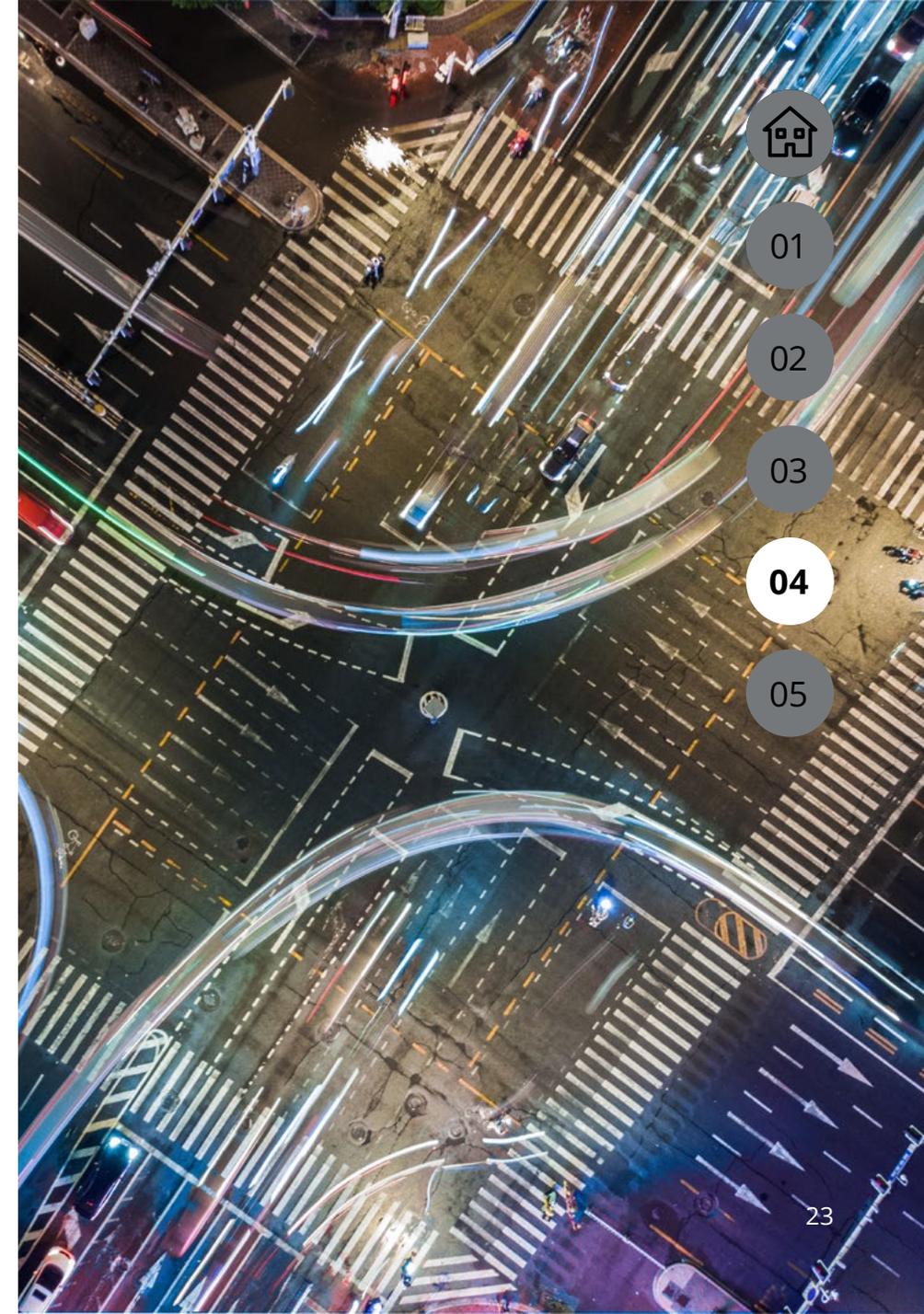
Effective planning and use of the scenarios will require an ability to identify, understand, and monitor various indicators and signposts.

Indicators include quantitative signs of potentially significant change—signs that you can monitor to determine if a particular scenario is beginning to unfold.

Signposts include events, milestones, breakthroughs, or developments that, when observed, signal the unfolding of a particular scenario.

Generate solid insights in each area, and you should be able to get a sense for how certain events can signal the likelihood of one particular scenario coming true.

For example, if consumer behavior shifts marginally toward sustainable consumption, that is an event strongly aligned with the Rising Tide scenario. If, on the other hand, consumer behavior shifts meaningfully to sustainable consumption, signs point strongly to the One Team, One Dream and the Ready, Set, Innovate scenarios.



Qualitative and quantitative modeling

Relationships between different components of the global energy system play out differently across scenarios. These are not precise forecasts, but directional estimates of multiple, credible views of the future.



One team, one dream

Global adoption of renewable technology accelerates electrification and drastically reduces energy demand and emissions



Ready, set, innovate

Private sector leaders drive high electrification and adoption of renewables in select regions leading to low energy demand and emissions



Me and my resource

Regionally disparate outcomes with high, hydrocarbon-based energy demand in some regions and leapfrogging to renewables in others



Rising tide

Emphasis on economic growth leads to high growth of energy demand and emissions and use of all available energy sources

Global GDP growth	2-3%	1.5-2.5%	1.5-2.5%	2.5-3.5%
Total annual energy demand (EJ)	500-550	600-650	700-750	750-800
Annual CO ₂ emissions (Gt)	15-20	25-30	30-35	35-40
Share of fossil fuels in primary energy (%)	55-60%	65-70%	70-75%	75-80%
Share of renewables in electricity consumption (%)	70-75%	65-70%	55-60%	50-55%
Electrification – Industry	35-40%	30-35%	<30%	30-35%
Electrification – Transport	>10%	5-10%	<5%	19-21%
Electrification – Buildings	>60%	55-60%	40-45%	40-45%



Connecting the dots, placing your bets

With so many potential factors in play, organizations will require a number of capabilities to make effective use of this high-resolution scenario planning approach. For starters, information transparency and access to data-driven insights—from both internal and external data—will be key. Internal collaboration—the tearing down of informational and organizational silos—will top the list for many companies.

Organizations will also have to embrace a risk-based “spread your bets” mindset based on the four scenarios. No single one of the futures will necessarily come to full fruition—as “the” intractable future for your business or your industry. The future is always evolving. So where should you devote your resources?

Understanding what matters most to your business—and where you can see the greatest impact under each scenario—will be essential for determining the planned actions to take. Deloitte can help you connect the dots—with capabilities for understanding your business from end to end, and servicing your business from end to end. Our diverse team of energy and business transformation specialists can help you turn your data into insights, to drive plans and actions.

Putting the approach to the test

Challenges from the COVID-19 crisis likely will reverberate well into the future. This novel approach to scenario planning has been designed to consider major global unknowns, including pandemics, economic crises, international conflicts, and more. How does the COVID-19 crisis connect to the four scenarios? In particular:

- Suddenly, everyone has experienced uncertainty in a visceral way and built new muscles to manage in the face of it
- While the pandemic has not shifted the fundamental drivers of the future of energy (i.e., our “axes”), it has almost certainly shifted the belief system about the relative likelihood of any one scenario to come—just as future events will require an ability to shift bets with agility.



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Stepping toward the future

Start by taking a deeper look into this novel scenario planning approach—into the processes, data, insights, and what-ifs that drive it. (We have only just scratched the surface here.) The real advantage will come from working through implications for your company based on your strategy, current position, asset portfolio, and other factors.



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As you begin to wade into the possibilities and the potential, Deloitte can serve as a guide—working side by side with you to explore the content and the methodology. Through insights based on extensive industry-specific experience, we can help you understand what your business might look like in a number of areas (cash flow, workforce demands, customer experience, supply chain issues, etc.) under each scenario—working with you all the way through execution and implementation. The ultimate vision? Actionable, ready-to-execute plans that address a multitude of future possibilities and allow you to earn, learn, and influence no matter what tomorrow brings.

Some key steps along the new scenario planning journey:

- **Finetune scenarios and action plans** for organization-specific needs, and as the future evolves
- **Determine and prioritize actions** based on current internal and external information
- **Create a roadmap** for ongoing scenario planning, decision-making, actions, and the evolution of scenario-planning capabilities

Why Deloitte

Deloitte is recognized as the world's foremost consulting practice in scenario thinking—integrating scenarios, strategy, and risk—all while being deeply rooted in the energy industry. Our legacy in scenario planning started in the Oil & Gas industry over 30 years ago, and we continue to innovate leading edge capabilities and advanced techniques to this day.

Deloitte scenario practitioners have worked with hundreds of the world's leading organizations, including a broad cross-section of the Fortune 100 in every sector, the leadership of the Armed Forces, and agencies of the Federal Government, multiple national security and intelligence agencies, and many of the world's largest private philanthropies and nonprofits. Deloitte has professionalized the practice of scenario planning.

Learn more.

www.deloitte.com/us/foe-scenarios



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Don't blink

The future of energy is being rapidly rewritten every day as new events emerge and as disruption continues unabated. How will you respond? What's your plan for thriving in a future filled with complex uncertainty as well as the simple certainty of decarbonization?

If taming disruption and taking planning to the next level are priorities for your organization, we should talk. We can share additional details on our approach, provide a demo of our scenario-planning data and model in action, or schedule an immersive lab session or workshop to help you begin preparing your business for the future of energy. Contact us to get the conversation started.

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