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Energy Transition Market

Insight Report 2022

Europe | North America | Asia Pacific

A view from the transition leaders.



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Introduction

In May, the International Energy Agency (IEA) released Net Zero by 2050: a Roadmap for the Global Energy Sector, the first comprehensive study of how to transition to a net zero energy system by 2050, while ensuring stable and affordable energy supplies, universal energy access, and enabling robust economic growth.

While the world does have a viable pathway to building a global energy sector with net-zero emissions, it said, but it is narrow and requires an unprecedented transformation of how energy is produced, transported and used globally. The energy transition broadly aims to switch the global energy sector from fossil-based to zero-carbon by the second half of this century and the report offers a roadmap, with more than 400 milestones, to help us get there.

These included the much-publicised pronouncement that there should be no further investment in new fossil fuel supply projects, the phasing out of new internal

combustion engine passenger cars by 2035, and a net-zero global electricity sector by 2040.

The report certainly chimed with Jeff Connolly, chief executive of Siemens Australia and the Pacific, who called it an inspiration and reality check on what is involved. "It tells you what we are facing," he said. Writing in the report, executive director Dr Fatih Birol said: "The pathway laid out in our Roadmap is global in scope, but each country will need to design its own strategy, taking into account its own specific circumstances."



Plans need to reflect countries' differing stages of economic development: in our pathway, advanced economies reach net zero before developing economies."

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This need for individual, national plans to achieve decarbonisation came through at a series of online discussion at the end of last year, just days after the closing speeches had been made at COP26 in Glasgow. They looked at the energy transitions in Europe, North America and Asia-Pacific (APAC), and while common goals existed, there were also individual regional challenges – and opportunities – around the energy transition.

Europe is ahead of the curve in many respects. Renewables already account for just under 20% of energy use, there's a solid carbon trading structure, and a host of innovation, forward thinking companies and public sector organisations, too. Yet it has been estimated that the continent will need to invest €379 billion a year until 2030 just to stay within the 1.5-degree pathway. The key here was maintaining momentum, moving forward with technologies and incentivising new investment.

In the APAC region infrastructure and creating a grid capable of supporting mass electrification are essential, as is collaboration between states and greater inter-connectivity between national grids. Energy equity is also a major issue across the continent.

At the core of U.S. energy policy is a pledge to invest trillions of dollars into zero-emission electricity

infrastructure by 2035. This includes plans to electrify America's love of the motor car, develop a smart grid that can assimilate the growth in decentralised power generation and find a role for the oil and gas industry in the transition to a low carbon future.

To deliver on climate goals, while also meeting an ever-growing demand, the energy sector must accelerate innovation at scale, a dual challenge that will create new opportunities for clean technology.

The role of carbon capture and storage, for instance, was described as: "crucial to the transition," by Katharina Beumelburg, chief strategy and sustainability officer at oilfield services company Schlumberger. "It has a fundamental role as a complimentary tech to decarbonise oil and gas and other sectors," she said, "particularly in hard to abate industries where large quantities of CO2 exist in low concentrations."

Hydrogen – in its green guise - is also being lauded globally as a carbon-free energy carrier, with estimates that it could account for 18% of global energy needs by 2050. This, the discussions heard, could help slash emissions from industrial power generation to domestic heating, end even air travel. As Beumelburg added: "Energy transition is an exciting and historic time with lots of opportunity."



The European Transition

Solar and wind have been at the heart of Europe's energy policy over the last decade, as renewable technologies have been assimilated into the existing energy mix. But now the time has come to take this transition to the next level, if the pledges of the Paris Agreement are to be met.

Speakers across the two-day Energy Transition Europe 2021 event talked about the huge opportunities which exist to develop the technology and infrastructure needed to maintain the momentum, as well as how the transition would be funded and the growing importance of hydrogen to net zero.



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Danish blueprint

If there was a European blue-print for transitioning to net zero, it would be Danish. In 1991, Denmark was the first country in the world to build an offshore windfarm, explained Dan Jorgensen, Minister for Energy, Utilities and Climate. "It was a very expensive way to create energy. So why did we do it? Because we saw that it was the future and someone had to take the first step," he said.

Denmark is now the wind energy capital of the world, thanks to the continued close collaboration between

companies, authorities, scientists and researchers. Two further huge wind islands are planned in the North Sea, with the capacity to supply ten million homes, both in Denmark and further afield.

Denmark have also led the way in ending new licenses for new oil and gas exploration, said Jorgensen, and helped established the multi-national Beyond Oil and Gas Alliance. "It was a big step, but it had to be done," he said. "If we are to be carbon neutral by 2050, we might as well set the agenda and make it clear."

Fossil fuel legacy

According to Tim Archer, a senior partner at Deloitte: “A net zero strategy will impact every area of business and its people. Done well, it will have economic value, protect and enhance our environment.”

“We’ve been working with businesses across Europe to help them navigate the best way to a carbon-neutral future,” he said, but importantly, it is not just about the new but also: “what products and services will continue to be valued; which assets will retain value.”

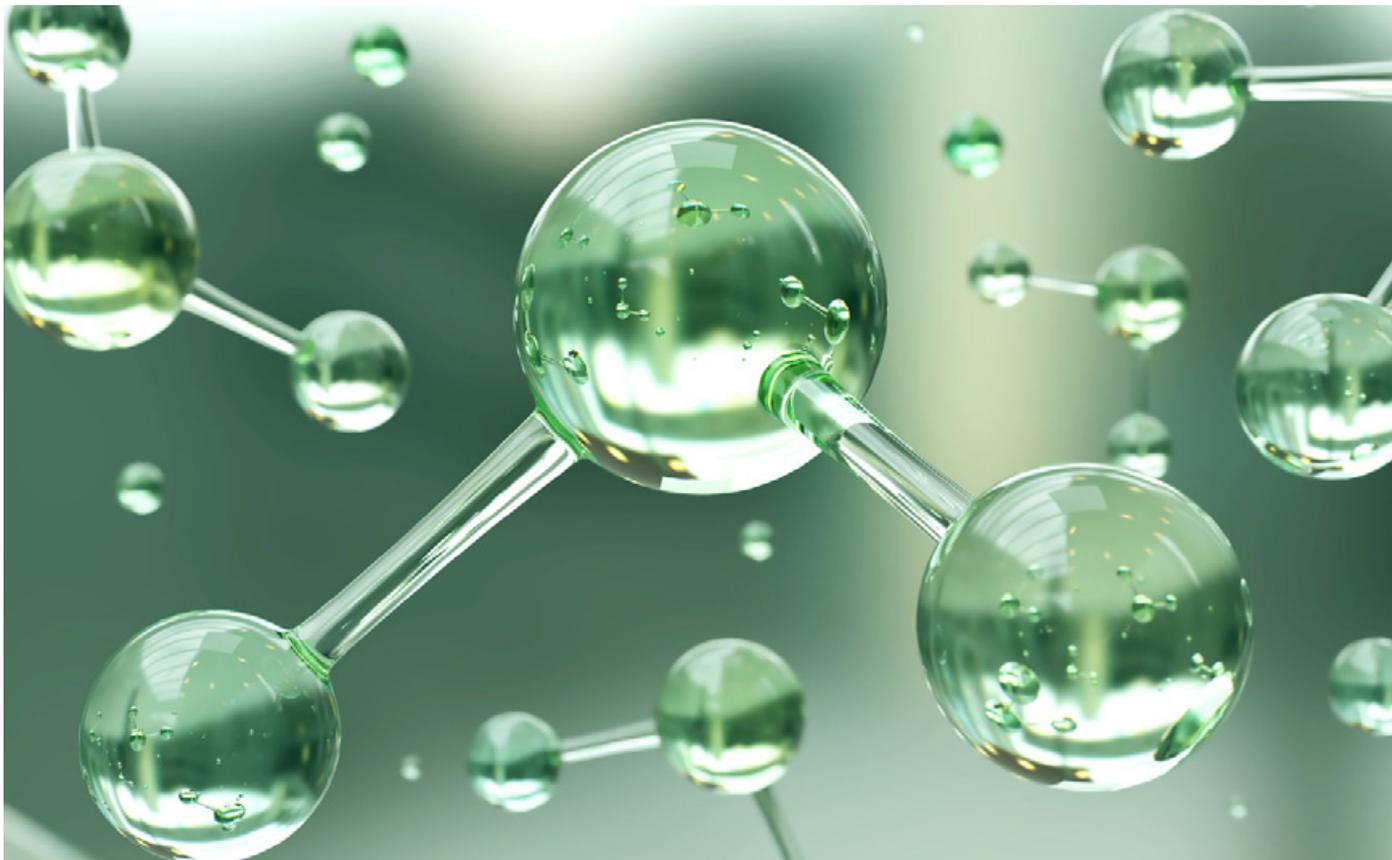
In other words, oil and gas companies still have a role to play in this transition, although many will argue with Daniel Fitzgerald, chief operating officer at Lundin Energy, when he stated: “oil and gas will be a part of the mix for a long time.” Simone Rossi, chief executive of EDF Energy, for one. He disagreed, pointing out that with some 15% of global energy-related greenhouse gas emissions coming from oil and gas: “Gas cannot be the fuel of our future.” Adrian Letts, chief executive of energy supplier OVO agreed. Gas is a key contributor to carbon emissions,

he said, particularly domestically, with 85% of homes in the UK heated by natural gas.

A distinction needs to be made between burning fossil fuels and using the expertise and the infrastructure of the oil and gas sector to support decarbonization. Jannicke Nilsson, vice president for safety, security and sustainability at Norway’s state-owned oil company Equinor believes that, for instance, their experience and knowledge of developing integrated offshore working centres could be passed on to offshore windfarms.

Colette Cohen, chief executive at the Net Zero Technology Centre, which is helping to accelerate the oil and gas industry’s transition to a net zero future, said the sector: “has great skills in this area and could be a leader on this front if you consider past relationship with technology.” This could include retrofitting turbines to offshore platforms and helping to develop modular offshore floating wind platforms, she said.





Green gold

In 2020, the EU announced a strategy to achieve 40GW of green hydrogen projects by 2030, in a bid to become a leader in the global hydrogen economy.

“If we’re going to make a difference on emissions, hydrogen needs to find its place in hard-to-abate industries,” said David Bryson, chief sustainability officer at energy company Uniper. But while: “we can overcome the technological hurdles,” he continued, an effective emissions trading system was needed as a way of generating demand.

“Finance is queueing up to put money into hydrogen, but they need to be convinced that it’s a worthwhile

investment vehicle,” agreed Simon Flowers, chairman of the consultancy group Wood Mackenzie. “Europe is uniquely well placed to build a hydrogen roadmap,” he continued, and while much of the hydrogen currently produced in Europe is grey - using natural gas and producing CO2 emissions - plenty of industries, such as petrochemicals, are already using blue hydrogen, when the carbon generated is stored underground, using carbon capture and storage.

This is one of those areas where the oil and gas industry, with its empty wells and redundant facilities could help says Cohen, and get the: “hydrogen marketplace up and running quicker.”

Technical know-how

According to IEA report, most of the global reductions in CO2 emissions between now and 2030 will come from technologies that are already available. But in 2050, almost half the reductions will need to come from technologies that are currently only at the prototype phase.

A lot of attention is paid to concepts and studies, said Rod Christie, a vice president at engineering company Baker Hughes: “now it’s about taking that forward with pilots, some proof of concept, and where does it provide returns?” What’s also needed for the transition to work, says Miguel Setas, board member for sustainability at energy company EDP, is more investment in infrastructure, especially intelligent, green grids. The company has previously issued nine green bonds worth €25m, with all the proceeds allocated to wind and solar projects, he explained. Now it is spending 15% of its CAPEX on the expansion and modernization of its networks.

David Holmes, general manager for energy at Dell Technologies said: “we need to understand the role of technology in accelerating the energy transition and achieving decarbonization,” and think critically about

grid modernization, demand response systems and how we integrate the whole energy ecosystem. Looking to the future, he is excited by new substations that can act as mini-data centres offering a single, common platform for multiple vendors, and solar panels designed with integrated storage.

Letts also supports the march of technology, explaining that measurement and smart meters are helping OVO to better understand consumption and put forward initiatives for consumers that help improve how they use electricity.

Frederic Godemel, a vice president for power systems and services at Schneider Electric spoke about the need to create more prosumers – consumers who could dramatically change the electricity system by choosing what energy they use, as well as producing their own. “This will require a high level of digital technology,” he said. Digitization can have a huge effect on business too, he added, and deploying digitized energy management system and automation could cut carbon footprint by as much as 50%.



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Financing the transition

“Decarbonization isn’t going to come for free. It also requires an economic framework that’s going to drive these things forward,” advised Christie. “For new tech,” said Setas, “we think that public grants and incentives with the right public policies and the right regulatory frameworks will have to be put in place to guarantee that those technologies will be deployed.”

Alan Hayes, global head of pricing at energy benchmarkers S&P Global Platts said that both public and private funds needed to be mobilised in order to realise

the transition. Investors will need timelines for phasing out carbon from the energy sector, he continued, as well as targets for renewables, transport policies that promote low-carbon, and even targeted tax incentives.

But amid all the talk of technology, tax and targets, Holmes believes that there remains a human angle, too, thanks to the new ideas, perspectives and thinking that young interns can bring to a business. “I’ve come to realise, one of the single most important resources we have, is our people,” he said.

The Energy Transition in Asia

Speaking at the Energy Transition Asia Pacific 2021 event, Valery Tubbax, chief financial officer at renewable energy specialists InterContinental Energy, was upbeat. “Decarbonisation is not up for debate; it is not only necessary, it is inevitable,” he said.

There was a strong momentum across the Asia Pacific region, he continued, while acknowledging the path to decarbonisation had its challenges, particularly around storage, transportation and intermittency. One of the keys to solving some of these dilemmas, he said, was connecting those countries that are rich in green energy, such as Japan and China, with the centres of consumptions.



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The idea of connectivity, in the form of linking up grids between different states, and collaboration played out across the two day event.

Mohamad Irwan Aman, head of sustainability at Sarawak Energy Berhad and a director of the UN Global Compact Network Malaysia & Brunei, explained that the ten countries within the Association of Southeast Asian Nations (ASEAN) – which represents 200 million people – have agreed to work together to increase the amount of renewable energy used across the region by 23%. This sort of collaboration was important, he explained, as the key to decarbonising Asia was a grid for green energy that connects all countries: “Energy sharing between countries, and interconnectivity between countries, is key.”

But countries within APAC still need to play to their own individual strengths, said Low Yen Ling, minister of state

for Singapore, and acknowledge they will develop at different rates and with different transition strategies.

Jeff Connolly, chief executive of Siemens Australia and the Pacific agreed. “Can we really say that every country is going to have the same roadmap and the same timing? I think that is naïve.... The question is can you set a realistically ambitious plan?” He also agreed that the development of an intercontinental energy infrastructure was critical. In Australia’s Northern Territory, he said, there is a high-voltage, direct current (HVDC) electric power transmission system transporting solar energy from central Australia, that could power 15% of Singapore’s electrical needs, replacing huge amounts of natural gas in the process.

“It’s very exciting but in the background we need a plan and we need to recognise all these elements are going to need to be worked on in unison,” he explained.



Road to transition

Leadership from governments and businesses is needed to drive the transition in Asia, said Nitin Apte, chief executive at Vena Energy: "It is about collaboration, not competition." To meet targets: "we need to have a vision, a regulatory pathway, transparency and most importantly, predictability."

Low Yen Ling sees getting to net zero as a "global fight," with the need for a clear path forward. "When we talk on leadership it is not just government but working together with the private sector," she said. In Singapore, for instance, there has been a push to give confidence to the private sector, by funding initiatives around training and certification, that can help the sector develop, as well as working out how to deploy and scale up technology.

Irwan also urged Asia's businesses to step up, take responsibility, and implement a plan. They should want to be a mover when it comes to addressing climate change, he said. "Don't wait until there is a policy," he urged, build a business case now and: "make it about the company's survival in the long term."

The alternative, said Esther An, from the UN's Economic and Social Commission for Asia and the Pacific (ESCAP), was inaction. "If you don't transition now, you will be too late." Investors have already made it very clear, she added, that if companies don't have a net zero energy strategy in place, they risk being divested.



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Energy mix

"If we are expecting major change then we can't keep the current market structures," said Christina Ng, from the Institute for Energy Economics and Financial Analysis (IEEFA). She felt that markets needed to change, and that the key driver when it comes to renewable technologies could no longer be profit alone.

There needed to be new incentives that channel market funds towards the right technologies and the right solutions, she said.

Across the world, oil and gas companies see a role for themselves in a fossil free future, on the basis that a mix of different energy sources will still be needed for decades to come. There's a need to incorporate the old with the new, said Mukesh Surana, chairman of the Hindustan Petroleum: "it's not either or, we are seeing it as optimization," he said. This is why the company has committed to installing 22,000 electric vehicle (EV) charging stations to support the penetration of EVs in India, he explained.

Other technological advances were also discussed. Addressing the issue of intermittency, Raman Kalra,

chief digital officer at India's largest renewable energy company ReNew Power, said: "The grid should be intelligent, the grid should be smart, to reduce the losses," and that meant more digital technologies.

The importance of hydrogen to the global energy transition is impossible to over-estimate. "Hydrogen will be the key element for the future of decarbonisation," said Nobuo Tanaka, chairman of the Innovation Cool Earth Forum (ICEF). The technology has the potential to have an even greater impact in APAC, he said, where it could help to reduce emission in the region's many hard-to-abate industries such as steel, cement and petrochemicals.

The catalyst behind the growing potential of hydrogen is solar, explained Philippe Malbranche, programme director of the International Solar Alliance, and the effect it has had in the plummeting price of green electricity to fuel power hungry electrolyzers.

With costs of just a cent per kilowatt hour now achievable, hydrogen will soon reach price equity with fossil fuels, at around \$1.5-2 per kilogramme. "It is really economically feasible, and cost effective," he said.



Energy equity

The question of equitable energy access was taken up by Jaideep Mukherji, chief executive of Smart Power India. He explained that in 2019 the Indian government achieved the remarkable milestone of electrifying nearly 100% of its households, something which would have seemed impossible a decade earlier.

But despite the progress, the per capita consumption of electricity in India is only a third of the global average, a figure that drops even lower in rural areas. This is forcing people to look towards other forms of energy instead, including heavily polluting diesel.

The solution, he said, is more: “distributed renewable energy solutions such as mini grids and rooftop solar, which have the potential to reliably serve these communities’ electricity needs,” while at the same time improving healthcare, education and access to safe drinking water.

Megha Pushpendra, from the International Solar Alliance, looked at the energy transition through a gender lens. Renewable energy, she explained, has been a catalyst for both women’s economic empowerment, and community development.

Yet women are still under-represented in the energy industry, and she urged the sector to consider some key changes such as improving women’s access to technology and engineering subjects, promoting energy careers for women, and improving policies to support women with families at both company and policy levels.

In the IEA report, Birol said: “The transition must be fair and inclusive, leaving nobody behind. We have to ensure that developing economies receive the financing and technological know-how they need to build out their energy systems to meet the needs of their expanding populations and economies in a sustainable way.”

This is the big conundrum facing many developing countries, said ReNew Power’s Karla - how to reduce emissions while continuing to grow GDP. India, he explained, is the third largest emitter of greenhouse gases but also has an economy that is set to grow exponentially over the next decade.

Solving this question remains at the heart of Asia’s energy transition.

Delivering Net Zero North America

The USA isn't used to playing catch up but in terms of the energy transition, it lags perhaps as much as ten years behind Europe. "We need to step it up, and do it quickly," urged Kathleen Barrón, a vice president at the electrical utility the Exelon Corporation, during Energy Transition North America 2021

The massive injection of cash promised in the new Infrastructure Bill will certainly help, with the deal including over \$62 billion for the U.S. Department of Energy (DOE) to deliver a more equitable clean energy future. Barrón described it as a gamechanger that is estimated to cut emissions by over a billion metric tonnes by 2030, while Tristan Grimbert, chief executive at EDF Renewables, said there has been: "more progress in the last six months than last six years."



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Ed Crooks, vice-chair at the consultancy Wood Mackenzie, said the fact the Bill had bipartisan support was crucial in: "giving investors the confidence to invest, knowing there's a policy regime that'll last for the right amount of time." The ability for the North American economy to transition away from carbon intensive industries will hinge on widespread technology development and deployment, said Dave Rhéaume, a senior director at electricity company Hydro-Quebec. But: "energy transition is not cheap, it's expensive... (you) cannot fall too much in love with perfection, there's a cost that needs to be borne by customers."

"Creating an environment where trust is the essential currency is key," said Katherine Neebe, chief sustainability officer at Duke Energy. "Companies have leaned into private-public partnerships and collaborations in a competitive way which is great," she explained, leading to strong partnerships in battery and energy storage and promising technologies around methane detection and monitoring.

There was also a strong argument that different ideas such as energy efficiency and smart consumption, as well as different types of energy, all had a role to play. "Paris is a steep mountain to climb," said Rhéaume. "You can't electrify everything."

According to Alan Armstrong, chief executive at Williams, which provides the US with 30% of its natural gas, said the biggest challenge with the energy transition is adopting a fact-based approach and focusing on progress that can be made together, rather than industry infighting. "The most frustrating thing is there are so many opportunities to reduce carbon... yet because of labelling this is taking longer than usual," he said.

Kim Greene, CEO of the Southern Company Gas, said that there was a need to balance "plain, safe, reliable, and affordable" forms of energy too. "Natural gas will be a foundational element of the clean energy solutions," she said. "We must make sure that policies aren't getting ahead of technology and that we don't unintentionally create negative consequences." It's about an: "energy transition and not an energy switch," she added.

Craig Cornelius, chief executive at Clearway Energy agreed that we were: "Definitely going to see a mix of technologies succeeding, not one key technology that carries everything," and that the likes of wind, solar, CCUS and nuclear would all need to complement each other.

Around 20% of electricity in the US comes from nuclear, and the technology should be seen as the backbone of the energy transition and a decarbonized economy, explained Maria Korsnick, chief executive of the Nuclear Energy Institute. "We need policy and investments in every carbon-free source, not technological tribalism on what counts as green." Investing in nuclear, she continued, creates high-paying jobs, eliminates air pollution from outdated sources, and offers new clean energy solutions.

America's hydrogen economy pulls in hundreds of millions of dollars of investment annually, with more than 8,000 small scale fuel systems in 40 states. But looking at the roadmap for hydrogen in the US, Sunita Satyapal, director at the US Department of Energy's Hydrogen and Fuel Cell Technologies Centre said that we need to move quickly and: "jumpstart this at the regional level as well as the national level."

Dave Edwards, a director for hydrogen energy at Air Liquide agreed: "Policies are what can enable us to encourage early adoption, when economics might not be sound on their own."

Customer experience

As the energy transition accelerates, what customers want – and the world needs – from energy providers is changing fast. Companies that meet these needs by transforming the customer experience can unlock new opportunities, drive growth, reduce costs and create long-term value. Krish Krishnamurthy, head of Clean hydrogen technologies R&D at Linde made the point that: “reducing our footprint is one thing, but we want to also reduce customer footprints.”

This idea was picked up in a discussion around the role of utilities in a decarbonizing world.

Enrico Viale, Enel’s head of North America, talked about the role of electrification, with smart, resilient grids that allowed customers to be active participants in the energy market.

Alessandro Palin, president of technology company ABB said that it was clear that without a smart grid there won’t be an energy transition, because only a smart grid had the ability to absorb the amount of renewable energy that was being generated.

Scott Neuman, chief executive at energy retail platform Kaluza, said that the movement towards decentralised energy was similar to the trend in internet development, starting with mainframes and then moving towards more localised access. Data was also on Neuman’s mind and how companies can use it to: “move efficiently and at speed.” Companies needed to design services that reflect how consumers actually behave, using more real-time updates to flag up errors before they escalate. “Anything you can do with technology to avoid that first call to a call center is transformational,” he said.





EVs in the fast lane

The US has often been portrayed as the home of the petrol engine, but now electric vehicles (EVs) are primed to transform the landscape, creating a predicted market worth \$72 billion by 2030, and outpacing sales of other engine types by 2036.

One of the most exciting developments is the launch of the Electric Highway Coalition, explained Philip Dion, chief customer officer at American Electric Power, describing it as a new 'symbiotic relationship' between electricity and vehicles.

Over 50 utilities across the US have come together to speed up the build-out of EV charging stations, filling in the gaps along major travel corridors. Each utility has committed to creating a fast-charging network across its territories by the end of 2023, meeting the needs of a predicted 22 million EVs that will be on the road by the end of the decade. The US National Grid is also involved and the organisation's vice president Future of Electric Gia Mahmoud explained how they are looking at ways to support the fact that most charging is going to happen at home.

San Francisco is already ahead of the curve, having developed a comprehensive charging infrastructure that is focused on multi-family dwellings. Long seen as a beacon for the energy transition, despite a huge growth in population and a massive hike in the city's GDP, in the twenty years between 1999 and 2019, it recorded a 41% reduction in emissions.

Mahmoud also believes that educating customers around the transition to EVs is vital, and the fact there could be future opportunities to make money charging vehicles at home, and selling energy back to the grid.

Dion came back to the argument that the bottom line is a grid that's fit-for-purpose and can meet demand, especially as companies switch whole fleets over to electric. He also suggested that new ways of thinking were required. "The fastest way to kill electric vehicles would be to bungle the use of funds," he warned, and that lessons should be learnt from the early days of solar power.

Outlooks and Conclusions

The IEA report predicts that by 2050, the energy world will look completely different. Global energy demand, it says, will be around 8% smaller than today yet it will be serving an economy more than twice as big, and a population with two billion more people.

Almost 90% of electricity generation will come from renewable sources, with solar – by then the world's single largest source of energy – and wind accounting for almost 70%, with most of the remainder coming from nuclear.

As a result, fossil fuels' share of the market will have dropped from almost four-fifths to slightly over one-fifth, holding on in the manufacture of goods where the carbon is embodied in the product such as plastics, in facilities fitted with carbon capture, and in sectors where low-emissions technology options are scarce.

This is the picture of the energy transition and moving it forward will involve developing and delivering new technology at scale, from smart grids, to floating offshore wind turbines and carbon capture and storage. Yet as was pointed out, much of the technology needed to decarbonise hasn't yet left the drawing board.

Looking ahead, Shaun Kenny, president of engineering corporation Bechtel Infrastructure, echoed the words of

the environmentalists when he said that today, any R&D investment that isn't about sustainability is probably wasted.

But he also warned against a piecemeal approach to the transition, which he said was currently being achieved on a project-by-project basis, when in fact what was needed was a full programme of joined up measures. "We need to move on from a debate on which solutions have roles to play, to how can that solution... be best deployed to maximum effect and cost," he said.

Craig Cornelius, chief executive at Clearway Energy, warned that finance needed to be incentivised, too. "The energy transition that's happening worldwide has to be funded by private investment," he said, and that the only way to harness the capital that was looking to invest in decarbonization was to get the correct public-sector frameworks in place along mechanisms such as tax incentives.

There were now clear signals in the market too, suggested Anna Borg, CEO at multinational power company Vattenfall. "Customer priorities and demands are changing. Financial markets are also starting to regard anything with carbon components as high-risk," she said.

