

# Energizing a sustainable future

Strategies, solutions and technologies for utilities



# Abstract

The ambitious global net-zero-emission targets and the evolving market dynamics present a phenomenal opportunity for the utilities sector. With widespread consolidations happening in the industry, traditional utility companies are divesting, acquiring and partnering with a lot of related and complementary service providers. They are creating large ecosystems and encompassing players from across the supply chain and beyond. Utility providers are exploring newer revenue streams and corresponding business models to create a sustainable future for themselves and the world at large. In the net-zero economy envisioned by 2050, the combined market for renewable resources, including wind turbines, solar panels and lithium-ion batteries, is estimated to be nearly \$27 trillion<sup>1</sup>.

However, as the second largest contributor to global greenhouse gas emissions, the utilities sector is well aware of the problems and challenges it is facing. Regulatory agencies world over are pushing towards creating a new global energy economy, which is electrified, more efficient and cleaner. The utilities sector is also undergoing a massive transformation with the rapid increase in the number of renewable energy players. Moreover, industrial and residential consumers are becoming prosumers, causing power and utilities companies to re-evaluate their business models. In this context, this paper discusses strategies, solutions, business models, and technologies that utilities can leverage to achieve their clean-energy goals.

## Embracing policy regulations

Recognizing the urgency of reducing greenhouse gas emissions, energy regulators across countries are introducing and re-assessing their guidelines and mandates. Even with stricter regulations, net-zero-emission targets seem to be practically achievable only by 2070, as outlined by the International Energy Agency's (IEA) sustainable development scenario<sup>2</sup> (Figure 1). Focused reductions in CO<sub>2</sub> emissions through various initiatives, such as avoiding demand, embracing hydrogen as fuel and electrification, are required to achieve the clean energy goals by 2070. To achieve net-zero emissions by 2050, the utility sector requires massive investments and deep structural changes along with accelerated innovation.

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<sup>1</sup> International Energy Agency; *World Energy Outlook 2021*; published October 2021; <https://www.iea.org/reports/world-energy-outlook-2021/a-new-energy-economy-is-emerging>; accessed October 28, 2021

<sup>2</sup> International Energy Agency; *Energy Technology Perspectives 2020*; published September 2020; <https://www.iea.org/reports/energy-technology-perspectives-2020?mode=overview>; accessed October 28, 2021

Achieving net-zero emissions requires a radical transformation in the way we supply, transform and use energy. This includes incorporating aspects of behavioral change along with profound transformation in energy system technology and infrastructure

*IEA's Sustainable Development Scenario*

### CO2 emissions reductions in the energy sector in the sustainable development scenario relative to the stated policies scenario

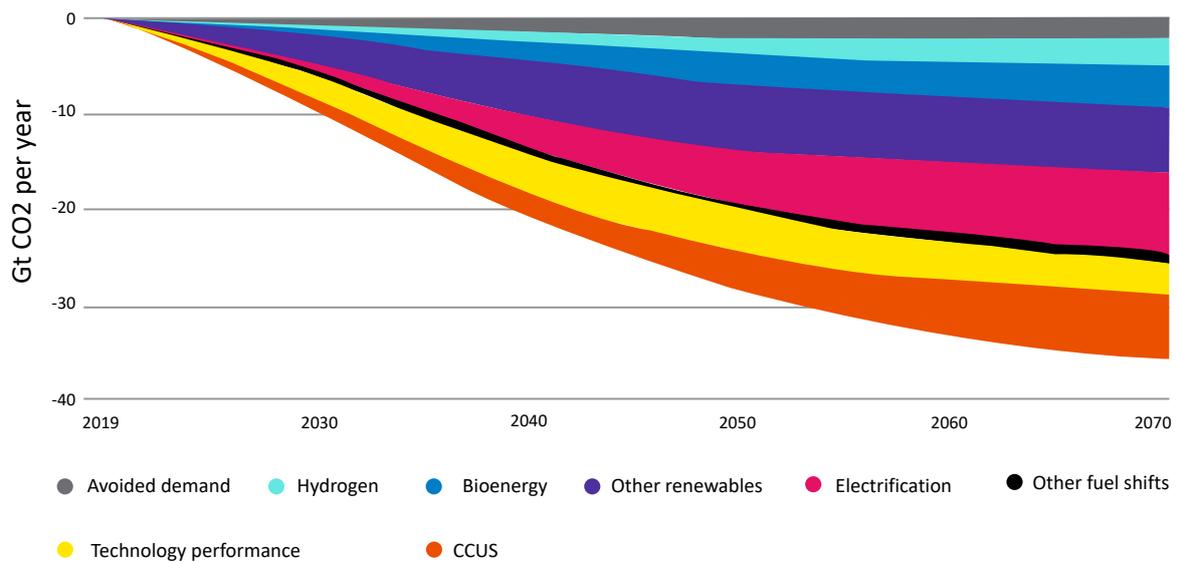


Figure 1: Cumulative Emissions Reductions between 2020 and 2070

In this context, utility companies are facing tight regulations across geographies, with varying levels of regional, national and international jurisdictions. Some of the recent local mandates include:

**The United Kingdom:** The UK government has committed a total of £3.9 billion<sup>3</sup> (more than \$5 billion) to decarbonize residential buildings by replacing gas boilers with low-carbon heaters by 2035.

**Poland/EU:** The European Union member aims to limit the amount of carbon dioxide emitted per unit of electricity to 550g<sup>4</sup>, adapting to EU regulations. Capacity auctions are expected to start in July 2025.

**The United States of America:** USA has announced that starting January 1, 2023, all newly manufactured central air conditioners and air conditioning heat pumps must have a seasonal energy efficiency ratio 2 and a heating seasonal performance factor 2<sup>5</sup>.

As part of the UN Glasgow Climate Change Conference 2021 (COP26), more than 40 countries have pledged to phase out coal and consciously move towards renewable energy sources. Several major governments and banks have committed to stop domestic and international new, direct public financing for fossil fuel development by the end of 2022.

## Pursuing new opportunities

Regulatory compliance aside, the utility sector has clear commercial motivations to pursue clean energy goals. The number of global organizations with publicly announced net-zero goals increased by over 200% between 2019 and 2020<sup>6</sup>. Firstly, carbon markets and offsets present a lucrative opportunity for utility providers. The South Asian market alone may offer \$10 billion in economic activity annually by 2030 to offset carbon emissions<sup>7</sup>. However, the more sustainable opportunity is to harness renewable energy sources, also because these are more affordable than generating energy from conventional sources. Taking government subsidies into account, the costs of renewable energy technologies continue to decline globally, in line with decreasing capital costs, increasing competition and sustained improvements in scale. For example, in USA, the cost of generating wind and solar energy (onshore wind and utility-scale solar) averages at \$27 per MWh and \$25 per MWh respectively, as against \$42 per MWh for coal<sup>8</sup>. The renewable energy opportunity is too big for utility providers to pass up, in terms of cost savings alone.

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<sup>[3]</sup> *The Guardian*; £5,000 grants unveiled to support home heat pump installation; published October 18, 2021; <https://www.theguardian.com/environment/2021/oct/18/5000-grants-unveiled-to-support-home-heat-pump-installation>; accessed October 28, 2021

<sup>[4]</sup> *The Energy Regulatory Office*; Announcement; published September 4, 2021; <https://www.ure.gov.pl/pl/urzad/informacje-ogolne/aktualnosci/9004,Prezes-URE-zatwierdzil-zmiany-w-Regulaminie-Rynku-Mocy-Rozpoczyna-sie-certyfikac.html>; accessed October 28, 2021

<sup>[5]</sup> *International Energy Agency*; Policy Database; <https://www.iea.org/policies/11456-updated-meps-central-air-conditioners-and-heat-pumps?topic=Energy%20Efficiency&type=Regulation>; accessed October 28, 2021

<sup>[6]</sup> *Bain & Company*; South Asia's Carbon Markets; published August 4, 2021; <https://www.bain.com/insights/southeast-asias-carbon-markets-a-critical-piece-of-the-climate-puzzle/>; accessed November 10, 2021

<sup>[7]</sup> *Bain & Company*; South Asia's Carbon Markets; published August 4, 2021; <https://www.bain.com/insights/southeast-asias-carbon-markets-a-critical-piece-of-the-climate-puzzle/>; accessed November 10, 2021

<sup>[8]</sup> *Lazard.com*; Levelized Cost of Energy; published October 28, 2021; <https://www.lazard.com/perspective/levelized-cost-of-energy-levelized-cost-of-storage-and-levelized-cost-of-hydrogen/>; accessed November 10, 2021

# The rapidly evolving renewable space

Given the rapidly growing opportunities in the renewable sector, the utility industry is challenged by stiff competition from emerging players. Despite the overall dip in power demand in 2020 owing to lockdowns during the COVID-19 pandemic, wind and solar energy continued their remarkable growth in recent times. Global capacity increased by 238 GW, which is 50% more than any previous expansion<sup>9</sup>. The utility sector is expected to see accelerated convergence with the renewable energy industry in 2021, given the potential for increasing demand for clean energy. Beyond the conventional energy players, organizations from unrelated industries are also becoming renewable energy producers to meet their individual emissions reduction goals. For example, Apple has committed to generate nearly 8 GW<sup>10</sup> of clean energy to make its entire business and manufacturing supply chain, involving over 110 global suppliers, carbon-neutral by 2030. It has announced \$4.6 billion spend in green bonds to support environmental projects around the world. Meanwhile, Facebook (recently changed name to Meta) has committed \$8 billion<sup>11</sup> for sustaining its transition to 100% renewable energy across the social media major's global operations. The company boasts of one of the largest renewable energy projects with the addition of 63 new wind and solar power plants to its portfolio.

On the other hand, utility companies are increasing participation in the electricity value chain by collaborating more with related industry players. They are also diversifying existing play in the renewable energy sector by reviewing the supply chain and setting up onshore and offshore facilities for generation. This helps utility companies accelerate disaster recovery.

However, the road to achieving renewable energy targets is laden with challenges for utility companies. Some key roadblocks, include building more flexible and adaptive transmission and distribution grids to accommodate the fluctuating nature of renewable energy sources, and encouraging consumers to adopt clean energy. Forecasting and optimizing generation capacity of renewable energy infrastructure, enhancing capacity in the grid, and integrating traditional and renewable energy in the grid are also critical concerns for utility players.

As of early December 2020, the share of renewables had exceeded that of coal in generation for 153 days compared with 39 days in 2019<sup>12</sup>.

*Deloitte 2021 Renewable Energy Industry Outlook*

<sup>[9]</sup> BP; *Statistical Review of World Energy 2021*; published July 2021; <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf>; accessed October 29, 2021

<sup>[10]</sup> Apple Inc; *Apple powers ahead in new renewable energy solutions with over 110 suppliers*; published March 31, 2021; <https://www.apple.com/in/newsroom/2021/03/apple-powers-ahead-in-new-renewable-energy-solutions-with-over-110-suppliers/>; accessed November 11, 2021

<sup>[11]</sup> Tech@Facebook; *Achieving our goal: 100% renewable energy for our global operations*; published April 15, 2021; <https://tech.fb.com/renewable-energy/>; accessed November 11, 2021

<sup>[12]</sup> Deloitte; *2021 Renewable Energy Industry Outlook*; <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/energy-resources/us-eri-renewable-energy-outlook-2021.pdf>; accessed October 29, 2021

# Overcoming challenges with new technologies and prosumer-driven business models

Inclusion of prosumers in the energy value ecosystem is a significant opportunity, where utilities are deploying their technology capabilities to overcome challenges posed by evolving market dynamics. They are also creating newer business models to accommodate prosumers and grow the utility ecosystem. For example, leading Australian energy provider AGL is subsidizing solar batteries and bundles for up to AUD 1,000 (about \$700) across residential communities, to encourage consumers to join its virtual power plant<sup>13</sup>. Prosumers who already own solar batteries are also given cash and bill-credit incentives to connect to the virtual grid. This model helps the utility stabilize supply and reduce dependence on the conventional grid.

With the growing number of prosumers across the globe, utility providers are leveraging cloud-based solutions, Internet of Things (IoT) and machine learning technologies to address complex challenges concerning management of their renewable energy portfolio. IoT, AI and big data technologies enable utility providers to collect and share information about local battery storage, rooftop solar cells, domestic appliances, and smart meters. This clustered information available on demand enables data-driven approaches for building a distributed energy ecosystem (DEE) among the utility, prosumers and partners for efficient demand management and grid stability.

These technologies also help utilities understand energy behaviors of prosumers over time to design collaborative models for power generation and management, in sync with variable energy demands.

## Going beyond net zero

Global utility providers seem to be racing towards announcing net-zero-emissions targets. For starters, the California Public Utility is working towards achieving 100% zero-carbon emissions by 2045<sup>14</sup>, and the state has set zero-net energy targets for newly constructed residential buildings. New York has set an ambitious target to procure 70% of its electricity from renewable energy sources by 2030<sup>15</sup>. While the initiatives are commendable, utility providers seem to be focused only on zero emissions without much emphasis on achieving negative emissions<sup>16</sup>. They must set separate goals and explicitly manage negative emissions plans from existing and future targets for emissions reduction. This broadened outlook will enable utility companies, regulators and governments evaluate comprehensive investment requirements. Utility providers must effectively work with partners in the ecosystem to assess requirements and enhance capabilities to achieve net-zero ambitions and progress beyond the targets.

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<sup>[13]</sup> AGL.com; <https://www.agl.com.au/solar-renewables/solar-energy/virtual-power-plant>; accessed October 29, 2021

<sup>[14]</sup> SD13.Senate.CA.gov; CAN CALIFORNIA ACHIEVE ZERO-CARBON ELECTRICITY BY 2045? THE DATA SAYS 'YES'; published September 22, 2021; <https://sd13.senate.ca.gov/news/getting-to-zero/september-22-2021/can-california-achieve-zero-carbon-electricity-2045-the-data#:~:text=The%20detailed%20analysis%20by%20the,%2C%20homes%2C%20and%20commercial%20buildings>; accessed October 29, 2021

<sup>[15]</sup> The New York Times; How Does Your State Make Electricity; published October 28, 2020; <https://www.nytimes.com/interactive/2020/10/28/climate/how-electricity-generation-changed-in-your-state-election.html>; accessed October 29, 2021

<sup>[16]</sup> Frontiersin.org; Beyond "Net-Zero": A Case for Separate Targets for Emissions Reduction and Negative Emissions; published August 21, 2019; <https://www.frontiersin.org/articles/10.3389/fclim.2019.00004/full>; accessed October 29, 2021

# About the author

## Anindya Pradhan

Anindya Pradhan is a Utility Value Discovery Advisor in the Utilities Innovation and Transformation Group (ITG) at TCS. He has over 20 years of global business consulting experience in the utilities industry, spanning markets in USA, Canada, UK, Europe, Australia, Japan, and India. An alumnus of the Indian Institute of Management (IIM), Anindya started his professional career as a part of the operations team of a thermal power plant. In 2004, he joined TCS' utilities practice. In his current role, he helps global utilities discover, define and generate value at the intersection of energy and digital technologies.

# Awards and accolades



## Contact

For more information on **Energy, Resources & Utilities** visit <https://www.tcs.com>

Email: [utilities.marketing@tcs.com](mailto:utilities.marketing@tcs.com)

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