Capgemini
RESEARCH INSTITUTE

REMODELING THE FUTURE

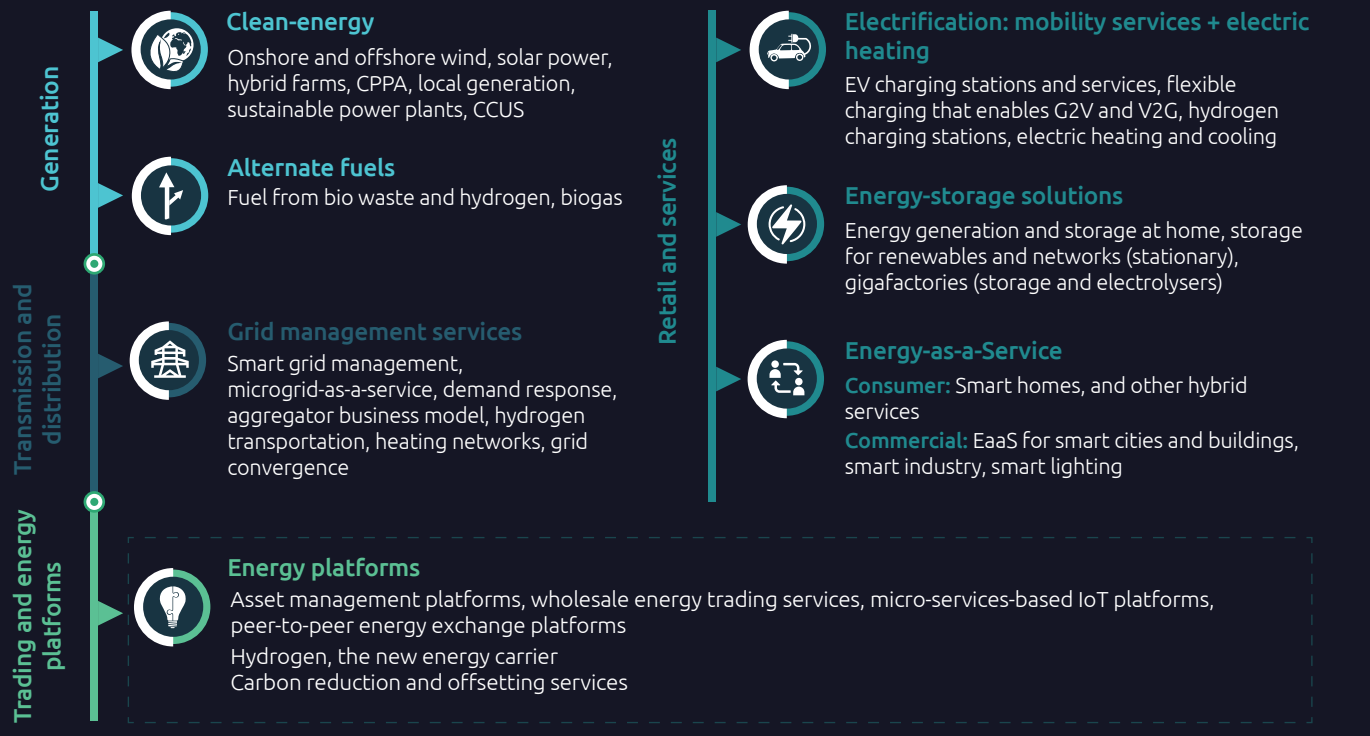
How energy transition is driving new models in energy and utilities

Executive Summary

Rapid shifts in the global business environment, led by the forces of decarbonization, decentralization, and digitization, have created a strong impetus for change in the energy and utilities sector. Against this backdrop, our research explores how the sector views its future, and its response to change. We found that energy and utility organizations are highly alive to the need to switch to new-energy models – i.e., new products, services, and ways of operating existing businesses. These include clean energy, alternate fuels, grid management services, mobility services such as electric vehicle (EV) charging stations, energy-storage solutions, and energy platforms, among others (see Figure 1).

As the share of renewables in the energy mix increases, energy storage solutions and grid management services will be critical to manage intermittency in renewable energy supply. Further, as consumers increasingly turn into prosumers, there is a growing need for renewable energy storage systems for residential and commercial use, and for energy platforms that facilitate peer-to-peer energy exchange. Energy and utility organizations recognize the need to orient themselves towards meeting the demands of a decarbonizing world. Overall, 73% of energy and utility industry executives expect new-energy models to be their mainstream business within the next five years.

Figure 1 New-energy models



Source: Capgemini Research Institute analysis.

For some organizations, this sense of urgency has begun to translate into action. French oil and gas company TotalEnergies, for instance, has announced plans to have 100GW in installed renewable power generation capacity by 2030, up from 7 GW in 2020.[1] Organizations such as Enel and Eni are working on green hydrogen projects.[2] Shell, Equinor, and TotalEnergies are jointly working on capturing and storing carbon emissions in the North Sea, as part of a project called "Northern Lights."[3] German electric utility E.ON has launched an insurance product for EV drivers, in partnership with Zurich Insurance,[4] while BP has invested USD7 million in EV charging firm IoTecha as part of its plans to set up 70,000 public EV charging stations by 2030.[5] Energy platforms are also witnessing strong interest. Spanish energy company Repsol, for instance, offers a solution that connects rooftop solar power generators (roofers) with consumers (matchers).[6]

While organizations that are implementing new-energy models report benefits including an increase in revenues and profitability, overall adoption of these models remains low. Energy and utility organizations face numerous capability gaps as they seek to scale new-energy models, including the lack of an innovation culture and fail-fast mindset, and the lack of adequate technology and data expertise.

To accelerate implementation, we recommend energy and utility organizations take a multi-pronged approach – focusing on pilots and experimentation and testing the market for multiple models as they seek to identify areas of competitive advantage. This will require fostering a culture of innovation at scale and engaging closely with external innovation ecosystems. New-energy models will also need to be supported with strong governance mechanisms including redesigned decision-making processes that use the right criteria to evaluate new businesses rather than relying on traditional metrics. In addition, energy and utility organizations will need to build a strong data and technology foundation and develop product and service-related capabilities to equip themselves for the future.

Introduction

New-energy models are transforming the energy and utilities sector. In 2017, Danish energy company Orsted, earlier known as DONG Energy, divested its upstream oil and gas business to enable its transformation into a leading, pure play renewables company.[7] The company will also phase out coal from its generation mix by 2023 and become carbon neutral by 2025.[8] It operates offshore and onshore wind farms, solar farms, energy storage facilities, and bioenergy plants and is undergoing transformation from a fossil fuel-based company to a green energy company. NextEra Energy Resources, the world's largest generator of wind and solar power, along with its affiliated companies views the shift away from internal combustion engines as a huge driver of new power demand and is planning future investments in electrification upgrades and charging stations, as well as energy management services.[9]

The urgency to transform is clearly reflected in our research findings:

- 71% of energy and utility industry executives in our survey say that energy and utility companies that do not implement new-energy models will be wiped out given the massive shift to decarbonization, digitization and decentralization.
- 73% expect new-energy models to be their mainstream business within the next five years.

Multiple factors are leading to this shift towards new-energy models. These include investor demand and organizations' desire to mitigate climate change. French energy major Total, for instance, rebranded itself as TotalEnergies in early 2021 to reflect its transformation into a multi-energy group and aims to develop 100 GW of renewable power generation capacity by 2030.[10] In addition, for the period 2022–2025, TotalEnergies will invest more than 20% of its net investments in renewables and electricity.[11]

To understand where the energy and utilities sector stands in terms of new-energy models, we surveyed 530 organizations. In addition, we conducted one-on-one interviews with a range of senior executives from this sector. More details on the research methodology are available at the end of the report.

Drawing on that extensive research, our report focuses on:

- The clear sense of urgency regarding the need to adopt new-energy models
- The benefits experienced by organizations that have deployed them
- The challenges holding back adoption
- Measures to accelerate adoption.

An urgent need to embrace the new

The energy and utilities sector is on the cusp of transition, with multiple changes due to decarbonization, massive electrification, and an increase in energy efficiency. Multiple new-energy models are being implemented by organizations around the world. These new models include alternate energy sources, such as green hydrogen and biofuels, and platforms that enable peer-to-peer energy exchange. In August 2021, Repsol, a Spanish multinational energy company, completed the manufacture of the first batch of bio-aviation fuel (known as "biojet") produced from waste. The batch comprised 5,300 tons of fuel and cut emissions of CO2 by 300 tons. One of the key objectives in Repsol's Strategic Plan 2020–25 is to produce 1.3 million tons of sustainable biofuels in 2025 and more than 2 million tons in 2030.[12]

Nicolas Breham, CEO of RTE International, a consultancy and engineering company and a subsidiary of RTE, France's transmission system operator, comments, *"The change in this sector will be massive and quick. We need to capitalize on it and still make continuous improvement. We used to be able to learn from our mistakes because the lifecycles of assets and of the organization were sufficiently long. Now, it's changing very quickly. So, how you learn and unlearn obsolete methods and adopt next-generation technologies is important."* In fact, 73% of executives expect new models to be their mainstream business in the next five years (see Figure 2). Eighty-six percent of organizations in the Nordics agree, however this figure is lower for many countries as it may take more than five years for the new models to become mainstream. But overall, organizations are more optimistic about new-energy models now. A 2018 research showed that almost four out of ten organizations believed the impact of new products and services would range from 5% to 9% of their total revenues within the next three to four years.[13]

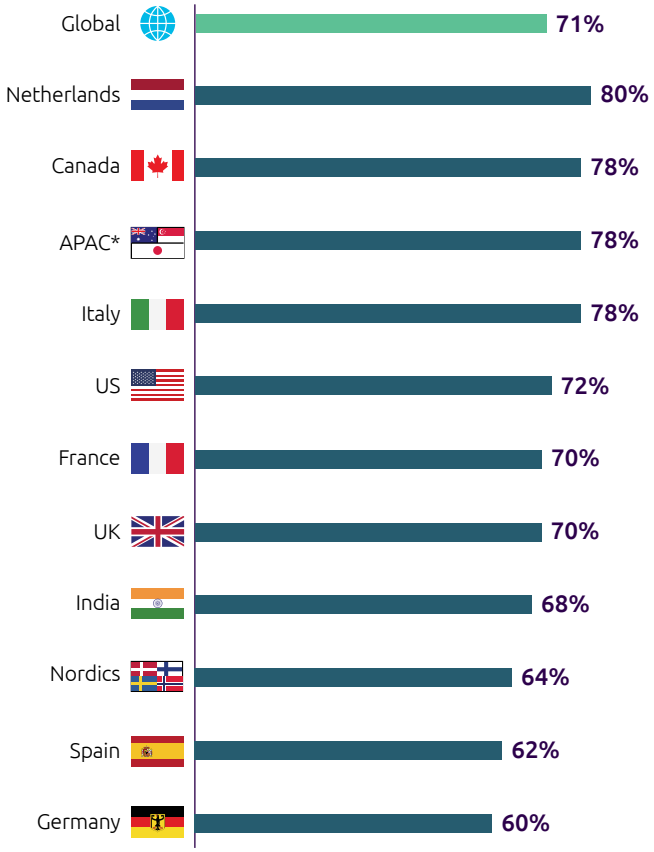
71%

Share of executives who say that energy and utility companies that do not implement new-energy models will be wiped out

Figure 2 New-energy models in the energy and utilities sector are viewed as high priority

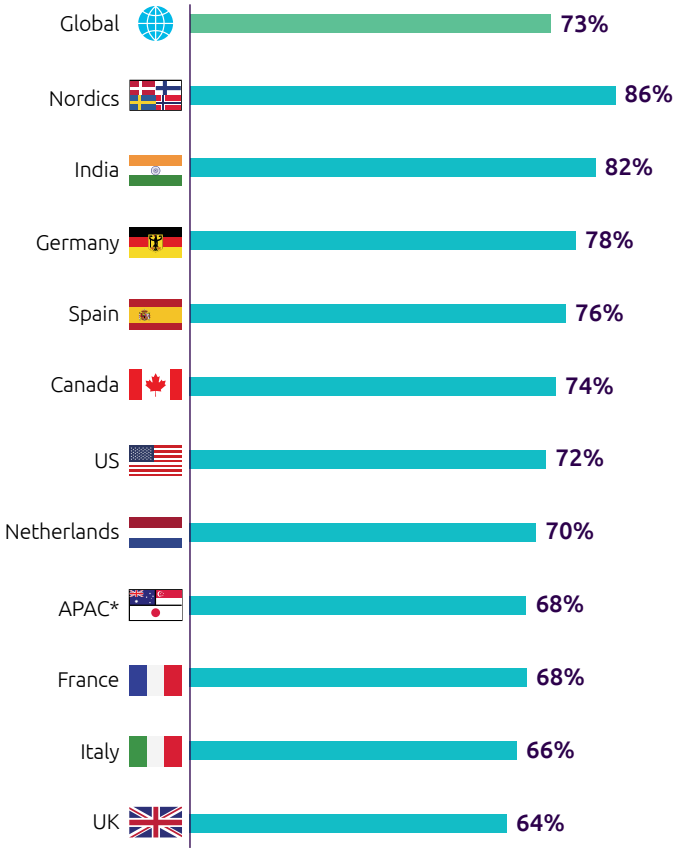
Energy and utility players that do not implement new-energy models will be wiped out

Share of organizations that agree with the above statement



New-energy models will become our mainstream business in the next five years

Share of organizations that agree with the above statement



*Australia, Singapore, and Japan.

Source: Capgemini Research Institute, New-energy Models in the Energy and Utilities Sector survey, August–September 2021, N=530 organizations from the energy and utilities sector.

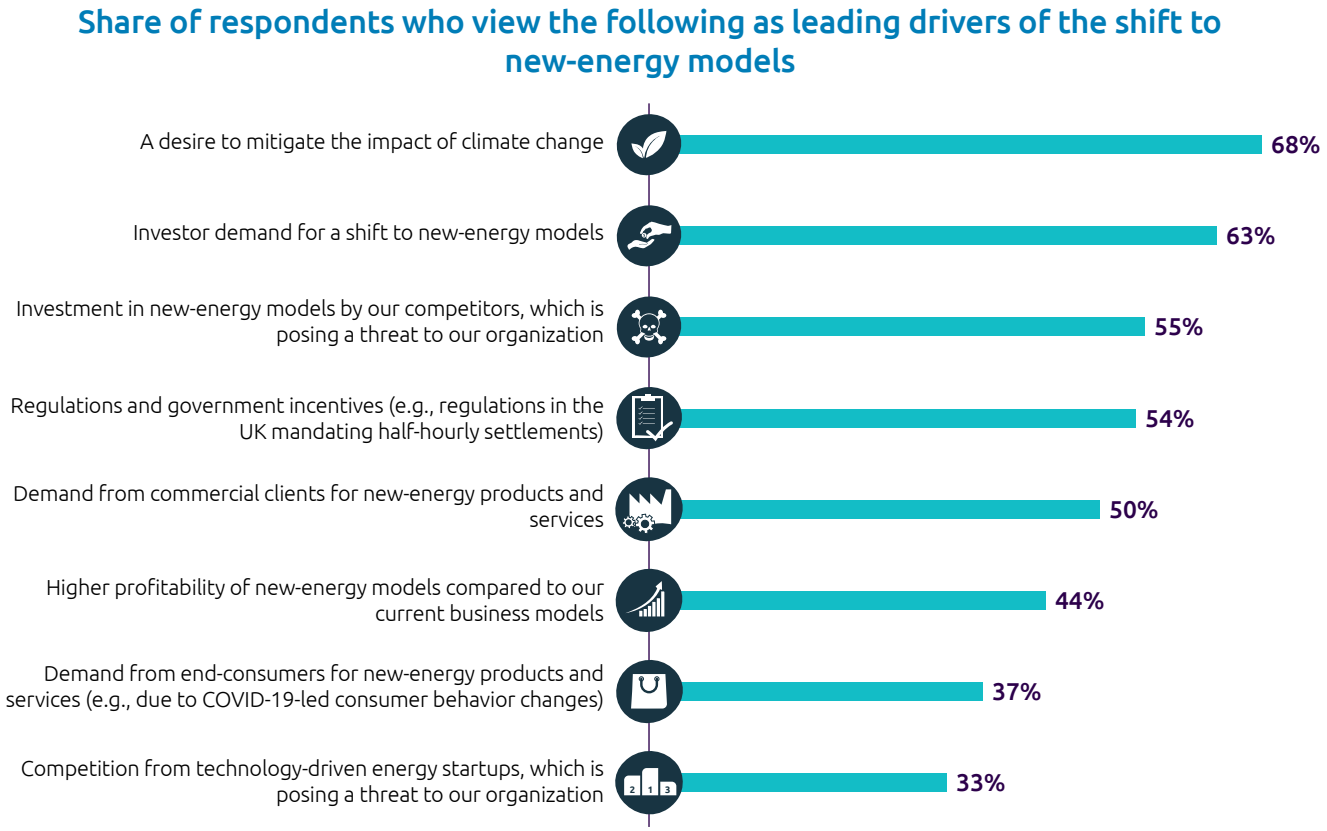
Climate change and investor demand are top drivers of change

Close to seven in ten (68%) energy and utility organizations say that mitigating the impact of climate change is driving their shift towards new-energy models, while 63% cite investor demand as a driver of change (see Figure 3).[14] Eni, for example, in its strategic plan 2021–2024: towards zero emissions, has plans to boost its transformation with commitment to full decarbonization of all its products and processes by 2050. The company has increased its energy production from renewable sources from 11.6 GWh in 2018 to 339.6 GWh in 2020 and aims to reduce net GHG emissions by 25% by 2030 and by 65% by 2040 (2018 as baseline). It has

plans to reach a renewable energy installed capacity of 60 GW by 2050 from 1 GW in 2020.[15]

BP, Eni, Equinor, Galp, Occidental, Repsol, Royal Dutch Shell, and TotalEnergies announced in 2020 that they had agreed to apply six energy-transition principles, which include public support for the goals of the Paris Agreement; industry decarbonization; energy-system collaboration; and the development of carbon sinks.[16]

Figure 3 Drivers of the shift to new-energy models in the energy sector



Source: Capgemini Research Institute, New-energy Models in the Energy and Utilities Sector survey, August–September 2021, N=530 organizations from the energy and utilities sector.

During the COP26 climate conference at Glasgow, Scotland in November 2021, Larry Fink, the CEO of Blackrock, a multinational investment management corporation, said, *"The key for our hydrocarbon companies, they need to rapidly move towards a more decarbonized business model. But at the same time, they are the number-one purveyor of energy, of gas and oil, in a society that still is totally dependent on that."* He also proposed the creation of new financial vehicles for the spin-off of oil assets with all the proceeds of sale to be committed by energy companies to green technology.[17]

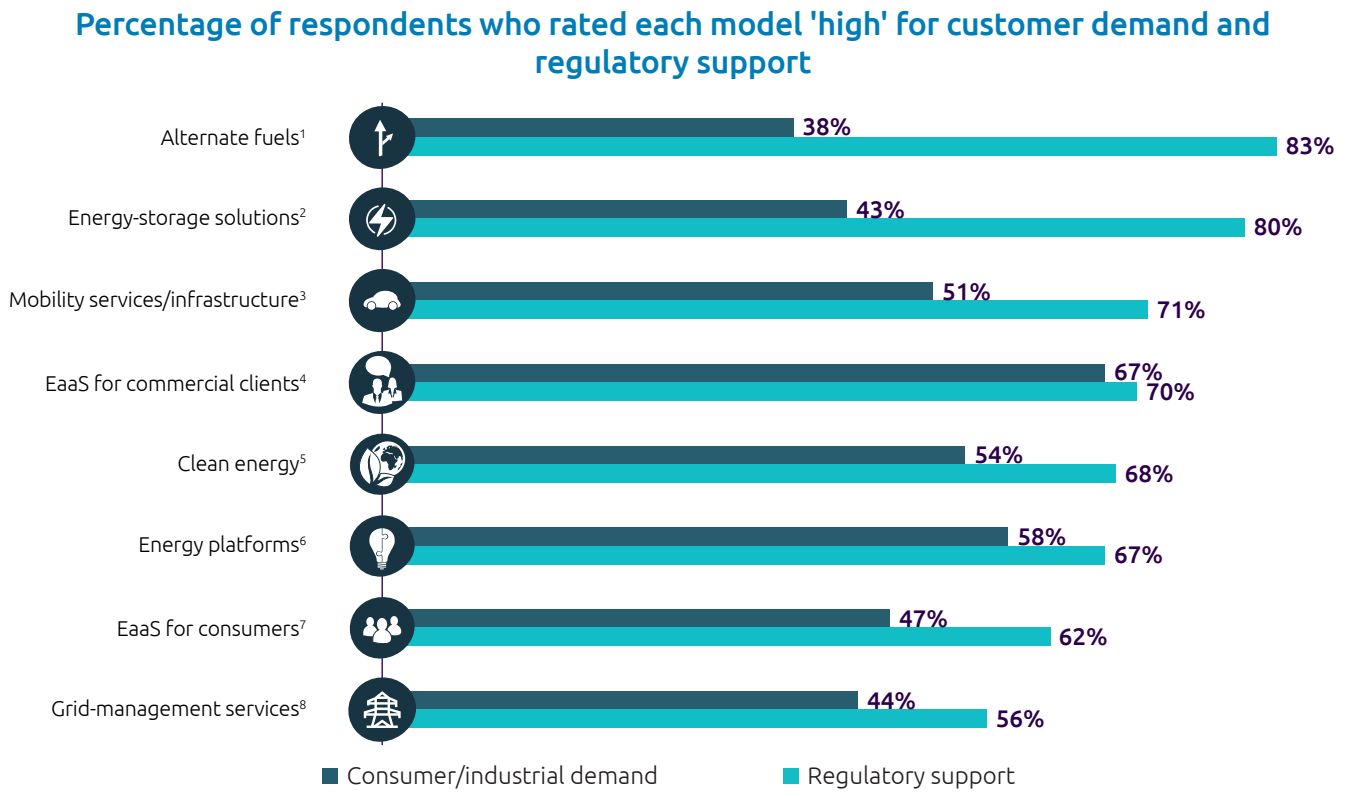
Organizations cite strong customer demand and regulatory support for most models

There is strong consumer and industrial demand for several new-energy models. Energy-as-a-Service (EaaS) for

commercial clients (67%) and energy platforms (58%), are the models for which respondents see particularly high demand. Moreover, most of the new-energy models enjoy high regulatory support according to respondents in our survey. Alternate fuels (83%) and energy-storage solutions (80%) are viewed as having the highest regulatory support among the new models.

- The Self-Generation Incentive Program (SGIP) program was founded in 2001 by the California Public Utilities Commission to incentivize energy storage projects and the reduction of greenhouse gas emissions. SGIP incentives such as rebates cover project installation costs and greatly improve the economic viability of adding battery storage.[18] In 2020, 1.46 GW of new energy storage went online in the US, representing a nearly 200% increase over 2019.[19] In addition, California regulators recently voted to require builders to include solar power and battery storage in high-rise residential projects and new commercial structures. The state became the first in the country to do so.[20] In the recent US Infrastructure Bill passed in November 2021, more than USD62 billion was allocated to the US Department of Energy (DOE) to ensure a "fairer clean energy future."[21]
- Germany plans to end coal-fired power generation by 2038.[22] The country also plans to increase the share of power generation from renewable sources to 65% by 2030 from 46% in 2020.
- The government of Norway is offering a number of incentives to promote zero-emission (electric or hydrogen) vehicles. In 2020, battery electric vehicles had a 54% market share in Norway. The government is also setting up fast-charging stations every 50km on all main roads.[23]

Figure 4 Energy and utility companies see high demand and regulatory support for new-energy models



Source: Capgemini Research Institute, New-energy Models in the Energy and Utilities Sector survey, August–September 2021, [1]N=71, [2]N=35, [3]N=41, [4]N=30, [5]N=50, [6]N=57, [7]N=34, [8]N=39 organizations from the energy and utilities sector.

> The change in this sector will be massive and quick. We need to capitalize on it and still make continuous improvement.

Nicolas Breham
CEO of RTE International

The energy and utilities sector is witnessing the emergence of multiple new-energy models

Table 1 **Organizations around the world are implementing new-energy models**

Energy model	Examples
 **Clean energy**	TotalEnergies, a French oil and gas company, is focusing on solar, onshore wind and offshore wind as part of its target to have 100 GW renewable energy power generation capacity by 2030.[24] NextEra Energy, an American energy company, operates more than 16GW of wind-power-installed capacity, with 2.3GW capacity added in 2020. It is also a leading operator of solar power farms, with around 6GW capacity in 2020.[25] IKEA is also selling solar panels and has started to sell renewable energy to households in Sweden.[26]
	Shell, an Anglo-Dutch multinational oil and gas company, along with Equinor, a Norwegian energy company and TotalEnergies, is investing in a project called "Northern Lights" in Norway, which is a CCUS project in a reservoir in the northern North Sea. Phase 1 of the project, expected to be operational in 2024, will include transportation, injection, and storage capacity of 1.5 million tons of CO2 per year.[27] Shell is also focusing on producing green hydrogen using renewable power, mainly wind and solar. The company has collaborated with or invested in many companies such as Hydro, Daimler Truck AG, ZeroAvia, RWE, and Equinor for hydrogen projects.[28]
 **Alternate Fuels**	Uniper Energy DMCC, a part of Germany based energy company Uniper SE, collaborated with Neutral Fuels, a Dubai based energy company in 2020 to provide maritime biofuel in Fujairah, UAE. Uniper's very low sulfur fuel oil (VLSFO) will blend with Neutral Fuels' biofuel to create a maritime fuel, meeting International Maritime Organization (IMO) standards.[29]
	Many multinational energy companies, such as Chevron, Eni, RWE, and TotalEnergies, are working on hydrogen projects. One of these, RWE, a German multinational energy company, is working on 30 green hydrogen projects together with partners.[30]
 **Grid-management services**	In 2019, Orsted, a Danish multinational power company, started operating its first 20 MW standalone, large-scale battery-storage project in Liverpool, UK.[31] BP and Schneider Electric are collaborating on low carbon energy solutions to help customers to decarbonize. Schneider Electric will provide technologies to help design and operate critical or energy-intensive power systems. For instance, Schneider Electric's microgrid platform can integrate on-site renewable power, reliable backup systems such as battery storage and electric vehicle infrastructure.[32]
	In November 2020, TP Renewable Microgrid (TPRMG), a 100% subsidiary of Indian electric utility company, Tata Power, commissioned its hundredth solar microgrid project in India. This 30kW microgrid project uses solar panels to harness energy from the sun and uses a battery as an energy-storage system.[33] Tata Power intends to set up 10,000 microgrids to support rural consumers.[34]

Energy model	Examples
 **Energy storage**	A large number of gigafactories are currently under construction around the world, with joint ventures between automobile companies and battery manufacturers. One of these, Ultium Cells LLC (a joint venture between GM and LG Chem), is a battery gigafactory in Ohio with 30 GWh of annual capacity and an investment of USD2.3 billion. The plant is expected to start operating in time to support GM's portfolio of next-generation battery electric vehicles (plans to roll out 20 new EVs by 2023). In early 2021, the joint venture also announced a second gigafactory, expected to be completed by late 2023 in Tennessee.[35] Automobile firms are also entering this space with Tesla and Nissan providing energy storage systems for residential use.[36]
	California leads the US in battery storage capacity, with the addition of 1.2 GW capacity in 2020, a number that is expected to double by the end of year 2021.[37] The state also leads the country in residential and non-residential deployments in MWh for 2020 with support from incentive schemes for solar-plus-storage installations.[38]
 **Mobility services**	In June 2021, BP made an investment of USD7million in electric vehicle charging firm IoTecha, which uses internet of things (IoT) technology to connect electric-vehicle (EV) charge points with the electricity grid, homes, and other buildings. This investment in IoTecha is aligned with BP's aim to provide over 70,000 public EV charging points worldwide by 2030 and the earlier acquisition of UK-based EV charging network operator Chargemaster (now renamed to BP Chargemaster) in 2018.[39]
	E.ON, a German multinational electric utility company, has launched an insurance product for EV drivers in partnership with Zurich Insurance. The product, called E.ON Drive E-Mobility Guarantee, provides EV drivers with access to assistance in case of unexpected events (e.g., towing of vehicles to the next charging station or mobile-charging of batteries on site).[40]
 **EaaS for consumers**	As one of the many examples of energy companies working on this model, Repsol is developing tools that enable consumers to improve the energy efficiency of their homes, allowing them to check their electricity consumption; monitor consumption by various appliances; and monitor generation/consumption of energy by their solar panels.[41]
	Eneco, a Dutch electric company, offers consumers energy solutions such as boiler maintenance, insulation, solar panels, and domestic battery storage and charging stations.[42]
 **EaaS for corporate clients**	In September 2021, Dutch energy company Essent launched energy-infrastructure solutions. The solution offers heating/cooling, electricity, hydrogen, energy efficiency, storage, and mobility for smart cities, industries and business parks.[43]
	As one of the multiple examples of energy companies working on this model, SSE Energy Solutions, a part of UK-based SSE Group, offers smart-building energy solutions, including building energy-management systems; business-energy intelligence (helping customers visualize trends and see wastage across multiple utilities); half-hourly data collection; and data aggregation for its corporate clients.[44]
 **Energy platforms**	Enel X offers an energy management platform targeted at business customers that helps them monitor their energy consumption in real time. The platform also enables customers to visualize energy consumption across sites, forecast consumption and costs, and provides recommendations to optimize energy use.[45]
	In 2020, Repsol launched Solmatch – a solution that connects rooftop solar power generators (roofers) with consumers (matchers) located within a distance of 500 meters.[46]
	Octopus Energy, a UK-based renewable energy group, has developed a platform called Kraken that uses advanced data and machine learning capabilities to help energy suppliers manage customer operations more efficiently as well as offer greener choices to customers more easily. Kraken has also enabled Octopus Energy to develop innovative offerings such Agile Octopus – a half-hourly time-of-use tariff.[47]

The benefits of new-energy models

Organizations that have implemented new-energy models report multiple benefits.

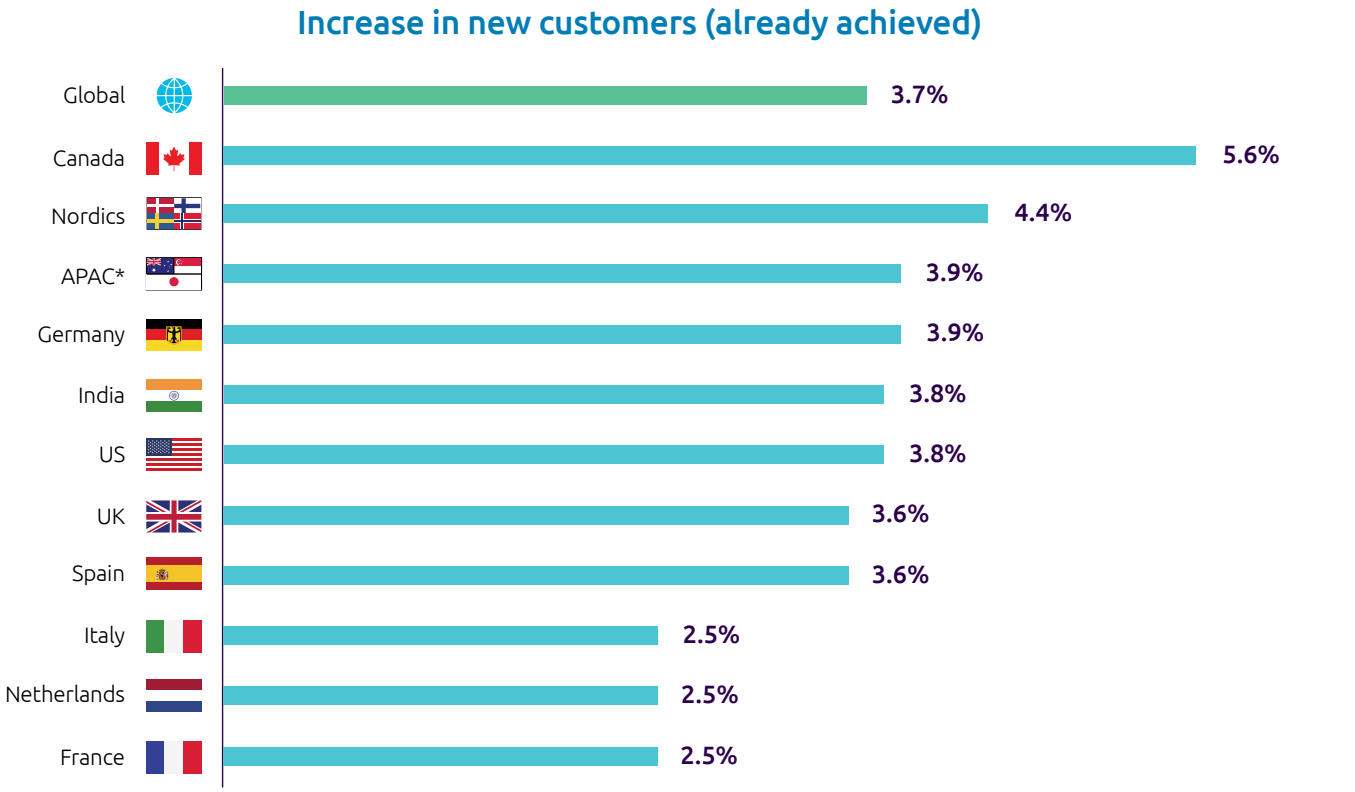
Revenue growth

Organizations have already achieved an increase of 6% in revenue due to new-energy models and expect a further 11% increase over the next three years. Organizations in Spain have seen the greatest increase in revenue, at 7.5%, and organizations in the UK anticipate their revenue to increase by 12%. Organizations also report a 5.7% increase in profits worldwide, which is expected to increase to 9.1% in the next three years due to the implementation of new-energy models. For instance, renewable power facilities generate revenues within three years leading to higher profits compared to fossil fuel plants which take nearly 10 years to construct with high variability in the fuel cost.[48] Spanish electric utility Iberdrola's renewables business boosted its net profit by over 270%, to EUR1.28bn during the first nine months of 2021. The unit closed the reporting period with revenue up 32.8% to EUR3.9bn, and growth in gross profit of 33.6%, to EUR3.55bn. Globally, the net owned installed capacity of renewable energy (including wind power, solar power, hydropower, mini hydro, solar power and batteries) grew by 10.4% to 37.4 GW.[49]

Increase in upsell opportunities and new customers

New-energy models are also leading to more upselling opportunities for organizations and are attracting new customers. Organizations have already achieved an increase of 4% in upselling opportunities due to new-energy models and expect a 9.2% increase in the next three years. New-energy models have also led to increase in new customers (Figure 5).

Figure 5 Organizations implementing new-energy models see increase in new customers



*Australia, Singapore and Japan.

Source: Capgemini Research Institute, New-energy Models in the Energy and Utilities Sector survey, August–September 2021, N=177 organizations from the energy and utilities sector.

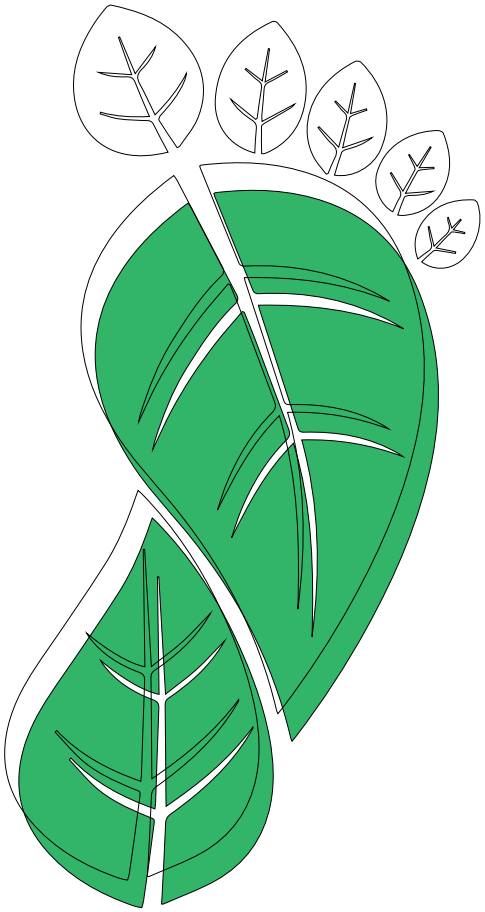
Reduction in scope-3 emissions

Organizations that are implementing clean energy models have already achieved a 4.6% reduction in scope-3 emissions and expect a further reduction of 13% in the next three years. E.ON SE, a Germany-based electric-utility company, was able to achieve a reduction of around 10% in its scope-3 emissions, with indirect CO2 emissions of 108.2m tons in 2020 compared to 120.3m tons in 2019. The company intends to reduce its scope-3 emissions by 50% by 2030 and 100% by 2050 (2019 baseline) by increasing the proportion of renewable energy (mainly onshore and offshore wind and solar) it provides to its customers.[50]

BP has also targeted a reduction of 20% by 2025 in its scope-3 emissions (from the combustion of upstream production of crude oil, natural gas and natural gas liquids). It is also targeting a reduction of 35–40% by 2030 (2019 baseline) through reduction in oil and gas production. They are also focusing on blue hydrogen and CCUS as strategically important areas apart from its investments in offshore wind.[51] In addition, BP expects to direct 40% or more of its investments to two main growth areas – low carbon electricity and energy, and customer convenience and mobility (one of the company's three key focus areas) – by 2030 and reduced oil and gas production by 40% by 2030.[52]

11%

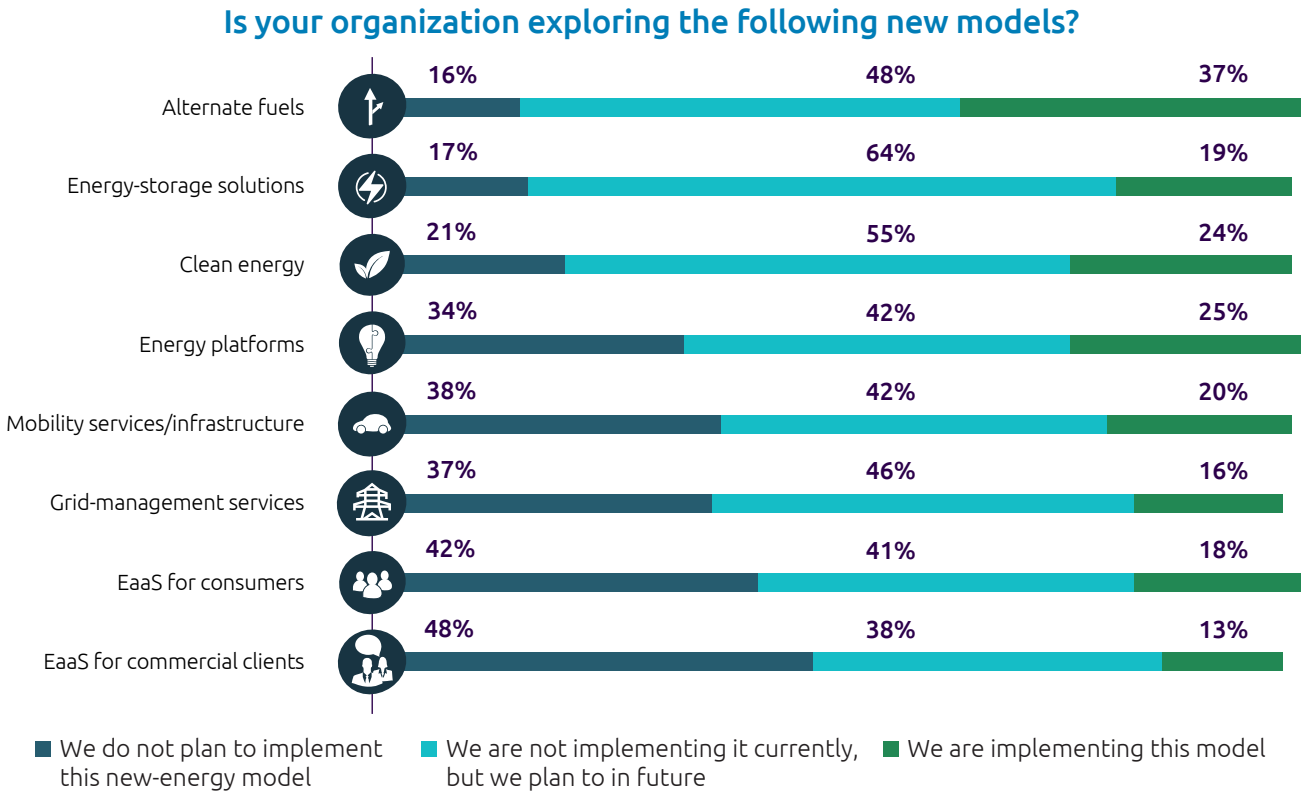
Increase in revenue due to new-energy models expected over the next three years



Multiple challenges to the adoption of new-energy models

While there is strong interest in various new-energy models, few organizations are implementing them. For instance, while 64% plan to implement energy-storage solutions in the future, only 19% are already doing so. Also, grid-management services, an essential focus area as organizations transition to renewable energy has very low implementation, at 16%.

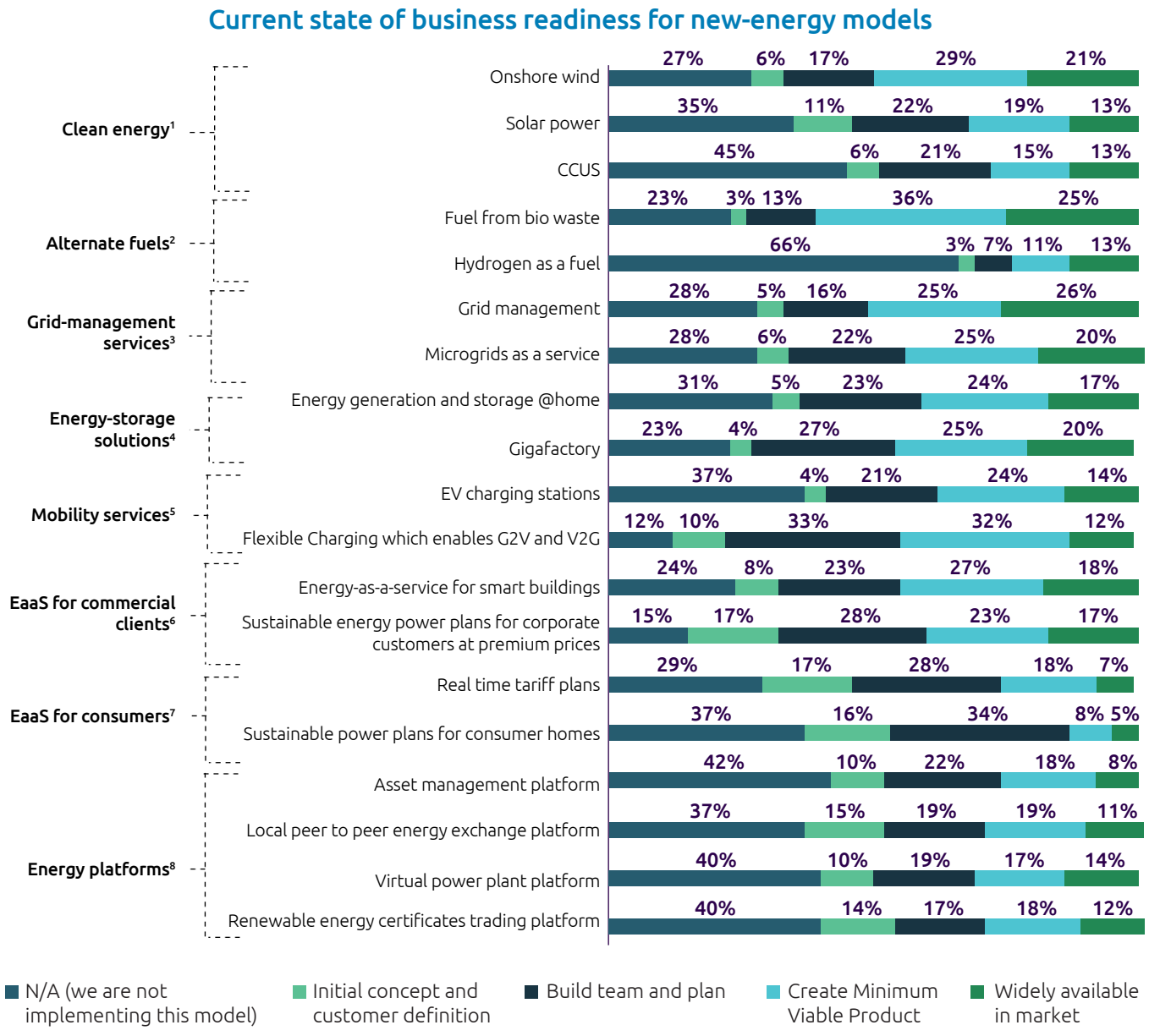
Figure 6 Most organizations are yet to implement new-energy models



Source: Capgemini Research Institute, New-energy Models in the Energy and Utilities Sector survey, August–September 2021, N=530 organizations from the energy and utilities sector.

We analyzed the adoption of use cases within the new-energy models around the world (see Figure 7) and found that most are not yet widely available on the market.

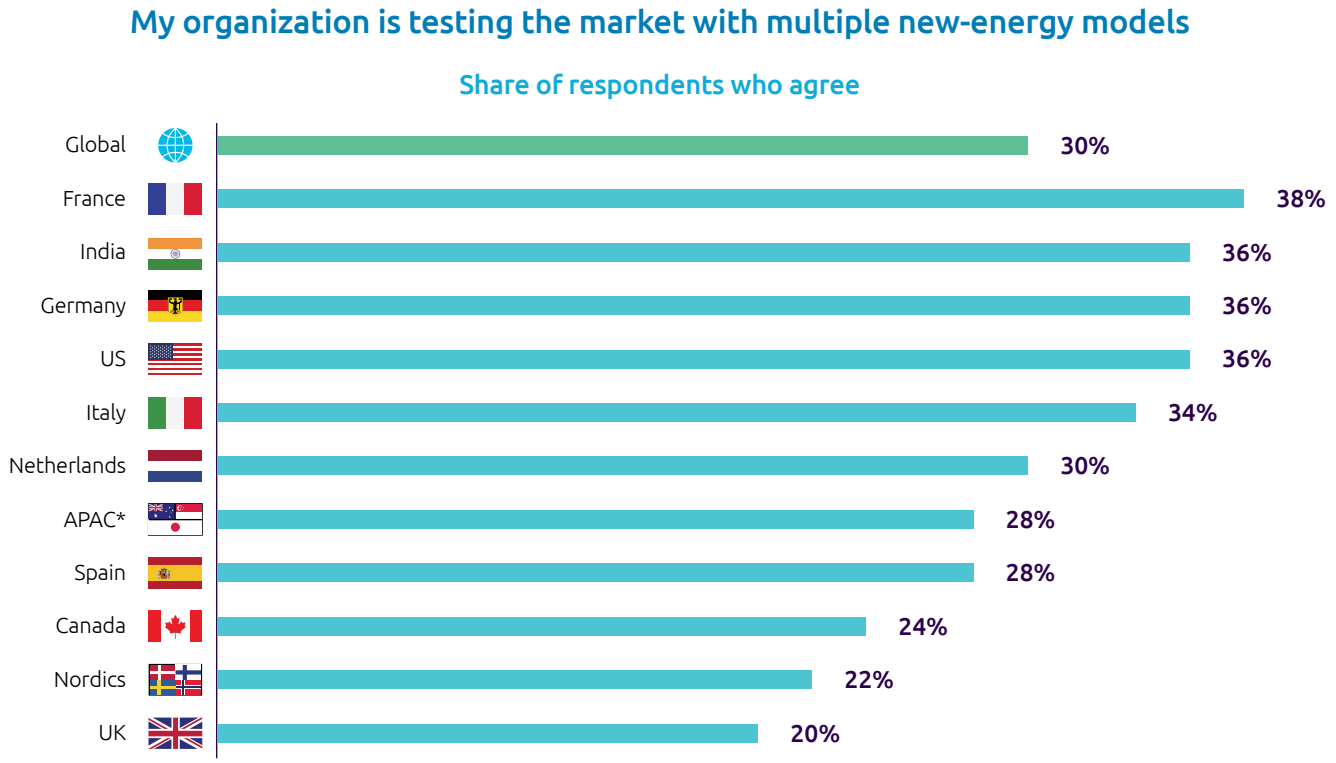
Figure 7 Business readiness level of new-energy models



Source: Capgemini Research Institute, New-energy Models in the Energy and Utilities Sector survey, August–September 2021, [1]N=126, [2]N=194, [3]N=87, [4]N=103, [5]N=105, [6]N=71, [7]N=95, [8]N=131 organizations from the energy and utilities sector.

Overall, few organizations are focusing on multiple new-energy models, with only 30% testing the market with multiple new-energy models. Organizations are also making limited bets, with 39% of organizations focused on a few new-energy models with aggressive go to market goals.

Figure 8 Less than a third (30%) of energy and utility organizations are testing the market with multiple new-energy models



*Australia, Singapore and Japan.

Source: Capgemini Research Institute, New-energy Models in the Energy and Utilities Sector survey, August–September 2021, N=530 organizations from the energy and utilities sector.

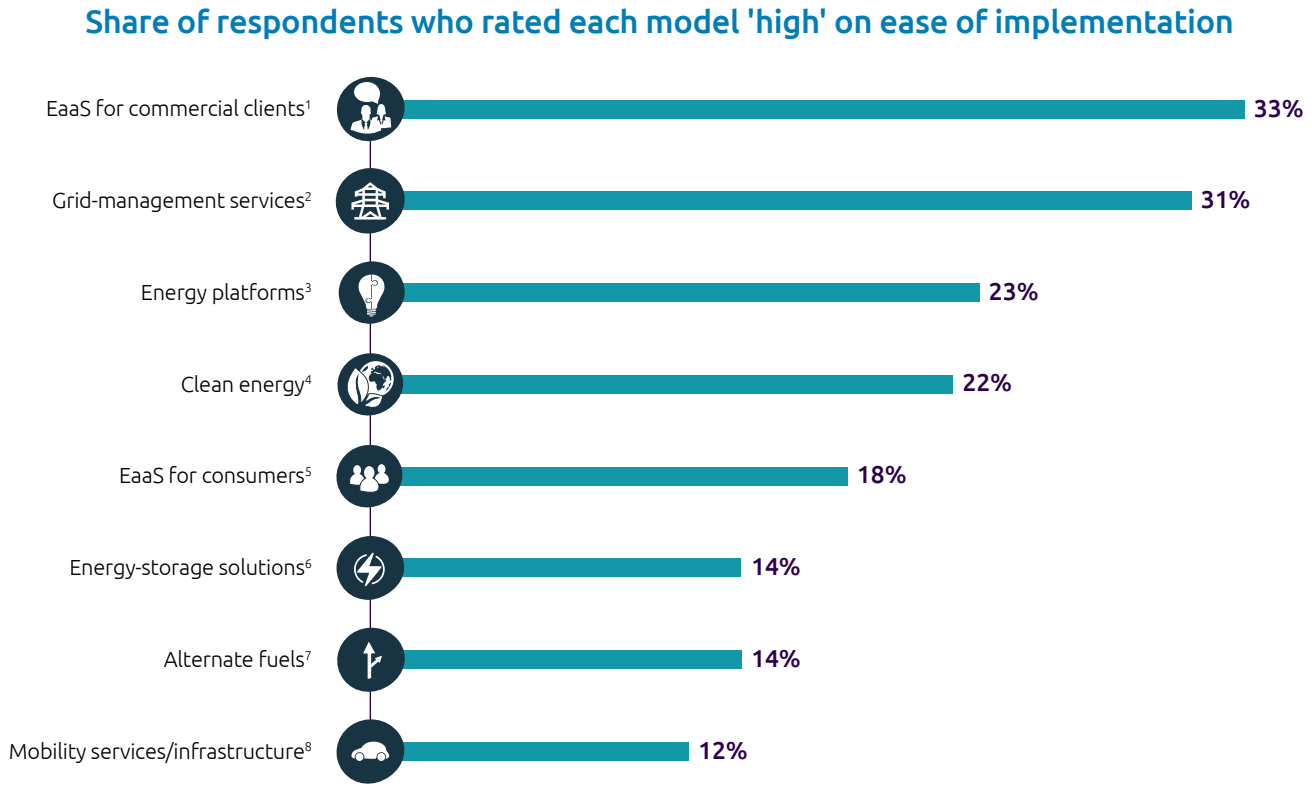
Ease of implementation is poor

Few organizations have made progress in adopting new-energy models, partly owing to difficulties in implementation. Mobility services is the most difficult model to implement, with only 12% of respondents saying they regarded it as having a high ease of implementation.

"One of the two major targets in our approach towards new business models is training of employees on digital skills."

Angel Fraile
Head of sustainability planning and stakeholder engagement

Figure 9 The ease of implementation of new-energy models is low

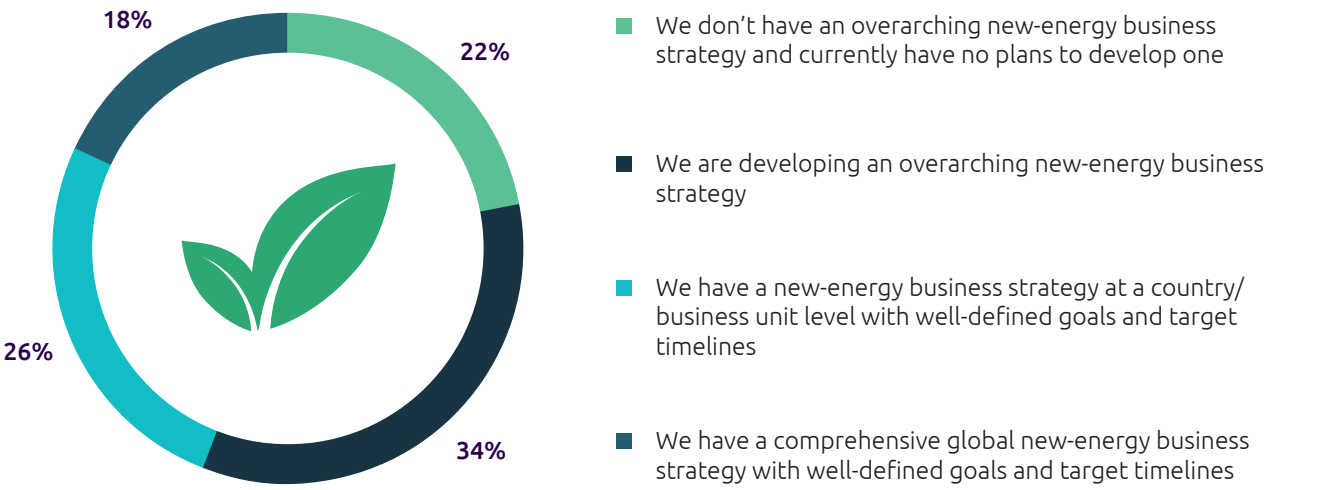


Source: Capgemini Research Institute, New-energy Models in the Energy and Utilities Sector survey, August–September 2021, [1]N=30, [2]N=39, [3]N=57, [4]N=50, [5]N=34, [6]N=35, [7]N=71, [8]N=41 organizations from the energy and utilities sector.

Most organizations lack a comprehensive strategy for the adoption of new-energy models

Only 18% of organizations have a comprehensive, global business strategy for new-energy models with well-defined goals and target timelines and another 26% have a strategy at a country or business unit level. This figure for organizations with a global strategy was higher for organizations engaged in renewable-energy generation, at 23%, and lower for organizations engaged in energy retail, at 13%. We found that 34% of organizations are still working on developing an overarching new-energy business strategy; 22% of organizations don't have an overarching new-energy business strategy and have no plans for developing one. While organizations regularly review their overall strategy, it is important to address new-energy models within their global strategy. These strategies are regularly revisited, and this is critical for organizations as, without an overall strategy for new-energy models, these initiatives can become siloed and not receive the management support necessary to scale them.

Figure 10 Most organizations are yet to create a new-energy business strategy



Source: Capgemini Research Institute, New-energy Models in the Energy and Utilities Sector survey, August–September 2021, N=530 organizations from the energy and utilities sector.

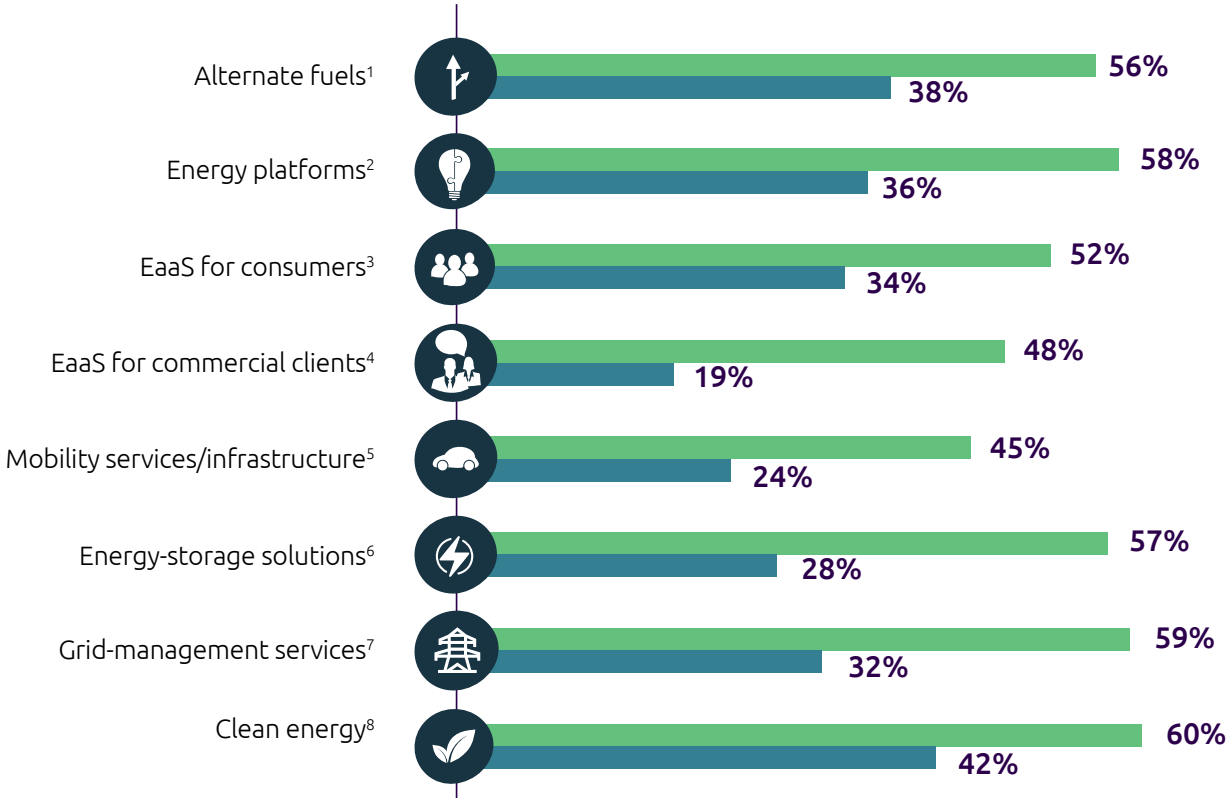
Organizations lack the capabilities and skillsets to develop new-energy models

As many as 70% of organizations say they lack the capabilities needed to develop new-energy models. The capabilities required for new-energy models such as alternate energy and energy platforms are very different from the current capabilities for energy and utility companies. Fifty-six percent of organizations agree that the capabilities needed to develop new-energy models are very different from their current capabilities. The key capabilities that they currently lack relate to technology, service-related skillsets, and data expertise. We found that:

- 68% of organizations lack in-house technology expertise and lack focus on new technologies.
- 62% of organizations do not have adequate skillsets to develop, sell, or manage services.
- 56% say they lack the data capabilities required to build new-energy models.

Organizations have high domain skills when it comes to new-energy models; however, they lack digital and IT skills for most new-energy models. For instance, 57% of organizations claim to have the required domain skills for energy-storage solutions, but only 28% have the necessary digital and IT skills. Angel Fraile, head of sustainability planning and stakeholder engagement at Spanish utilities company Endesa, says, *"One of the two major targets in our approach towards new business models is training of employees on digital skills. If we are going to digitalize our assets and our relations with customers, we need our employees to be well trained and upskilled on digital."*

Figure 11 Organizations lack digital and IT skills to develop new-energy models



Source: Capgemini Research Institute, New-energy Models in the Energy and Utilities Sector survey, August–September 2021, [1]N=446, [2]N=352, [3]N=310, [4]N=275, [5]N=327, [6]N=442, [7]N=333, [8]N=417 organizations from the energy and utilities sector.

Josh Harvey, head of strategy at Australia-based electricity distribution network operator Essential Energy, highlights the role of digital technologies in three key areas, *"We really look at digitalization in three areas. First, how do we digitalize our workforce to enhance decision making. Second, how do we use digital technology to integrate and optimize the capacity of renewables that are connected to our network. And third, how do we support our customers as they transition to a digital experience, for example via blockchain or peer to peer trading."*

Innovation and collaboration are critical

Innovation and collaboration are areas where energy and utilities organizations are struggling. Given that organizations lack the capabilities needed to develop new-energy models, collaboration is a key requirement. A total of 71% of organizations say they need to be more agile in partnering with other ecosystem players (e.g., startups, large tech

companies, and companies from other industry sectors) to develop new-energy models. The need to partner with a wide range of organizations outside the energy sector (e.g., large tech companies) to develop new-energy models is echoed by 69% of organizations. However, current levels of collaboration across the industry are very low, with just one in five organizations working with external entities such as incubators, academic institutes, municipalities, startups, and tech organizations.

The need to operate an innovation function at scale to develop and test new models and industrialize the results is critical; currently, only 33% of organizations claim to do so. Greg Jackson, founder and CEO at UK-based renewable energy startup Octopus Energy, stresses the need for energy and utility companies to develop a test-and-learn mindset, *"Large corporations are essentially a series of control mechanisms. So, what you've got is a machine that is designed to assess things carefully and then put enormous resources behind it. But what you need in the world of innovation is to not spend too long assessing and not put too many resources."*

Collaboration with customers will also be key to the success of new-energy models. Hannah McCaughey, a senior energy industry executive based in Australia, emphasizes this in the context of driving green hydrogen adoption, *"Hydrogen is less dense than methane and so its impact in relation to existing equipment needs to be factored in. It will require a lot of work on existing pipelines but equally, it's important to work with customers to understand how hydrogen impacts their industrial equipment."*

Customer centricity is lacking in the energy and utilities sector

Only 28% of organizations say they can to provide a convenient, seamless, omnichannel, customer experience similar to those offered by technology companies such as Amazon, Apple, and Tesla. Many new-energy models require seamless customer experience as the customer touchpoints are not limited to customers' homes but also extend to EVs, solar roofs, and energy trading. We found that only 30% of organizations say the customer offerings from their new-energy models are personalized to individual customer requirements. This limits the scaling of new models that require customization. For instance, just 29% of organizations say the customer offerings from their new-energy models can be scaled and bundled based on individual customer requirements. Half-hourly settlements for electricity to support personalized services is one such offering. Given the difference in energy costs from renewable and non-renewable sources, half-hourly settlements provide a more transparent billing structure for customers. Only 17% of organizations can provide such services currently. Erwin Leeuwis, director of strategy at Eneco, an energy firm in the Netherlands, says, *"I think, as an industry, we are good at building big, complicated technical stuff. We're not good at finding a proposition that fits customer needs and continuously improving the proposition based on customer feedback."*

> Large corporations are essentially a series of control mechanisms. So, what you've got is a machine that is designed to assess things carefully and then put enormous resources behind it. But what you need in the world of innovation is to not spend too long assessing and not put too many resources."

Greg Jackson
Founder and CEO, Octopus Energy

A fragile status quo: challenging industry complacency

Most energy and utilities firms recognize the need to adopt new-energy models. However, they don't seem to be concerned about competition from innovative game changers, perhaps because the energy market in many countries is highly regulated and many firms are active only in their local market.

Most organizations still feel the status quo will persist, and newer innovative organizations will fail to dislodge them to become market leaders. Only 32% of organizations say they are under threat of losing out to innovative digital disruptors in the energy and utilities sector. In addition, only 12% believe that players from outside of the energy and utilities industry will become threats to incumbents (see Figure 12).

The sector is highly regulated; however, many of the new-energy models, such as electric charging and consumer-energy trading, may lead to deregulation. Recent initiatives from global players indicate that they are already experimenting with new-energy models with ambitions to expand the initiatives globally.

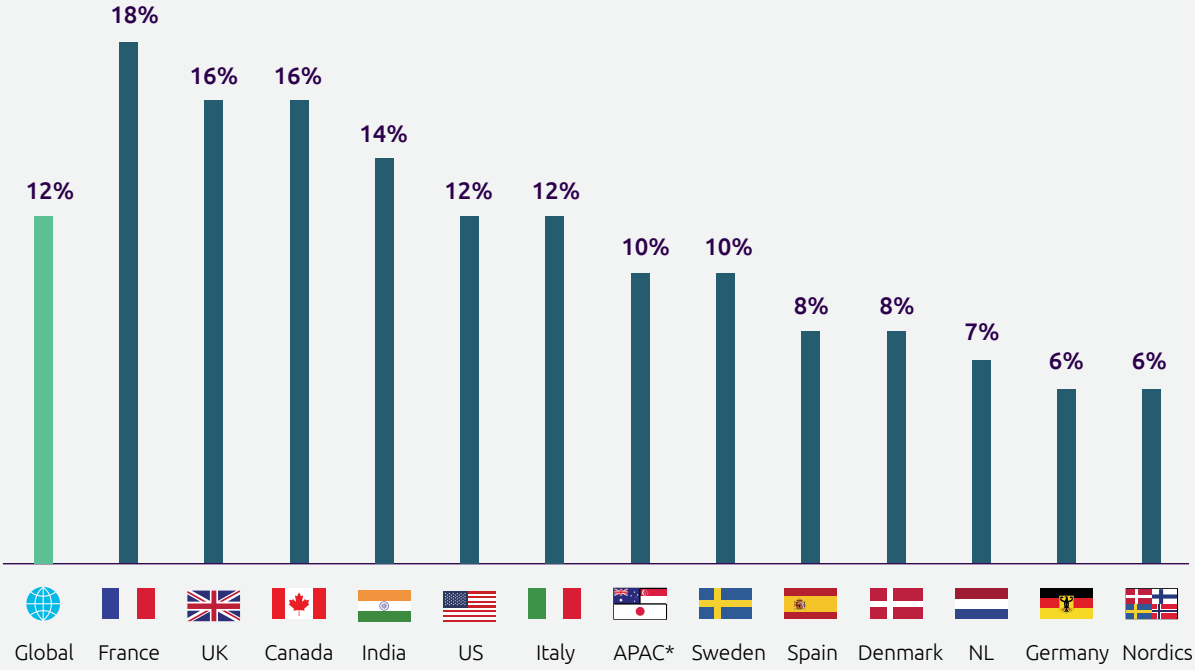
- In 2010, Google Energy, a subsidiary of Google, got the green light from the Federal Energy Regulatory Commission (FERC) to buy and sell energy as if it were a utility company.[53] Google and Amazon are the largest corporate buyers of renewable energy in the world.[54] Data centers account for 2% of the electricity consumption in the US.[55] Google is also experimenting with energy storage. Malta Inc, the startup spun out of Google parent company Alphabet's moonshot factory, X, is working on super-long-duration energy storage.[56]
- IKEA has started to sell renewable energy to households in Sweden. IKEA's solar panel consumers will now be able to track their own production in an app and sell back surplus electricity. IKEA is planning to roll out the new renewable energy offer as well as IKEA's solar panel offering to all markets.[57]

"I think, as an industry, we are good at building big, complicated technical stuff. We're not good at finding a proposition that fits customer needs and continuously improving the proposition based on customer feedback."

Erwin Leeuwis
Director of strategy, Eneco

Figure 12 Most organizations still feel the status quo will persist

Percentage of respondents who believe that non-industry players will enter the energy and utilities industry and become a threat to incumbents



*Australia, Singapore and Japan

Source: Capgemini Research Institute, New-energy Models in the Energy and Utilities Sector survey, August–September 2021, N=530 organizations from the energy and utilities sector.

What do companies need to scale new-energy models?

While energy and utility organizations acknowledge the importance of new-energy models and close to three quarters (73%) of executives expect new models to be their organization's mainstream business in the next five years, current implementation levels of new-energy models are low as we saw earlier.

Drawing on our survey analysis and interviews, as well as our own experience in this area, we recommend the following actions to accelerate the implementation of new-energy models.

Figure 13 Actions for accelerating implementation of new-energy models

Source: Capgemini Research Institute analysis.

Align organizational strategy and take a multi-pronged approach to identify new-energy models

Develop an organization-wide strategy to align targets, resources and learnings

The shift to services emerged as a key priority in the last decade, however energy transition is the key driving force this decade. An organization-wide strategy for the development of new energy models is essential for the success of energy transition programs. Only 18% of organizations have a comprehensive global new-energy business strategy with well-defined goals and target timelines. An organization-wide vision of new-energy models will be key to aligning the entire organization for the development and adoption of these models. For instance, TotalEnergies aims to become one of the top five renewable power producers with 100 GW gross installed capacity by 2030.[58]

Eneco's Erwin Leeuwis says, *"An organization-wide strategy is important because you need to allocate resources based on the strategy. Also, by doing so, you get a much better connection between what the business unit needs and what the customer needs, because the business unit is in touch with the customers, and what you can offer. We coordinate strategy development centrally, to ensure we learn lessons across countries and business*

units and speak the same language in terms of innovation methods and terminology."

Focus on pilots and experimentation to iteratively identify areas of competitive advantage across the value chain

Organizations should take a multi-pronged approach to new-energy models – testing the market for multiple models – as not all models may succeed, and organizations may not know at the outset where their competitive advantages may lie.

Key elements of this approach include:

- Starting small, running pilots, and working closely with customers to gather feedback and enhance the models.
- Collaboration with external entities for screening and identifying potential areas for innovation. An innovation manager at an international energy firm, says, *"The screening of ideas for innovation is done by our colleagues within the innovation team but, of course, they also rely on external corporations, consultancies, research institutes within universities, and external support to make sure that we don't miss out on any relevant ideas, topics, or technologies that might pop up in the future."*

Establish governance mechanisms to support new models in hypergrowth mode

Establish organizational structures to incubate new-energy models

The pace of growth needed for new-energy models will be very high. For instance, Shell plans to have 500,000 electric vehicle charging points globally by 2025 from over 60,000 points currently.[59] In addition, new-energy models are attracting strong funding from venture capital funds with more than EUR7 billion invested in cleantech venture capital in the EU in H1 2021.[60]

Organizations must set up dedicated roles, business units, and programs to drive the implementation of new-energy models, as 70% of organizations say new-energy initiatives are dispersed and unconnected. An ad-hoc approach to the development of new-energy models leads to slow progress. Two-thirds of organizations say their decision-making processes in the development of new-energy models suffer from this failing.

Once the models are identified it is important to demarcate the models to develop internally and to collaborate with external entities. Forty-two percent of organizations say they currently have the clarity to identify energy models that can be developed in-house versus those that require external collaboration. Eneco's Erwin Leeuwis says, *"When a new-energy model is closer to our core business and current customers, and we want to cross-sell, we conduct internal innovation. However, if we really need to cross-sell to our customers, but we don't have the skills in-house, we proceed via mergers and acquisitions."*

Australia-based APA Group, for instance, has set up a new Transformation and Technology business unit to address the challenges and opportunities of the energy transition.[61] It has also established a program – called Pathfinder – to invest in low-carbon solutions.[62] Hannah McCaughey, a senior energy industry executive formerly with APA Group, explains the rationale behind setting up the program, *"The Pathfinder Program was founded with the goal of investing in new products and technologies in order to help customers decarbonize. And we saw three opportunities that we wanted to explore in the next few years – hydrogen, energy storage and batteries, and microgrids. The goal of the program was to develop and test new products and services with customers, rather than making big bets or focusing on revenues at the outset."*

"The Pathfinder Program was founded with the goal of investing in new products and technologies in order to help customers decarbonize."

Hannah McCaughey
A senior energy industry executive formerly with APA Group

Organizations where the competency for new-energy models is not available within need new business structures and teams. Jon Slade, CEO of ENSEK, a software company specializing in the energy sector says, *"Energy and utility firms are used to working in a certain way. One of the biggest challenges with any transformation program is the ability to take that organization on a journey. The most successful ventures we see are when a new company is established under the support and backing of the parent organization, essentially either as the same or a new and separate brand."* We found that among organizations that are already establishing new structures, mergers and acquisitions (86%) and acquiring startups (58%) are rated as the most beneficial strategies. Enel X and Volkswagen will establish a joint venture aimed at deploying, owning and operating more than 3,000 high power charging points in Italy which will be available to drivers of any electric vehicle. Francesco Venturini, CEO at Enel X, says, *"The energy transition requires teamwork. The EU auto industry and the energy sector have the required expertise and means to make the energy transition happen as quickly as possible, with the electrification of transportation as one of its main avenues."* [63]

Figure 14 **Mergers and acquisitions, along with joint ventures, are rated as highly beneficial for new-energy models**

Share of organizations that have deployed these strategies and found them beneficial

Source: Capgemini Research Institute, New-energy Models in the Energy and Utilities Sector survey, August–September 2021, [1]N=69, [2]N=109, [3]N=106, [4]N=125 organizations from the energy and utilities sector.

Redesign decision-making processes to evaluate new models

Organizations that use traditional metrics (focused on generating immediate returns) to evaluate emerging businesses run the risk of jeopardizing them before they have had a chance to realize their full potential. To enable new businesses to flourish, energy companies will need to ensure that they redesign decision-making processes and use the right criteria to evaluate new businesses. Jodie Hallam, general manager for energy services at Mondo, the commercial energy business arm of Australian electricity and gas transmission and distribution firm AusNet Services, highlights Mondo's approach to addressing this challenge, *"The energy sector needs to start looking at financing and evaluating new businesses differently, and not measure them the same way as mature businesses. At Mondo, we've separated business development for our mature and new businesses, because we believe it's not fair to business development teams to have immediate sales targets for products that are just emerging and are not yet ready to be commercialized. New businesses need time to mature and demonstrate their value, so they need to be measured using non-traditional metrics – such as growth in customer numbers, number of customers on a platform, number of products delivered, or pilots won – and not EBITDA or net profit. We also ensure new business teams are focused on pilots with clearly defined outcomes such as maturing technology or getting closer to understanding customer needs."*

Deploy leadership talent to further new energy models

Successful implementation and scaling of new-energy models will require strong leadership support. C-suite involvement is crucial; however, our research shows that it is currently lacking. In most cases, new-energy models fall within the remit of innovation or sustainability teams (31% of respondents say new-energy models are led by the head of innovation, while 35% say they are led by the head of sustainability). Only 7% of executives in our survey say that the CEO is responsible for driving new-energy models in their organizations. Scaling new-energy models will require a shift in internal mindsets. Energy and utility organizations will need to ensure that new models are not seen as the remit of specific teams but rather as a group-wide priority. Top leadership will need to be adequately invested in new models and organizations will need to ensure that the best leadership talent in the organization can be deployed on new models. Organizations will therefore need to create career pathways for leaders to move from mainstream business segments to new business areas. For instance, Enel Green Power, an Enel subsidiary, built a team dedicated to renewable power which was later merged back into the parent company. Engineers from the renewable power team were moved into senior executive roles within the parent company to enable rapid dispersion of innovation.[64]

Foster a culture of innovation at scale

Organizations need to look both externally and internally to foster a culture of innovation. Seventy percent of organizations agree that the future integrated energy companies will need to engage with external innovation ecosystems. Current levels of innovation within organizations are low; only 33% of organizations say they are operating an innovation function at scale to develop and test new models and industrialize the results. As our discussions with experts revealed, few energy companies make innovation a core function and few have developed a mindset of experimentation. Enel has established ten innovation hubs across the world. Through these innovation hubs Enel has launched more than 200 projects with startups and scaled more than 50 solutions globally.[65] Equinor, a global energy firm, and Techstars, a US-based startup accelerator, have jointly set up a startup mentorship program called "Equinor & Techstars Energy Accelerator," and have selected ten startups this year from applications across 44 countries. Gareth Burns, Equinor's vice president for Equinor Ventures – Equinor's corporate venture arm – says, *"We believe working together with startups that push barriers within technology and innovation is fundamental to shape the future of energy."*[66]

"A lot of that comes down to the approach and mindset of an organization, not being afraid to fail, trying new things, leveraging new technology, new data and new operating models to really test the boundaries of what's possible in the energy and utilities market."

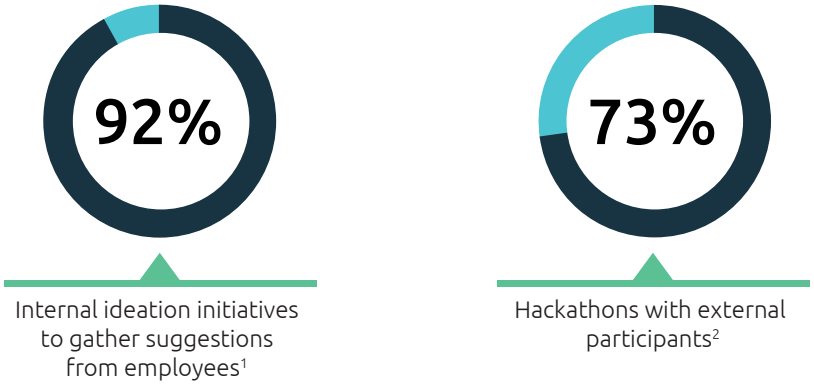
Jon Slade
CEO, ENSEK

A culture of innovation also requires organizations to encourage a fail-fast philosophy. However, 47% of organizations say they do not do so. Jon Slade, CEO, ENSEK adds, *"A lot of that comes down to the approach and mindset of an organization, not being afraid to fail, trying new things, leveraging new technology, new data and new operating models to really test the boundaries of what's possible in the energy and utilities market."*

Organizations must also ensure their workforces are involved in ideation for new-energy models. Of the organizations that have implemented internal ideation initiatives, 92% of executives say they have proven beneficial in the development of new-energy models. 'Hackathons' with external participants is another option that nearly three quarters (73%) of organizations have found beneficial.

Figure 15 **Ideation initiatives with employees are most beneficial for internal collaboration**

Share of organizations that have deployed these strategies and found them beneficial



Source: Capgemini Research Institute, New-energy Models in the Energy and Utilities Sector survey, August–September 2021, [1]N=61, [2]N=84 organizations from the energy and utilities sector.

Develop a robust data and technology foundation for new-energy models

A robust data and technology foundation is a prerequisite for the successful implementation of new-energy models. We found that only 38% of organizations have begun working with big data for smart load management and smart metering, and 17% do not work with big data at all. Also, 47% of organizations have only just begun working with AI for demand forecasting and 10% do not work with AI at all. Organizations that are able to harness data are able to gain significant benefits. French multinational utility Engie developed Darwin, a solution that collects in real time the data communicated by wind, solar, hydroelectric and biogas parks and combines it with other information, such as weather forecasts, to help operational teams improve their revenue and control their costs.[67] Vector, a New Zealand-based electricity and gas distribution company, on the other hand, has partnered with Amazon Web Services (AWS) to develop a New Energy Platform (NEP), an IoT and analytics solution.

This platform that will leverage AWS IoT Analytics, aims to deliver cleaner, affordable, and reliable energy options to consumers in Australia and New Zealand. The NEP will help Vector deliver advanced meter processing from 30-minute to five-minute intervals, by increasing the rate and capacity of data collection, in Australia by 2021.[68] Jason Clark, executive general manager at PLUS ES, the unregulated business of Australian electricity distribution business Ausgrid, highlights the key elements of building a data-centric culture: *"First of all, curiosity and sponsorship for data has to come from the top. Distribution businesses will also need to manage legacy IT systems and architecture; shift from capturing data to really starting to think about using data to solve problems and add value for customers; and start to do some simple pilots as they work towards more mature data governance. Ultimately that's likely to lead to the build out of a more accurate data strategy and architecture. In sum, being curious, starting small and focusing on solving real-world problems for customers, are to my mind some of the key ingredients for getting it right."*

Organizations should also look at technologies such as blockchain for new models. Thirty-seven percent of organizations say they work extensively with this technology. Equigy, a consortium of Austrian Power Grid, Swissgrid, a Swiss transmission grid operator, TenneT, a Netherlands based transmission system operator and Terna, a Greek renewable energy company, aims to address the imbalance between supply and demand of renewable energy sources. Equigy's platform uses blockchain to track transactions when a household or business releases electricity to the grid.[69]

The role of the energy and utilities sector will evolve with customer interactions across electric vehicles charging, energy storage, and energy trading leading to the need for integrated platforms that are accessible to end customers and partners.

Upskill talent and create product and service-related capabilities to develop new businesses

Implement training programs around innovation and technology

Sixty-nine percent of organizations say they do not have the required skillsets in-house to implement new-energy models. Greg Jackson, founder and CEO at Octopus Energy, adds, *"It is also incredibly important that they have the skills not just for business, but for 21st century business. As an example, this means understanding the difference between continuous development and a quarterly release cycle. If you don't have those kinds of skill sets on the board, you cannot make agile decisions."* One way to remedy this is to develop in-house training programs on innovation and technology. For instance, BP is working to enable a transition for its workforce through education, employment initiatives and programs with industry partners to develop early-stage talent with the skills needed for future energy systems.[70] However, reskilling is not straightforward for the energy and utilities sector; 67% state that they are unable to reskill the workforce in line with the requirements for new models. Self-paced learning through digital-learning libraries is an option worth exploring; another is to re-educate traditional IT workforces in AI and data analytics because these can be more cost-effective than bringing in external talent. Currently, most organizations hire talent from other organizations in the same geography. However, there is ample scope to train talent internally. In a few areas, such as hydrogen and CCUS, organizations are training talent internally in parallel with implementing revised hiring programs. Attracting talent is also important, as half of organizations agree that there is a high cost associated with reskilling existing talent to work on the deployment of new-energy models.

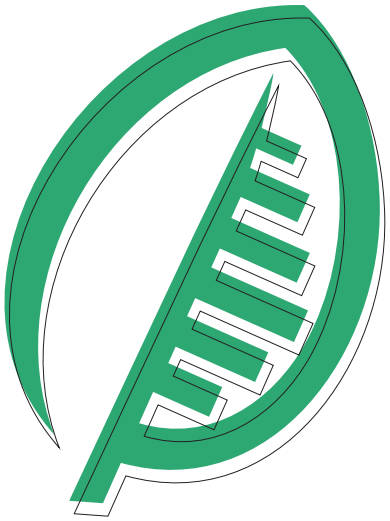
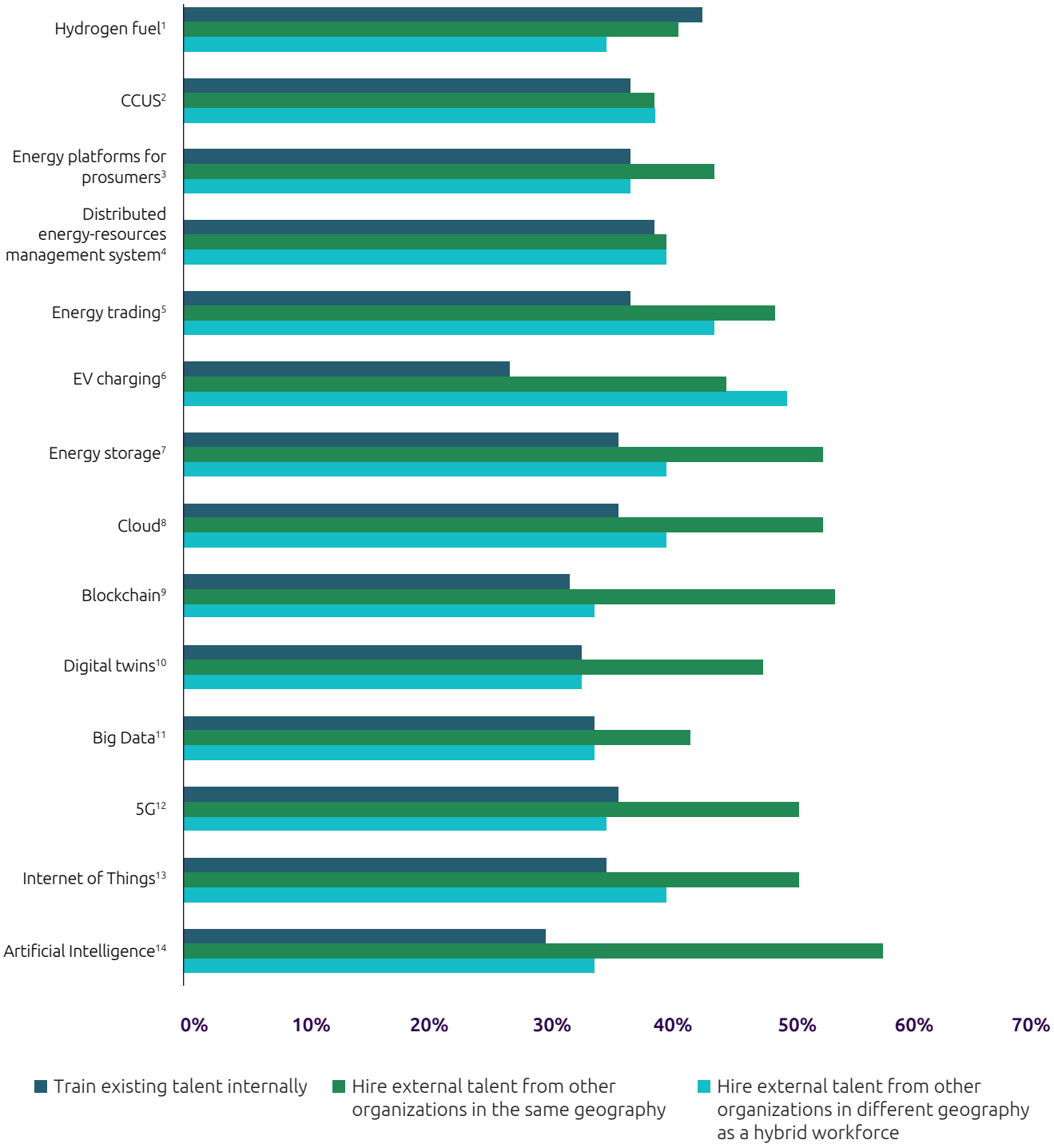


Figure 16 Organizations use a mix of internal training and external hiring for new-energy models

For the technologies your organization works with, how do you source the relevant talent?



Source: Capgemini Research Institute, New-energy Models in the Energy and Utilities Sector survey, August–September 2021, [1]N=326, [2]N=236, [3]N=87, [4]N=87, [5]N=177, [6]N=255, [7]N=223, [8]N=6, [9]N=103, [10]N=95, [11]N=91, [12]N=190, [13]N=102, [14]N=54 organizations from the energy and utilities sector.

Create product and service-related capabilities to develop new businesses

New-energy models will need capabilities that may not exist within organizations currently. For instance, 62% of organizations say they lack in-house skillsets to develop, sell, and manage services. In addition, developing energy services and solutions will require a customer-centric mindset and product capabilities that energy companies outside of the retail segment may not currently have available to them. Enel, for instance, has set up Enel X – a separate global business line that offers integrated solutions across electric mobility, smart home technologies and digitalized urban infrastructures for smart cities.[71]

> Distribution businesses have historically had a different lens in the way that they look at the market, but to be a sustainable business it is absolutely critical to become customer focused."
>
> **Jason Clark**
> **Executive general manager at PLUS ES**

Jodie Hallam, general manager for energy services at Mondo, the commercial energy business arm of Australian electricity and gas transmission and distribution firm AusNet Services, comments, *"We have established a product team and have created a product-development framework that really helps us focus on assessing customer needs and understanding how the solutions that we're building are actually solving customer problems. The team brings together product-strategy capabilities, with deep network experience, retail capabilities, and data-science capabilities."*

Organizations should also consider establishing leadership roles with accountability for driving customer centricity. Ausgrid, the largest electricity distributor on Australia's east coast, has created a dedicated chief customer officer role. Jason Clark, executive general manager at PLUS ES, the unregulated business of Australian electricity distribution business Ausgrid, comments, *"Distribution businesses have historically had a different lens in the way that they look at the market, but to be a sustainable business it is absolutely critical to become customer focused."*

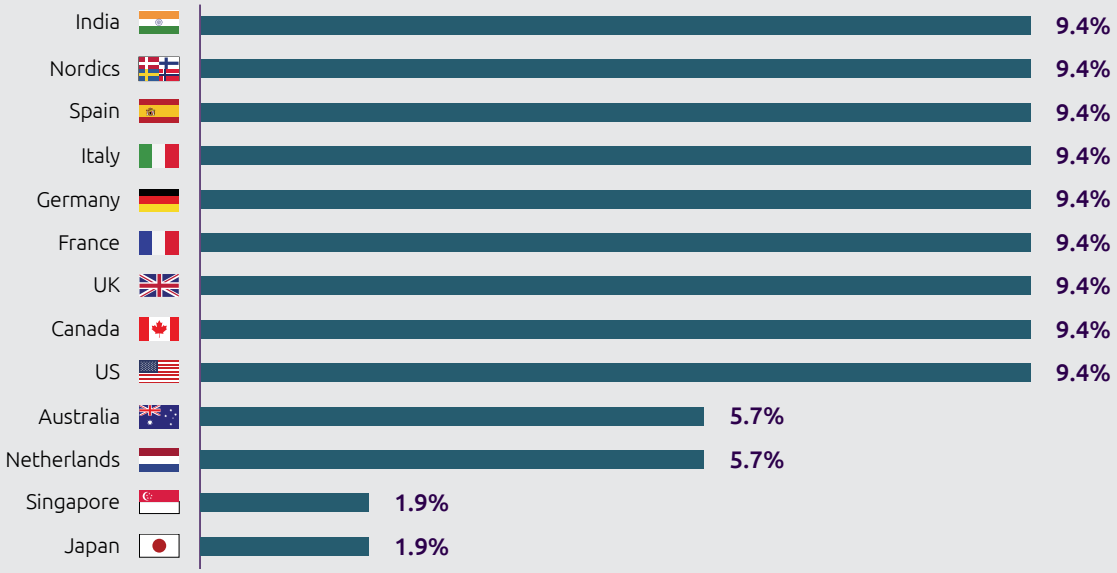
Conclusion

The energy and utilities sector is undergoing a massive change across the value chain, right from generation and distribution to energy retail and services. Most organizations believe that new-energy models will become their mainstream business in the next few years, however current adoption of new models is low. Organizations that have snatched a head start in venturing into new business areas to provide services on energy transition are clearly reaping the benefits. However, the path to developing new-energy models is not easy. Organizations will need to significantly step up their ability to innovate, developing a hitherto lacking openness to experimentation and agility in forging new partnerships, both within and outside their existing ecosystems. In addition, given that technology and data underpin most new-energy businesses today, investing in developing technology and data skill sets will be critical. Organizations will need to develop new approaches to measuring the success of new businesses in order to account for the uncertainty that is inherent in them. Finally, we need a global rather than local approach to monitoring game changers, to avoid being disrupted and to be an actor in energy transformation.

Research Methodology

For this research, we conducted an online survey of 530 senior executives from energy and utility organizations in August and September 2021. All of these organizations reported revenues of more than USD200 million for the previous financial year.

Organizations by country



Source: Capgemini Research Institute, New-energy Models in the Energy and Utilities Sector survey, August–September 2021, N=530 organizations from the energy and utilities sector.

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Source: Capgemini Research Institute, New-energy Models in the Energy and Utilities Sector survey, August–September 2021, N=530 organizations from the energy and utilities sector.

In addition to the survey, we conducted in-depth interviews with senior executives from the energy and utilities sector. In these interviews, we explored the relevant new-energy models, implementation challenges, and the outlook for the energy sector.

The study findings reflect the views of the people who responded to our online questionnaire for this research and are aimed at providing directional guidance. Please refer to the methodology for details of respondents and get in touch with a Capgemini expert to understand specific implications.

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Who are we?

Capgemini is a multicultural company of 290,000 people in nearly 50 countries*, who work with world-renowned clients to find solutions to their most demanding challenges. Capgemini Invent is the Group's digital innovation, consulting, and transformation brand. We bring to life what's next for their clients by combining strategy, technology, data science and creative design expertise – with unrivaled sectorial expertise. We enable our clients to design and build tomorrow's businesses.

We are privilege to work with a large proportion of the world's leading energy and utilities players on some of their most complex business model challenges as they face into a rapidly changing world. Our Energy and Utilities clients range from energy generators, network operators, retailers, oil and gas providers, water companies and emerging renewables players.

For more information about Capgemini Invent Energy & Utilities, please visit our Capgemini Energy and Utilities website or follow us on LinkedIn

What we do?

As Capgemini Invent, we have three core fields of play that allow us to focus in and help organizations' to evolve and transform their Business Models.

Customer First focused on helping organizations' become customer centric enterprises and drive sustainable growth by building and orchestrating experiences at scale while harnessing the power of data and technology.

Intelligent Industry focused on the future of industry by bringing together the physical and digital worlds, helping companies to invent intelligent products, operations, and services at scale.

Enterprise Transformation, in order to be able to scale or transform into new business models, clients need a digital organisation set up for success by combining the right people, organizations, processes and assets.

Who do we do work with?

We partner with almost all of the world's largest Energy & Utilities to deliver new Innovation, Smart Products and New Business Models. We also partner and work alongside Energy and Utilities innovation communities such as EIT InnoEnergy, Techstars and Greentown Labs to bring to life what is next for our clients and help them scale these new innovative ideas.

We have provided a few select examples of the work we do with our clients;

Future of Energy – We are modelling and exploring the impacts of renewables and new technologies on our Energy Business Models today – Think the role out of EVs, the future and viability of Hydrogen as a replacement to traditional gas, the future of petrol stations and many more fascinating industry and society changing topics.

Bringing Green Energy concepts to life – We are helping our clients to set and execute their net zero ambitions by for example helping clients generate clean energy from organic waste through evolving their business model into a circular business model, helping them defining their transformation journeys towards carbon neutrality or researching and defining the role the end consumer has in making Net Zero a reality.

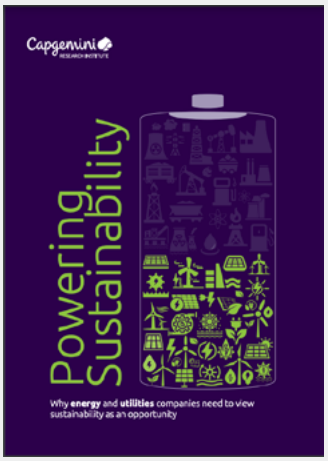
Increasing market competition, visibility and transparency - We are working on a number of market platform projects that will allow the industry to connect more holistically, gaining access to real-time data to enable better decision making and reducing barriers of trade thus increasing competition and bringing more innovation into the Energy industry as well as reducing end consumer bills.

Making it happen – One of Capgemini's core strengths is, we will make the change happen. We will "roll up our sleeves" and make the new Business Model a reality with our client whether that be setting up a new nonregulated part of the business to test out new commercial models or merging or separating two companies due to regulatory changes or commercial ambitions.

Want to know more about what we can do for you? Please get in touch with any of our geography leads

Also, please have a look at our dedicated Path to Net Zero assets – available here - *https://www.capgemini.com/gb-en/service/invent/path-to-net-zero/*

Discover more about our research:



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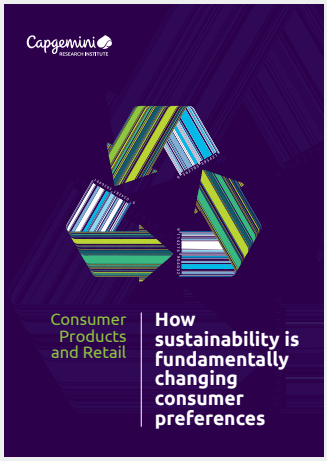

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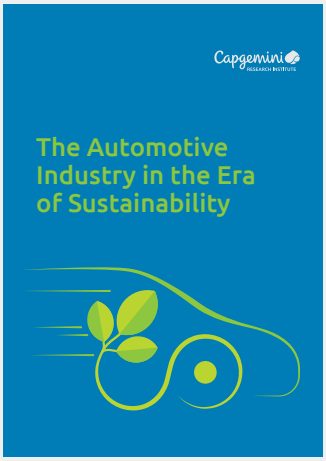

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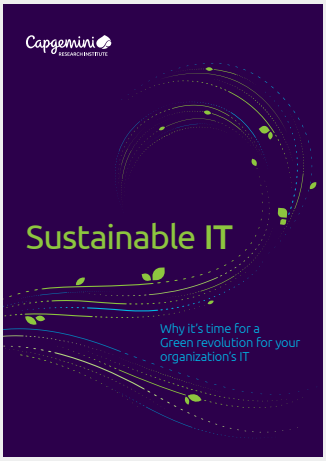

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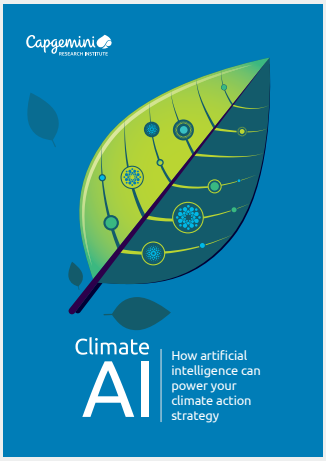

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