Urgent Action Needed: Energy Markets are Changing Faster Than Energy Companies

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Initiatives: Energy and Utilities Digital Transformation and Innovation

A broad range of financial and regulatory pressures, combined with significant growth opportunities, mean oil and gas companies can no longer ignore the global shift to renewable energy sources. As energy transition becomes relevant, oil and gas CIOs must enable faster transformation.

Overview

Impacts

- Dramatic price/performance improvements in renewable technologies, including energy storage, are making them a large and highly attractive investment category.
- Environmental sustainability is becoming one of the most influential priorities for governments, businesses, investors and energy consumers.
- R&D objectives for oil and gas companies are being rebalanced, with game-changing technology breakthroughs becoming as high-priority as operational performance improvements.

Recommendations

Oil and gas CIOs responsible for driving transformation and innovation need to:

- Review the economic attractiveness of renewable energy investments to take advantage of new opportunities to create premium low/no-carbon products and services in a changing world. Ample opportunities exist to create premium low/no-carbon products and services due to recent changes.
- Refresh business strategy by taking a broader view of the social and regulatory factors shaping industry trends and deeply rethinking their implications for all business priorities.
Strategic Planning Assumptions

By YE22, over 20% of large oil and gas company R&D spending will focus on enabling global-scale operations of new green technologies.

By YE24, over 40% of traditional oil and gas companies will operate low/no-carbon subsidiaries, rebranding themselves as diversified energy companies.

By YE26, over 60% of the capital programs of the largest energy companies will focus on low-risk renewables investments.

Introduction

For more than 100 years, oil, gas and electricity have been the energy backbone of the global economy. However, conditions are changing rapidly. Decentralization is softening the regulatory boundaries that shape power generation and marketing. Decarbonization is limiting demand and creating hypercompetition among oil and gas companies. And new energy technologies, like hydrogen, are opening nontraditional pathways for massive capital investment. Collectively, these trends will drive all energy companies to transition their business models, operating models, organization designs and technologies.

The past decade has seen dramatic price/performance improvements in renewable energy technologies like offshore wind, solar, hydrogen and carbon capture, use and storage (CCUS). The result is energy markets that are anxious to reduce greenhouse gas (GHG) emissions and their impacts on climate. Until recently, government policies largely hadn't kept pace with these developments, but that changed during the COVID-19 pandemic’s unprecedented disruption of energy markets worldwide. Social preferences are growing stronger, and becoming as influential as official mandates. Across all industries, companies are beginning to act. A recent McKinsey report shows that after a decade of low-impact “greenwashing,” companies are backing up their GHG reduction commitments with larger sustainable energy initiatives and investments. In Gartner's 2020 Sustainability Survey, 64% of the respondents — all in industries other than energy — claim they're developing new products and services, and 61% say they're developing new business models. The world surrounding the oil and gas industry has begun to move rapidly.
By contrast, until recently, most fossil fuel companies were moving slowly (see Energy Companies Are Facing a Decade of Deep Redesign and Need Strong CIO Leadership), raising concerns that they would trail too far behind the market. However, as illustrated in Figure 1, oil and gas companies are beginning to embrace energy transition more enthusiastically.

Figure 1: Three Impacts That Are Driving Faster and More Profound Change

Initially, energy transition was perceived as a threat to most oil and gas companies, and for good reason. Approximately one-third of the respondents to Gartner’s sustainability survey reported consumer and regulatory pressure as the motivation for higher investment levels in green energy sources in 2020. And 92% of survey respondents project to have achieved their sustainability goals by 2030. This suggests diminishing demand for fossil fuels, and higher competition (and lower prices) for oil and gas producers. To mitigate this risk, oil and gas companies see digital capabilities as the primary driver for the magnitude of operating efficiency improvements needed to sustain profitability (see How Energy Executives Can Get Ahead of Environmental Risks With Strong Greenhouse Gas Commitments).
But risk mitigation isn’t enough. Companies that plan to be industry leaders in 2050 need to recognize that renewable energy represents an important growth opportunity for the sector. And they want to pivot their business strategies to discover, develop and scale the provisioning of a broad array of low- or no-carbon energy products, services and assets. A practical sense of urgency for energy transition may now be the primary factor that defines future industry leaders. And as future energy markets look to be more complex, dynamic and volatile, energy transition leaders are relying on digital technologies to enable their companies to become flexible without losing efficiency.

Oil and gas CIOs must work collaboratively with energy transition leaders to maximize the impact of digital capabilities to further improve cost efficiency while simultaneously enabling faster energy transition.

**Impacts and Recommendations**

**Price/Performance Improvements Are Making Renewable Technologies the Dominant Energy Investment Category**

During the coming decade, the economics for renewable energy sources will pass across an inflection point, driven by five key factors:

- Technology-driven price/performance improvements in photovoltaic (PV) solar, wind turbines and lithium-ion batteries, with green hydrogen and pumped hydro (PHES) also becoming market factors.

- Rapid growth in consumer demand for renewable capacity and technologies, including PV solar electric vehicles (EVs) and hybrids and “cleaner energy” sources.

- A dramatic increase in business “green energy” demand for facilities, such as leading cloud infrastructure providers. Many enterprises are now holding their supply chain partners directly accountable for reducing GHG emissions.

- Investor interest in renewable energy projects and companies that offer attractive multiples/returns on invested capital.

- Government interventions, such as carbon and emissions taxes, renewable portfolio standards and bans on internal combustion vehicles.
The cost of manufacturing solar panels has declined 89% during the past 10 years. And “soft” costs for installation, such as permitting, siting, inspections and grid connections will decrease as more software and automation are used. Large-scale battery “backups” are being deployed worldwide — in locations including South Australia, California and Texas — because they already offer faster, less expensive means of addressing the problem of intermittent renewable output. This means storage is slowly improving the capacity factor of renewable energy sources, further improving the economic vitality.

The price/performance improvements in renewable technology are contributing to significant advances in consumer acceptance and adoption. Falling solar prices, for example, have led to grid parity — the point when it’s no more expensive for business or residential consumers to produce electricity themselves than to buy it from the grid — in many markets. A similar effect is being seen in the transportation sector, where price/performance improvement and market scaling for battery technology are driving EV adoption, sometimes even in markets without government intervention. Oil and gas companies should view these consumers as potential sources of premium revenue.

Digital advances that provide greater visibility into energy consumption are also contributing to energy efficiency. Properly packaged and marketed data and analytics and reporting encourage “behavior evolution” among consumers and businesses. For example, utilities have found that simple data feedback, like peer consumption comparisons, drives three to five percent energy efficiency improvements. And installing smart thermostats with the ability to turn off air conditioning during peak hours can reduce the need for new generation capacity.

In addition to regulation, governments are promoting energy transition by efforts designed to change consumer behaviors. They often use websites, reports and notifications, public service announcements and other means to highlight national and regional conditions and even personal energy usage, identify pollution “hot spots” and offer opportunities to make suggestions for improvements.

Recommendations:

- Relentlessly leverage digital technologies to drive operational efficiencies in all forms of energy that your company produces.
- Regularly update your assessment of the price/performance of renewables as compared to fossil fuels. Factor in likely near-term actions by governments, investors, businesses and consumers.
Environmental Sustainability Is Becoming the Main Driver of Energy Decisions for All Stakeholders

In recent years, social pressure — the demand for energy sources that are both cleaner and more renewable — has grown more influential in shaping national energy policies and energy sector regulatory frameworks. Five factors are elevating this pressure:

- Continuously rebalance your capital investment portfolio to capture emerging value from renewables, especially those that leverage your firm’s geoengineering capabilities.

- The drive for more responsible climate actions, which was originally popularized by young climate activists in the more developed economies and has now spread worldwide, is increasingly becoming mainstream in all social sectors.

- Governments are responding to sustainability pressures from their citizens and businesses. Many national governments are enacting policies that mandate more responsible climate behavior from their citizens and from enterprises operating in their jurisdictions. At the local level, a growing number of municipalities are engaging financial service companies, nonprofit organizations and sustainable solution providers in sustainability initiatives.

- Business risk management is a growing concern, important enough to be receiving attention at the board level. Having a well-developed and well-articulated position on sustainability and climate change is becoming part of good corporate governance and a way to minimize future business risk. That includes reputational risk, as well as risk resulting from disasters and extreme weather events that can have a negative impact on supply chains, insurance (and other) costs, revenue and ultimately profits.

- Investors have also begun adopting more sustainability criteria in assessing the overall value and risk in climate changes. For example, CDP (formerly the Carbon Disclosure Project) provides a scoring system that requires transparency of and visibility into climate-change-related corporate behavior.

- Employees, as exemplified by millennials and digital natives working for large high-tech companies (but not limited to them), are also becoming more vocal in their attempts to influence corporate climate sustainability actions. And more enterprises are positioning and marketing themselves as environmentally responsible as part of their recruiting and talent retention strategies.
None of these activities are necessarily new, but they are becoming louder and more insistent. The green movement, despite periodic ups and downs, has been alive for over 50 years in many developed economies (the first Earth Day was in 1970). The United Nations Intergovernmental Panel on Climate Change (IPCC), established in 1988, became highly visible in the first decade of this century. The CDP was founded in 2000, and its influence has increased steadily. What has changed is the size and scale of these activities, as sustainability initiatives become more important facets of corporate business strategy and investments. Climate change considerations are also becoming the centerpiece of national energy policy, with consequent regulation aimed at decarbonizing existing portfolios of energy sources and securing the path toward a green energy future.

The alignment of consumer, investor, business and employee interests, along with national policymaking and consequent regulation, have created an environment that energy companies can no longer ignore. The usual greenwashing or lobbying that worked in the past to sustain business as usual for energy companies is becoming less effective. Changing customer and investor sentiment is forcing more rapid changes in business strategies, investment approaches and policies, and has driven a series of recent government and corporate activities and pledges. The pressure for sustainability can no longer be stopped or even slowed, and energy companies must redesign their business models to address the transformation that will inevitably result.

**Recommendations:**

- Update your business strategy to take a broader view of the direct and indirect impacts of elevating social pressures on your investment portfolio. Work with impacted stakeholders to quantify the long-term challenges posed by climate change. Then conduct ongoing assessments of near-term opportunities and risks introduced by shifting regulations.

- Continuously assess the company's exposure to changes in national sustainability policy and changing consumer, business and investor sustainability sentiment by projecting more disruptive scenarios, and their potential. Implications for future business.
New Technologies Are Shifting Investments From Operational Improvements to Transformational Innovation

For several years, technological innovation in oil and gas has been focused on the use of digital technologies to drive cost efficiencies. For this reason, oil and gas companies typically have detailed plans for digital investments to improve business performance in all traditional sub-sectors, such as geoscience, oil rig, supply chain and refinery operations, product distribution, marketing, and wholesale/retail product distribution. And every year they’re making further incremental improvements to efficiency, reliability and agility.

The situation for most power utilities is different. Most are being forced to transform their generation portfolios driven by government mandates to invest in new energy technologies (see The Impacts of Exponential Renewable Generation Growth Across the Energy Ecosystem). The disruption at the grid edge resulting from exponential price performance improvement in consumer energy technology is now forcing them to react. They must do this to maintain the viability of the energy delivery infrastructure, as well as to capture new opportunities created by the electrification of transportation.

However, energy transformation is beginning to bring digital and energy technology innovation together. As digital and energy technologies unite, it becomes possible to view the spectrum of technology innovations from a new point of view — the magnitude of impact that innovation produces. Many technology innovations are needed to drive cost efficiency across all forms of energy and all business models. Other technology innovations must deliver game-changing capabilities that enable new business models for green energy products and services. Figure 2 shows Gartner’s three-horizon model for classifying the objectives of technology investments across the entire spectrum.
This framework can help energy companies achieve proper balance across their sustainability-related innovation portfolio. And it fully supports the need to integrate digital and energy technologies. The three horizons are:

- **Horizon 1: Core** — Ideas that improve cash flow and return on investment by providing a continuous stream of incremental innovation to a company’s existing business capabilities. This includes digital innovations that improve efficiency, reliability and agility.

- **Horizon 2: Adjacent** — Ideas that extend existing core capabilities to new customers, markets, or value streams. Examples include deep-water oil rig construction for wind turbines and adapting retail stations for electric vehicle charging.
Oil and gas is fundamentally a commodity-based business, so it's not surprising that historic innovation has been dominated by Horizon 1 opportunities. The remarkable improvements in cost efficiency over the past five years demonstrated the industry's prowess with digital technologies. However, when presented with unique challenges, the industry also has demonstrated the ability to create new energy technologies and deliver Horizon 3 results. For example, oil and gas companies invented subsea factories capable of operating thousands of meters below the ocean surfaces. In the future, oil and gas companies need to combine their strong digital and energy technology skills and apply them to create renewable energy solutions.

By the end of this decade, energy industries will be a composite of old and new business models. Traditional energy generation activities, including those based on fossil fuels, will continue to lead global sales until sometime between 2035 and 2050, depending on the speed of the drivers we've been discussing. They will generate enormous cash flows that will fund investments in green energy generation. Energy strategy and technology leaders must strike the right balance in their capital investment portfolios to avoid overcommitting to proven-but-declining technologies, while also avoiding premature investment in accelerating but less-developed new technologies. Rapidly developing new, game-changing energy technologies of the future is an advantage in all scenarios. To achieve this goal, energy strategy and technology leaders must increase their R&D investment in Horizon 2 and Horizon 3 technologies.

**Recommendations:**

- **Horizon 3: Transformational** — Ideas that create new business models enabled by radical technology breakthroughs. Examples include transforming transportation markets from hydrocarbons to hydrogen and creating a new business based on direct capture of greenhouse gases from the atmosphere.

- Adopt a unified portfolio for technology innovation investments that brings together digital innovations for efficiency and agility, as well as energy innovations that create new low-carbon products and solutions.

- Protect future competitiveness by increasing R&D investments in game-changing Horizon 3 technologies. This will require new partnerships with universities, technology firms and governments.
- Focus Horizon 1 innovations on those that can most significantly improve free cash flow from operations and reduce the cost of change. These investments are essential to fund other aspects of energy transition, especially when commodity prices are low.

- Create leverage that accelerates energy transition within your firm via tactical Horizon 2 investments made collaboratively with technology startups and venture funds. Keep these investments practical and focused on very specific near-term objectives.
## Acronym Key and Glossary Terms

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<th>Term</th>
<th>Definition</th>
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<tr>
<td>Green Hydrogen</td>
<td>The Green Hydrogen Catapult Initiative has brought seven companies together to expand green hydrogen production 50 fold by 2026. Green hydrogen is produced by using renewable energy (wind and solar) to power electrolysis that splits water into its constituent parts. It is widely regarded as the leading contender to decarbonize emissions-intensive heavy industry and transport sectors.</td>
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<td>Blue Hydrogen</td>
<td>Blue hydrogen is derived from globally abundant natural gas resources through the well-established process of steam methane reforming. The carbon dioxide emissions are captured and sequestered during manufacturing.</td>
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<td>Carbon Capture, Utilization and Storage (CCUS)</td>
<td>CCUS is a process that captures carbon dioxide emissions from sources like coal-fired power plants and either reuses or stores it so it will not enter the atmosphere.</td>
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<td>Ammonia for Energy Transport and Storage</td>
<td>Liquid ammonia energy is safe to transport, can be converted into hydrogen without emissions and can store surplus energy from renewable sources such as wind and PV.</td>
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<tr>
<td>Direct Air Capture (DAC)</td>
<td>DAC is a form of carbon capture use and sequestration (SSUS) technology that operates independently from CO2 producing facilities such as coal power plants. DAC pairs well with certain upstream oil and gas operations which are currently purchasing CO2 to repressurize depleting reservoirs.</td>
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<td>Small Modular Nuclear Reactors</td>
<td>Nuclear is somewhat controversial as a green energy but is a source that does not emit CO2. Small modular reactors offer the potential for commercial scale production and wide geographic placement, making them contenders as solutions to the problem of intermittency associated with wind, PV and hydro.</td>
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### Evidence

1. [Net Zero or Bust: Beating the Abatement Cost Curve for Growth](#), McKinsey.
2020 Gartner Sustainability Survey. This survey considered the impact of pressures from stakeholders (customers, employees, investors, regulators and partners) for more aggressive economic, social and environmental sustainability action. It explored different organizational sustainability goals and targets set, how the level of investment in the sustainability programs has changed over time and the value derived from them. The survey was conducted online during November and December 2020, with 183 respondents from North America, Europe, Asia/Pacific, across all industries except energy and utilities, in enterprises with $250 million or more in annual revenue. Respondents were at the director level or above, and had some level of involvement in their organizations’ sustainability efforts. The study was developed collaboratively by Gartner analysts and the Gartner Research and Data Analytics Team.

Why the Price of New Solar Electricity Fell an Incredible 89% in the Last Decade, Singularity Hub.

Recommended by the Authors

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