Exclusive Insights /// Actionable Intelligence /// Exclusive Interviews

Energy Transition Dialogues

Consultancy Intelligence Publishing

INTELLIGENCE BRIEFING

ISSUE 45, MONDAY, APRIL 25th

SCROLL DOWN

IMF EXECUTIVE SUMMARY ENERGY TECHNOLOGY EXCLUSIVE SOUNDINGS ETC.

"Ukraine Could Reshape Hydrogen's Trajectory"

Boyana Achovski, Secretary General, Gas Infrastructure Europe

Speeding up hydrogen has never been more important for Europe. The unprecedented invasion of Ukraine has underlined the need for energy source diversification, both for natural gas import routes, and for speeding up the processes related to renewable low carbon gases, especially hydrogen. The latest data shows that the European Commission has doubled its 2030 hydrogen targets from 10 million tons to 20 million tons. Such developments emphasize the need to guarantee security of supply in the immediate term and showcase the importance of the path to decarbonization. The discussions we are having in Europe about renewable gases and hydrogen are very timely and the whole scope of the European Green Deal should be much more accelerated.

Regulation and infrastructure key to hydrogen reliability. Security of energy supply and hydrogen routes across the globe should really a cornerstone of the discussions at COP 27 later this year. From a European perspective, we are seeing a variety of legislative procedures under development, and we expect to see an improved regulatory framework for hydrogen that will be based on the EU Renewable Energy Directive. Hydrogen infrastructure must be a well interconnected system, which includes pipelines, storage and terminals. Storage provides the flexibility and balance in supply and demand, and terminals will be indispensable to Europe if it wants to be able to rely on hydrogen import derivatives, such as ammonia and synthetic gas.

FULL INTERVIEW HERE

GI Consultancy Intelligence Publishing

Amazon extends position as world's largest corporate buyer of renewable energy

The company announces 37 new renewable energy projects totaling 3.5 GW of clean energy capacity.

Amazon is continuing to scale its renewable energy investments with 37 new renewable energy projects around the world, marking significant progress on its path to power 100% of its operations with renewable energy by 2025—five years ahead of the original target of 2030. The new projects increase the capacity of Amazon's renewable energy portfolio by nearly 30%, from 12.2 gigawatts (GW) to 15.7 GW, and bring the total number of renewable energy projects to 310 across 19 countries.

The additional 3.5 GW of clean energy capacity from these new projects extends Amazon's leadership position as the world's largest corporate buyer of renewable energy, and advances its efforts to meet The Climate Pledge, a commitment to be net-zero carbon by 2040—10 years ahead of the Paris Agreement.

These projects will generate enough carbon-free energy annually to avoid emissions equivalent to more than 3.7 million cars in the U.S. each year.

"Our commitment to protecting the planet and limiting Amazon's impact on the environment has led us to become the largest corporate buyer of renewable energy in the world in both 2020 and 2021. Given the growth of our business, and our mission to run 100% of Amazon's operations on renewable energy, we aren't slowing our renewable investments down," said Andy Jassy, CEO of Amazon. "We now have 310 wind and solar projects across 19 countries, and are working hard to reach our goal of powering 100% of our business on renewable energy by 2025—five years ahead of our original target of 2030."

The 37 new projects are located across the U.S., Spain, France, Australia, Canada, India, Japan, and the United Arab Emirates. They vary in project type and size, with three new wind farms, 26 new solar farms, and eight new rooftop solar installations at company buildings around the world. As a result of these projects, Amazon now has a total of 310 renewable energy projects, including 134 wind and solar farms and 176 rooftop solar projects.

Once operational, Amazon's 310 projects are expected to produce 42,000 gigawatt hours (GWh) of renewable energy each year—enough electricity output to power 3.9 million U.S. homes annually. The carbon-free energy generated by these projects will also help avoid 17.3 million metric tons of carbon emissions annually, avoiding the equivalent of the annual emissions of more than 3.7 million cars in the U.S. each year.

Amazon also continues to invest in renewable energy projects paired with energy storage. The energy storage systems allow Amazon to store clean energy produced by its solar projects and deploy it when solar energy is not available, such as in the evening hours, or during periods of high demand. This strengthens the climate impact of Amazon's clean energy portfolio by enabling carbon-free electricity throughout more parts of the day. The new projects include a 300-megawatt (MW) solar project paired with 150 MW of battery storage in Arizona and a 150 MW solar project paired with 75 MW of battery storage in California. Combined, the two projects double Amazon's total announced solar paired with energy storage from 220 MW to 445 MW.

"Amazon continues to be a leader in rapidly scaling up renewable energy projects here in the U.S. This increasingly includes hybrid projects that pair energy storage with renewable energy generation, unlocking the ability to use clean reliable energy throughout all hours of the day," said Heather Zichal, CEO of the American Clean Power Association.

VIEW FULL REPORT HERE

GI Consultancy Intelligence Publishing

Jonathan Blackburn
Manager of Partnerships and Transactions
RWE Renewables

Deploying more renewables and fuel switching next steps in decarbonisation

Investment in the energy transition by companies and countries is accelerating, purely driven by economics. Solar is the cheapest source of electricity for most of the world now. Th technology for solar and wind, especially on a large scale, has been proven for decades and it is a very safe investment for the likes of pension funds for example, providing an annuity for 30 to 40 years. The counterpoint to this is that the returns get more compressed as the investment becomes less risky.

Green hydrogen economics on positive trajectory

We can get to 70% or 80% of our decarbonization targets with the technologies that we have today and by deploying as many renewables as we can - that must be a key focus. But it is not going to get us all the way there, so we need to look at other sources such as green hydrogen. The energy security issues being triggered by the war in Ukraine have improved the economics of green hydrogen almost overnight, to a point where they are projected to be at cost parity in many places. The next chunk of de-carbonisation will come from fuel switching regimes, such as using green hydrogen or in the case of the transport sector, where we already see the switch from petroleum to batteries. These technologies are commercially available today and we are seeing massive deployment of utility scale batteries in the US.

**Paraphrased Comments*

Ranked

The Top 10 Countries by Energy Transition Investment

	Energy Transition Investment (US$)	% of World Total
1. China	$266bn	35.2%
2. US	$114bn	15.1%
3. Germany	$47bn	6.2%
4. UK	$31bn	4.1%
5. France	$27bn	3.6%
6. Japan	$26bn	3.4%
7. India	$14bn	1.9%
8. South Korea	$13bn	1.7%
9. Brazil	$12bn	1.6%
10. Spain	$11bn	1.5%
Total	**$561bn**	**74.3%**

Source: BloombergNEF, Figures are Generated from Annual 2021 Reported Numbers

GI Consultancy Intelligence Publishing

Chinese Academy of Engineering (CAE) Charts China's Routes to Carbon Neutrality

Chinese Academy of Engineering (CAE) is China's most authoritative advisory body on technological and engineering matters. Established in 1994, the CAE gathers China's best brains in technological and engineering fields as a collective think-tank to advise government agencies and companies on major national strategic and technological options.

Such an important body will not remain silent on China's biggest strategic issue – carbon peaking before 2030 and neutrality by 2060. On March 31st, the CAE revealed its main conclusions and recommendations of a major advisory project titled **"China's Strategies and Routes to Carbon Peaking and Neutrality".**

This Insight China report shares the "highlights" of the findings before the full CAE report is released.

Numerical Milestones:
The CAE study concluded with the following quantitative milestones:

By 2027: to achieve CO2 emissions peaking at 12.2 billion tons from a total of 10 bt in 2020.
By 2045: to produce 80% of power from non-fossil sources, against 30% in 2020; and,
By 2060: to achieve carbon neutrality, with 2.6 billion tons of CO2 equivalent GHGs emissions from hard to abate sectors, which will be off-set by variety of carbon sink means.

Eight strategies:
CAE drives home 8 nation-wide strategic priorities that shall be deployed simultaneously:

1) Prioritizing energy conservation: to uphold the concept of energy conservation as the first energy source, and continuously improve the efficiency of energy use in the society as a whole.
2) Reinforcing Energy Security: to make good use of fossil energy sources for emergencies, properly handle instability risk of new energy supplies, and reduce and prevent the risk of external over-dependence of oil and gas and critical minerals.
3) Energy substitution: to replace traditional energy sources with new ones gradually and in a safe and reliable manner, and continuously increase the proportion of non-fossil energy sources.
4) Re-electrification: to focus on the replacement of fossil fuels with electrical energy and development of electricity-based raw material and fuel production technologies, and vigorously upgrade the level of electrification of key sectors.
5) Resource recycling: to accelerate upgrading, retrofitting and transformation of traditional industries and business process reengineering, and realize multi-level recycling and reuse of resources.
6) Carbon sink: to uphold combination and integration of ecological carbon sinks and artificial carbon uses, enhance ecosystems' carbon sequestration capacity and promote research and development of carbon removal technologies.
7) Digitalisation: to promote digitalization of carbon reduction and management activities, and help transform production and consumption to become green.
8) International cooperation: to deepen and strengthen international cooperation in all above areas.

Seven routes:
The CAE research charts the following 7 routes to pursue:

1) Enhancing the quality and efficiency of economic development, and using industrial structural optimization and upgrading as an important means to decouple economic growth with carbon emissions.
2) Building a clean, low-carbon, secure and efficient energy system as the key and basis to achieve peaking and neutrality.
3) Accelerating the construction of a new power system with renewables as the mainstay, and safely and steadily achieving net zero emissions from the power sector.
4) Promoting orderly attainment of emissions peaking and progressive neutrality of industrial sectors, supported by electrification and deep decarbonisation technologies.
5) Achieving low-carbon transition in transport through high-proportion electrification.
6) Focusing on breakthroughs in key green building technologies to achieve zero carbon emissions from electricity and heat use in buildings.
7) And, **planning for carbon removal technologies** to bridge the "last mile" to carbon neutrality.

Three recommendations:
The CAE has formulated the following three broadline recommendations to the Chinese government:

1) Maintain the nation's strategic determination and focus, deliver better co-ordination and, on the premise of ensuring the orderly operation of the economy and society, and the security of energy and resource supply, adhere to the national "one-game-of-chess" strategy and achieve carbon neutrality in an orderly and gradual manner.
2) Strengthen scientific and technological innovation by providing strong impetus and support for achieving carbon neutrality, especially, by delivering major breakthroughs in key technologies.
3) And, establish and improve the systems, mechanisms and policy parameters to ensure the implementation of adopted measures, in the meanwhile speeding up the establishment of a system for total carbon emission control, accelerating the construction of a mechanism to plan, promote and assess the integrated reduction of local pollution and carbon, and continuously improving the supporting and supervision systems.

(Source: The Pulse - Routes to Carbon Neutrality - 2020-4-20)

GI Consultancy Intelligence Publishing

Energy transition makes business sense for companies

Rasso Barstenschlage
General Manager
Al Masood Power Division

Following COP26, how can the power sector help accelerate decarbonization? COP26 was only the start of a small revolution. Everybody now talks about COP 27 in Egypt and COP 28 in the UAE next year. Five or 10 years ago, the talks were more on country-level strategies. Today, we are talking about physical nuts and bolts, bricks and stones moving, and projects are underway or getting completed. Some of the technologies used have existed for some time, while others, which were previously prototypes, are now in early stages. Users are now talking about sustainable energy business models, which years ago we did not talk about.

What's being done about the challenge of scaling up technology? In the Middle East, especially UAE or Saudi Arabia, solar has been seen as a big part of the energy transition. We see these in many projects in the UAE as well as NEOM in Saudi Arabia. There are many technologies out there that are not new to the industry such as electrolysis and fuel cells. However, what is new today is that people bring them together for certain applications. Today, we as a company talk about hydrogen as a fuel for a vessel operating in Abu Dhabi. It is a commercialized application. Solar was expensive years ago, yet today, it is the cheapest source of energy production. The same is happening to hydrogen right now. Hydrogen is still expensive but as more is produced and consumed, the price will go down. In essence, technologies are there; it is just finding the right technology for the right fit and purpose.

Does the UAE have the toolbox to meet its net zero target? Commitment is the key to success to achieving the net zero targets, for any government, be it in the UAE, Saudi Arabia or any other part of the Middle East. It pays to have leaders who believe in their strategies and are working to achieve results. The government is committed to it. There is funding in place to make it happen.

How important are partnerships and collaboration in making net zero happen? The GCC countries' business model, is based on partnerships. Small or big family businesses in the region were largely built this way and today, this remains important. There are many projects on a lower scale where it can only work with partnerships. In some mega projects, international players do play an important role.

Are we on track for the digitalization of the sector? I think the equipment is mostly available, but it is about the acceptance of the end user to implement. How many electrical components are in place and how many of them are interconnected? Hardly any of them – whether it is an elevator, a cooling system or lighting, they are all working independently. This needs to be connected, then it can also be measured, and what you measure, you can make more efficient.

Is the talent required to facilitate the energy transition evolving? One of the key challenges at present is the reskilling of existing employees. At Al Masood, we are looking into reskilling as future-proofing the company. We know that oil and gas will not disappear, however, hydrogen production and the whole supply chain, will be equally important. With digitization, things that were physically connected via cables, now are in the cloud. We will need these new skills fairly quickly.

Are you starting to see more awareness and uptake of the transition? Companies within the region are seeing that carbon reduction impacts their business positively financially. International companies are already looking at local partners which are taking part in these goals. Financial credit ratings now take into account carbon footprints. I believe it is moving fast and it is very important point that the local industry understands this. While being carbon neutral is not a step overnight, moving to that direction is a benefit for the company. If I am participating in making it happen, I am a part of the community. People are starting to look at solutions for their own homes such as solar panels. And if you look at the building codes in Dubai, sustainable energy is part of every new building approval.

What would be your top recommendation for companies starting this journey? It is very important to get consultancy. You need direction and you need a target. We started with individual projects within the company. We changed our printing system to two pages. We have converted to full LED bulbs. Our next move will be solar. We invest a lot of time in sourcing, but there are many companies out there which can support in a much more cost-effective transition.

FULL INTERVIEW HERE

GI Consultancy Intelligence Publishing

Energy Technology: where and what does China want to innovate?

China's technological strengths in clean energy transition are proven in the last decade. From renewables to energy storage, China has built and demonstrated its leadership in manufacturing and applications of new technologies, while contributing to drive down their costs and accelerate scaling of their deployment, both domestically and globally. Such capability is also reflected in fossil-based power generation where technology innovation plays a key role in reducing emissions and capturing efficiency gains, enabled by digitalization and driven by most restrictive regulations and standards.

Given the above, the direction China wants to steer its energy technology innovation will not only matter for China to achieve its carbon neutrality goals, but also have much larger global impacts.

This report presents the Chinese priorities in energy technology innovation, on the basis of the 14th FYP for Energy Technology Innovation (the Plan), jointly released by the NEA (National Energy Administration) and the MOST (Ministry of Science and Technology) on the 2nd April 2022.

The Technology Shortboards

Does China have shortfalls in energy technology innovation? Absolutely, and plenty. The Plan has identified the following three major gaps that need to be bridged:

1) Heavy dependency on imports in key technology equipment, as well as some critical components, specialized software, and important base materials;
2) Lack of clear competitive advantage in originality, game-changing and forward-looking technologies even in those Chinese advantaged industries such as solar, wind and batteries; and,
3) "Loose and weak" innovation ecosystem among industry, academia and research circles where policies and mechanisms fall well behind the need to achieve major technology breakthroughs, to turn the R&D results into market-ready products, and to "tolerate" failures in R&D process.

The Plan sets out detailed strategy and actions of how the world's largest manufacturer will address those clearly identified shortfalls.

The Strategic Goals:

The Plan has laid out the country's strategic focuses to further innovate technologies that will "overcome the country's current shortboards, consolidate its longboards, achieve real impact via concrete projects and form synergies for collaborative innovation".

The objective is fixated on achieving major breakthroughs in key technology equipment and shaping up obvious advantages in a batch of specific energy technologies that are rising quickly and with continued emergence of new businesses and new models. In the meantime, the energy technology innovation ecosphere is further strengthened, and technology innovation strongly supports and guides energy industry's high-quality growth.

The strategy is clustered around five priorities: continue innovation in renewables, re-construction of the power system, safe and efficient nuclear power, clean and efficient use of fossil fuels, and accelerated digitalisation.

Five Task Clusters for Innovation:

Accordingly, the Plan has laid out five task clusters for innovation:

1) Advanced renewable power generation and comprehensive utilisation, which lists 17 key tasks. It stresses the focus on large scale and high penetration of renewables, and also on "higher efficiency, lower cost and more reliable" renewables including hydro, wind, solar, biomass, geothermal, ocean energies. Hydrogen is included in this cluster.
2) New power system and its supportive technologies, which puts 12 key tasks on the list. The focus is on grid connection technologies for both large-scale renewables and distributed renewables, as well as smart and generation-grid-load interactive grids. Energy storage technologies are included here too.
3) Safe and highly efficient nuclear power technologies, which covers 11 key tasks to improve the competitiveness of currently applicable technologies, optimize the 3rd generation technologies through standardization, and strengthen innovation in strategic technologies including small modular reactors (SMR), (Super) High Temperature Gas Cooled Reactors, and Molten salt reactors.
4) Fossil fuel "greening" technologies, which specifies 37 proposed key tasks, covering conventional and unconventional oil and gas exploration, transport, refining and distribution; clean and efficient utilisation of coal including CCUS, and development of gas turbine technologies.
5) Digitalisation technologies, which contains 16 proposed key tasks, covering common technologies in broad and deep application of digital technologies in traditional coal, oil and gas, power plants and grids that define a new phase of integrated development of "energy and IoT".

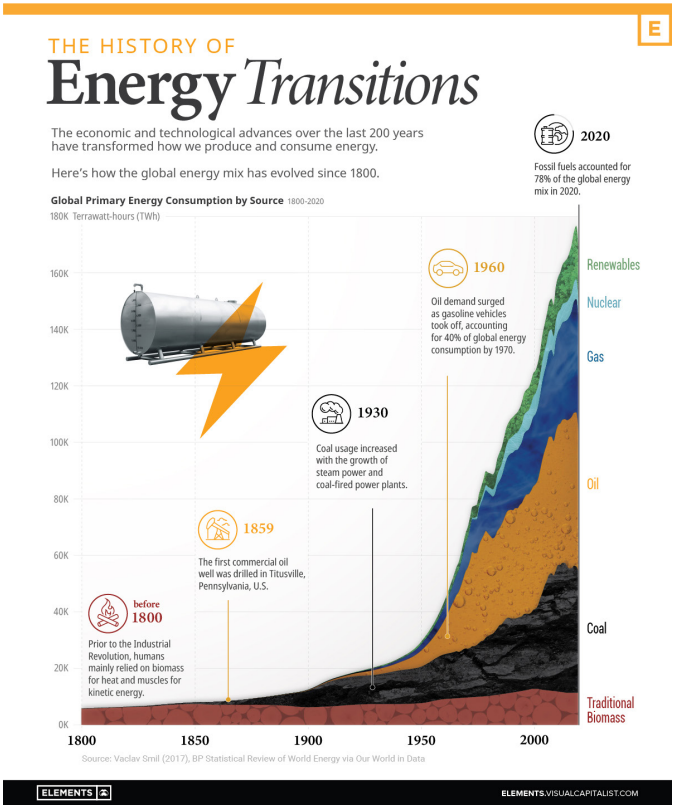
FULL REPORT HERE

GI Consultancy Intelligence Publishing

IMF Executive Summary - April 2022

The war in Ukraine has triggered a costly humanitarian crisis that demands a peaceful resolution.
Economic damage from the conflict will contribute to a significant slowdown in global growth in 2022. A severe double-digit drop in GDP for Ukraine and a large contraction in Russia are more than likely, along with worldwide spillovers through commodity markets, trade, and financial channels. Even as the war reduces growth, it will add to inflation. Fuel and food prices have increased rapidly, with vulnerable populations—particularly in low-income countries—most affected. Elevated inflation will complicate the trade-offs central banks face between containing price pressures and safeguarding growth. Interest rates are expected to rise as central banks tighten policy, exerting pressure on emerging market and developing economies. Moreover, many countries have limited fiscal policy space to cushion the impact of the war on their economies. The invasion has contributed to economic fragmentation as a significant number of countries sever commercial ties with Russia and risks derailing the post-pandemic recovery. It also threatens the rules-based frameworks that have facilitated greater global economic integration and helped lift millions out of poverty. In addition, the conflict adds to the economic strains wrought by the pandemic.
Although many parts of the world appear to be moving past the acute phase of the COVID-19 crisis, deaths remain high, especially among the unvaccinated. Moreover, recent lockdowns in key manufacturing and trade hubs in China will likely compound supply disruptions elsewhere.
Global growth is projected to slow from an estimated 6.1 percent in 2021 to 3.6 percent in 2022 and 2023. This is 0.8 and 0.2 percentage points lower for 2022 and 2023 than in the January World Economic Outlook Update. Beyond 2023, global growth is forecast to decline to about 3.3 percent over the medium term. Crucially, this forecast assumes that the conflict remains confined to Ukraine, further sanctions on Russia exempt the energy sector (although the impact of European countries' decisions to wean themselves off Russian energy and embargoes announced through March 31, 2022, are factored into the baseline), and the pandemic's health and economic impacts abate over the course of 2022. With a few exceptions, employment and output will typically remain below pre-pandemic trends through 2026. Scarring effects are expected to be much larger in emerging market and developing economies than in advanced economies—reflecting more limited policy support and generally slower vaccination—with output expected to remain below the pre-pandemic trend throughout the forecast horizon. Unusually high uncertainty surrounds this forecast, and downside risks to the global outlook dominate—including from a possible worsening of the war, escalation of sanctions on Russia, a sharper-than-anticipated deceleration in China as a strict zero-COVID strategy is tested by Omicron, and a renewed flare-up of the pandemic should a new, more virulent virus strain emerge. Moreover, the war in Ukraine has increased the probability of wider social tensions because of higher food and energy prices, which would further weigh on the outlook. Inflation is expected to remain elevated for longer than in the previous forecast, driven by war-induced commodity price increases and broadening price pressures. For 2022, inflation is projected at 5.7 percent in advanced economies and 8.7 percent in emerging market and developing economies—1.8 and 2.8 percentage points higher than projected in January. Although a gradual resolution of supply-demand imbalances and a modest pickup in labor supply are expected in the baseline, easing price inflation eventually, uncertainty again surrounds the forecast. Conditions could significantly deteriorate. Worsening supply-demand imbalances—including those stemming from the war—and further increases in commodity prices could lead to persistently high inflation, rising inflation expectations, and stronger wage growth. If signs emerge that inflation will be high over the medium term, central banks will be forced to react faster than currently anticipated—raising interest rates and exposing debt vulnerabilities, particularly in emerging markets.

FULL REPORT HERE



GI Consultancy Intelligence Publishing

Russian Invasion of Ukraine Clouding Energy Transition

Dr. James Henderson
Director of Energy Transition Research Initiative &
Chairman of Gas Research Programme
Al Masood Power Division

How is the recent volatility in fossil fuel prices impacting the energy transition? Clearly high prices and volatile prices are not great for consumers as it creates negative reaction in the energy sector. Not everyone is aware of the energy transition and the investments being made in renewables such as wind and solar. High hydrocarbon prices do change the incentives for investing in what ultimately will be the cheaper forms of energy. In the short term, volatility may discourage consumers and reduce the amount of money available for investment. But in the medium-term, high hydrocarbon prices can have a positive effect by creating that momentum away from fossil fuels, which are obviously becoming more expensive versus green energy.

How can the Middle East focus on consumer demand while pursuing energy security? For the Middle East, energy security is a double-edged sword. On the one hand, there is the domestic energy security reflected in the increasing use of renewables, and there are also opportunities on the export side. The security of knowing that production of greener fuels can play a role in securing the future of countries that have been reliant on hydrocarbon export revenues, which are now gradually diversifying to greener export revenues.

How is the current situation in Russia and Ukraine impacting the energy transition? There is an impact because energy prices have shot up around the world, reducing the amount of money that is available to be spent on the energy transition. On the flipside, at least in Europe, there is now a plan by the EU to find alternative sources of hydrocarbon supply, as well as encourage energy efficiency and accelerate the shift to renewables. In this sense, it is hastening the transition because using hydrocarbons would mean dependance on Russia. Renewables would be the way to go for Europe. It is also interesting that other forms of energy such as nuclear are having a renaissance, even in countries that abandoned it after the Fukushima disaster. The war is catalyzing a rethink on how fast the move is on energy transition.

What role do you see hydrogen playing in the Middle East to reach net zero? There is a bit of cynicism about how rapidly hydrogen can play a role. However, there is no doubt that the momentum is there. The strategies are being produced and companies are focusing on hydrogen. Whether it is blue, low carbon hydrogen, or green hydrogen, is not a debate. Everyone wants to get to a place where we are using renewable hydrogen. The discussion around hydrogen is certainly accelerating the positive views on replacing grey hydrogen. The other big question, particularly for the Middle East, is the question of hydrogen exports. There is no doubt that Europe will need to be importing hydrogen. Every strategy of any European country involves hydrogen imports, and these could come from North Africa and the Middle East.

Should we build a hydrogen infrastructure for exporting the gas itself or create hubs to manufacture low carbon products for export? It is going to come down to ad hoc decisions based on geography and country preferences. There is no doubt about the significant variety of opportunities here. What is being explored now is transportation via ammonia and other forms of liquefied hydrogen. I know that there is experimentation going on in shipping and the energy content of the hydrogen as it is transported and then converted back.

Pipelines present opportunities, but that depends on geography, especially within regions where there is the possibility of using or converting existing pipelines to hydrogen, and an element of blending, perhaps at the initial stages.

Creating industrial hubs around hydrogen production is vital because there will be times when the economics of hydrogen transport will not make sense. The economics of manufacturing goods using hydrogen and green steel is a very good example. It will mean that industrial clusters can be built in areas with large amounts of renewable energy which can be dedicated to the creation of hydrogen via electrolysis. It makes more sense to transport the materials that you have manufactured rather than transporting the hydrogen.

We are seeing examples of that in countries where renewable energy is prevalent. In the UK, there are small examples of CCS being developed around blue hydrogen. It brings the methane onshore and reforms it with the use of steam, creates the hydrogen and uses the hydrogen in the local area - in industrial clusters and power stations, and to

CONTINUED ON PAGE 2

a certain degree, in residential areas. But the key focus is industrial power generation clusters and taking the CO2 back offshore.

It works in certain parts of the world where there is potential for CO2 storage. In other countries, it will be completely different because it is not about methane conversion, it is about electrolysis. The Middle East and North Africa will be classic examples of that which means the potential for big industrial clusters to be built up around hydrogen hubs is a huge economic opportunity for countries where these hubs can take place.

Is there an opportunity for investment in the energy transition to catch up? The trajectory is good, but when you look at the numbers, we really are at 'two minutes to midnight'. We are going to run out of our carbon budgets for 1.5 degrees by the end of this decade at the latest. Even the most optimistic scenario we are seeing is hitting it in the early 2030s. That comes down to three relatively distinct regions where each share a third of the emissions: the developed countries, China, and the developing world. In my view, the developing world is the greatest concern. Developing countries are saying, 'Well, we didn't create this problem. We want economic growth. We're firing our economic growth through the cheapest source of energy we have.' In a lot of countries in the world, it means domestically produced hydrocarbons, particularly coal. So, the developing world really needs to be financed in large part by the developed world. Public and private funding, and the cost of that funding is a key issue. The cost of capital in the developing world is high and we need to address that too.

How do see geopolitics playing out as we head to the COP 27 agenda? What we need is global cooperation on a wide-ranging number of energy transition issues. There were gains made at COP26. However, to get countries such as China, the US, and Russia, which are hydrocarbon producers, on board, looks very difficult. Europe, as a major consumer, is hugely concerned about its political relations with Russia. The US and China, the two largest emitters in the world, are struggling over their attitudes towards the Russian invasion of Ukraine and are not really focused on environmental issues. The rest of the world is struggling with volatile and high prices and how that can be addressed. If the war continues through to the autumn, then my fear is that we will lose some of the momentum. COP27 will happen but will not have the focus and attention it needs.

FULL INTERVIEW HERE

EXCLUSIVE SOUNDINGS

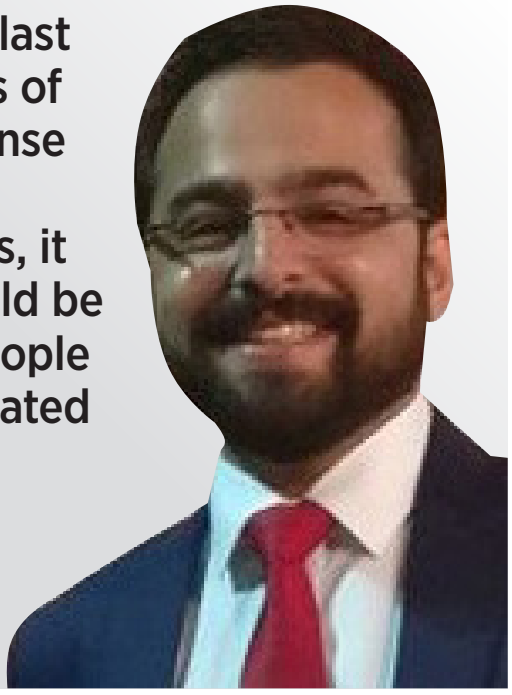
"The energy transition requires a lot more empowerment around the world. We don't have enough of it and those that do have it, often don't know how to execute or help the teams, departments, or consortiums that are tasked with developing the green technologies for the energy transition to take place."

Claudia Zuluaga
Founder
The Future is 50/50

"We need to be thinking very hard about providing funding and encouraging private investment to the developing world if we are going to have any chance of bringing ourselves back on track to 1.5 degrees."

Dr. James Henderson
Director of Energy Transition Research Initiative &
Chairman of Gas Research Programme
The Oxford Institute for Energy Studies

"We are certain that energy transition will continue to accelerate, and that big data will play a pivotal role, just as it did during the shale revolution over the last decade. If you get a thousand pieces of paper, you are not going to make sense of it. But if somebody gives you the same data in 10 columns and 10 rows, it suddenly starts making sense. It could be as simple as a spreadsheet which people would use or it could be as sophisticated as visualization software."



Mohit Kaul
Founder
Enerdatics


GI
Consultancy
Intelligence
Publishing