INSIGHTS

SYNERGIA FOUNDATION

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THE RACE TO NET-ZERO

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AR. NO. 01

THE CHROMATICS OF A HYDROGEN ECONOMY

There is a clear and pressing need to establish uniform certification schemes at the global level, which allow consumers to trace the carbon footprint of hydrogen generation.

Mary Kavita Dominic, is a Policy Research Associate with the Synergia Foundation. This article was originally published in the Deccan Herald on September 14, 2021.

For more than 150 years, the French author Jules Verne has been beguiling readers with his classic science fiction novels. Among the many characters he has immortalised, Cyrus Smith – the ingenious engineer from 'The Mysterious Island' stands out for his prophetic postulations about a futuristic fuel source.

To recall the words of this Vernian protagonist "I believe that water will one day be employed as fuel, that hydrogen and oxygen which constitute it, used singly or together, will furnish an inexhaustible source of heat and light..."

Little did the world realise that this fictional hypothesis would one day come to fruition in the form of a hydrogen economy.

Indeed, in a rare coinciding of fact and fiction, humans today are exploring the possibility of using hydrogen as a low-carbon alternative to fossil fuels.

Its versatility as a clean energy carrier has been particularly attractive for governments, as they seek to accelerate their decarbonisation agendas.

For example, countries like the European Union, Australia, Canada, Japan, Germany and the United States have piloted new policies and projects to capitalise on the hydrogen vector.

Even India has announced a 'National Hydrogen Energy Mission'.

However, as pointed out by climate scientists, not all hydrogen is created equal. Depending on the production techniques employed, its carbon emissions may vary significantly. Against this backdrop, it is critical to establish an international certification system that allows consumers to track and verify the carbon footprint of hydrogen generation.

A HYDROGEN RAINBOW

There is little dispute that hydrogen, when combined with oxygen in fuel cells, can release heat or electricity without harmful emissions.

The only by-product is water, making it a critical energy vector for net-zero economies. However, the climate benefits of hydrogen are also predicated on its production process. If the methods for generating it are not emission-free, then it

Did You Know?

A Guarantee of Origin (GO) certificate traces the chain of custody of a product by providing information about its origin and related supply chains. In jurisdictions like Europe, this model is typically used to certify the source of electric power. In the context of hydrogen generation, a GO certificate can measure and track the GHG emissions to ascertain whether the hydrogen has been renewably sourced. A case in point is the CertifHy project in Europe, which identifies two different product categories: a) Hydrogen based on renewable inputs and b) Hydrogen based on fossil inputs, but with low carbon emissions.

can hardly be deemed a clean substitute for fossil fuels.

Therefore, policymakers need to account for the full lifecycle of greenhouse gas (GHG) emissions in hydrogen production, encompassing upstream activities like steam reformation or electricity generation and downstream functions like transport and distribution.

In this regard, organisations like the International Renewable Energy Agency have devised a useful nomenclature, based on colour gradients, to evaluate the environmental impact of hydrogen generation.

For instance, when hydrogen is extracted from natural gas using steam methane reformation (SMR), it is classified as 'grey hydrogen'. Although carbon-intensive, it remains the most commonly used process, as low-carbon technologies are not necessarily cost-competitive.

When the same SMR technique is employed with carbon capture and sequestration, the resultant product is referred to as 'blue hydrogen'. It has a low-to-moderate carbon intensity.

Similarly, the colour 'green' is used to signify the extraction of hydrogen from water, using electrolysis powered by renewable energy. Currently accounting for less than 1 percent of the totally hydrogen production, it is often touted to be the 'future of clean energy'.

Despite its obvious advantages, the large-scale deployment of green hydrogen is weighed down by high production costs and the capital expenditure of electrolysis units. Only technological innovation and economies of scale can eventually drive down these prices. Until then, the more cost-efficient blue hydrogen is expected to be a part of the energy mix, playing a transitional role in net-zero economies.

HARMONISING QUALITY STANDARDS

While the carbon footprint of blue hydrogen maybe relatively less than grey hydrogen, climate activists assert that SMR prolongs fossil fuel usage and 'locks' nations into a future of methane leakages. It may be the case that methane burns more cleanly than oil or coal, but it is still a potent greenhouse gas.

Studies suggest that it can be even more harmful than carbon dioxide on shorter timescales. As a result, countries are under increasing pressure to prioritise green hydrogen, despite cost constraints. There is, however, no internationally accepted system to verify the renewable credentials of hydrogen.

Given that all hydrogen molecules look alike, it is entirely possible for unscrupulous producers to pass off grey or blue hydrogen as clean energy. In this context, there is a clear and pressing need to institute uniform certification schemes that allow consumers to trace the origin of hydrogen.

If climate concerns have indeed driven them to spend more on green hydrogen, it is only reasonable that they get their money's worth.

> "Authenticating the hydrogen quality may also be critical for claiming tax rebates or other 'green' policy incentives"

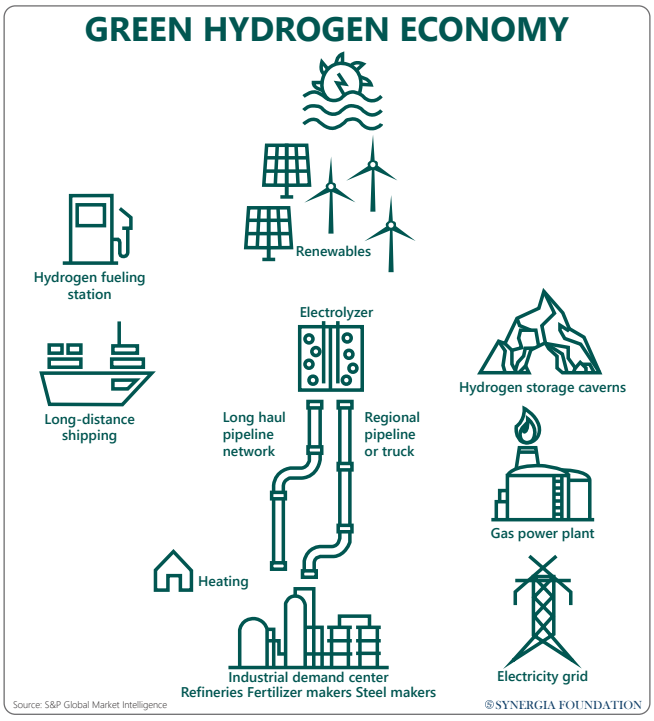
Currently, countries and organizations have formulated their own standards, such as Australia's Hydrogen Certification Scheme or EU's CertifHy project. However, these may not necessarily be compatible with each other.

Depending on the baselines used for emission intensities or GHG savings, the definition of blue, green and grey hydrogen can vary considerably. Such discrepancies can also hinder global trade and complicate the market-based pricing of different shades of hydrogen.

More worryingly, governments and businesses may get away with setting the lowest possible benchmarks for themselves, while projecting a veneer of climate consciousness. Consequently, it is important to establish a uniform 'Guarantee of Origin' scheme at the international level, which harmonises certification standards and attests to the low-carbon bona fides of a hydrogen product.

Such an electronic document, which provides information about the energy source and production methods of hydrogen will go a long way in ensuring transparency. To track the audit trails and preserve supply chain integrity, new technologies like blockchain can also be capitalised upon.

As India prepares to scale up green hydrogen production, a uniform certification system would be in its best interests. In fact, the country has already lobbied for common quality standards at multilateral forums like the BRICS Green Hydrogen Summit. Going forward, such sustained efforts will be key in establishing itself as a responsible norm-setter in the field of environmental jurisprudence.



AR. NO. 02

GAME-CHANGERS IN THE ENERGY LANDSCAPE

The path to Net-Zero 2050 is strewn with obstacles that can only be overcome through global collaboration and cooperation.

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The energy ecosystem has always been in a tremendous amount of transition, every couple of decades. There have been various disruptions, whether it is the transition from coal to oil, the oil price shocks of 1970s following the creation of the OPEC cartel or the shale gas revolution.

The International Energy Agency (IEA) came into being out of the 1973 oil crisis when major producers of the Middle East had imposed an oil embargo, as a fallout of the Arab Israel war. The economic shocks of historically high prices had reverberated across the globe, cutting across a wide swathe of economies.

> "In this context, the IEA emerged with a mandate for energy security and policy cooperation. It was instrumental in creating collective petroleum security through strategic oil stockpiles"

As per Mr. Nobuo Tanaka, the Executive Director of the IEA between 2007 and 2011, the agency proved its value on three occasions.

The first one was during the 1991 First Gulf war, the second during the devastation of American oil production by Hurricane Katrina in 2005, and the third during the Libyan civil war. In addition to this, the IEA has played an active part in cooling down the market whenever disruptions occur.

CHANGING FACE OF ENERGY MARKET

As a core resource, the energy market has seen many evolutions. Two major changes in the last decade were; first, the shale revolution in North America, which turned the U.S. into a net exporter of gas and oil, thus reducing pressure on an overheated market and second, the rise of China and India as emerging global economies. This has altered the trajectory of Middle East oil exports, with 90 per cent of their output being consumed by Asia.

As recalled by Mr. Nobuo Tanaka, he was urged by Mr. Henry Kissinger - the founding father of the IEA, to make China and India members of the organisation, because in comparison to them, the OECD countries had been importing far less oil and gas.

Currently, both China and India have been accorded an observer status in the IEA. In 2019, India applied for full membership, something that will be considered during the next ministerial meeting scheduled for 2022.

Another noteworthy event of the first decade of this century was the beginning of the golden age of natural gas, thanks to the American shale revolution.

The cheaper gas began to rapidly replace oil, and more importantly, carbon-heavy coal in the power sector, thus

EXPERT INSIGHTS

Mr. Nobuo Tanaka, Former Executive Director of the International Energy Agency, 106th Synergia Forum: 'Geopolitics of Energy in the Transformation towards Carbon Neutrality?'

> "When I met Mr. Henry Kissinger - the founding father of the IEA, he had told me that my job was to get India and China into the organization, because they will be the major importers of oil in the future. The OECD countries would import less and less, relative to these two players in the oil field."

considerably reducing carbon emissions in North America. In other words, sustainability by gas has given a new perspective to energy security.

PUSH FOR RENEWABLES

The case for renewables has been pushed not only by governments but also by big tech companies like Microsoft, Apple and Amazon. Once they declared their carbon neutrality goals and timelines, their supply chain companies too were forced to toe this line if they wanted to stay in business.

Hopefully, all these businesses and their supply chains will be carbon neutral by 2030. While various governments have called for 2050 as the deadline for carbon neutrality, big tech companies have insisted on 2030. This has implications for other global companies too.

Similarly, there is a renewed bid in the automobile industry to reduce its carbon footprint. Even the ever-alert financial sector is encouraging SDG investment in renewables. This is being monitored by the Task Force on Climate-related Financial Disclosures (TCFD), which was created in 2015 by the Financial Stability Board.

As can be recalled, the TCFD is tasked with developing climate-related risk disclosures for use by financial institutions, companies, and investors. As a result, the pressure in the financial sector is quite strong, creating a kind of demand side-driven transformation that impacts the supply side.

FUTURE OF FOSSIL FUELS

When the COVID-19 pandemic struck last year, it was a "Black April" for the oil industry. The demand had plunged due to nationwide lockdowns. The only winner was renewable energy. Interestingly, it was during this period that many countries announced their 2050 net-zero targets.

Citing IEA figures, Mr. Nobuo Tanaka opines that once the world emerges from the current depression or stagnation caused by the pandemic, the oil demand may start rising by 2022 or even as late as 2027.

However, some oil companies are claiming that the peak oil demand is closer than what was earlier imagined. It may have already occurred in 2019!

Not surprisingly, many European oil companies - Total, Equinor, BP and Shell - are fast moving away from oil dependence. However, this shift is less discernible in China or Russia as the major companies there are slow movers. "It is inevitable that even big oil is moving away from oil. There is a risk of stranded assetization of the fossil field", predicts Mr. Tanaka.

This is echoed by Dr. Fatih Birol, the current executive director of the IEA, who is getting more optimistic than ever about the world's ability to conclude the Paris Agreement- "even '1.5 degrees' seems less remote than it did a year ago," he says.

While releasing the IEA's 'Net-Zero by 2050' Report, Dr. Fatih came under criticism for declaring that there is no need for new oil and gas exploration projects.

While a ban on new investments in the oil and gas field was not being propagated by the IEA, it was a sound economic model to not make new investments in this field, if a government had already announced carbon neutrality by 2050. Coal, definitely, will have to go away if global electricity production has to reach net-zero by 2040.

CLEAN ENERGY

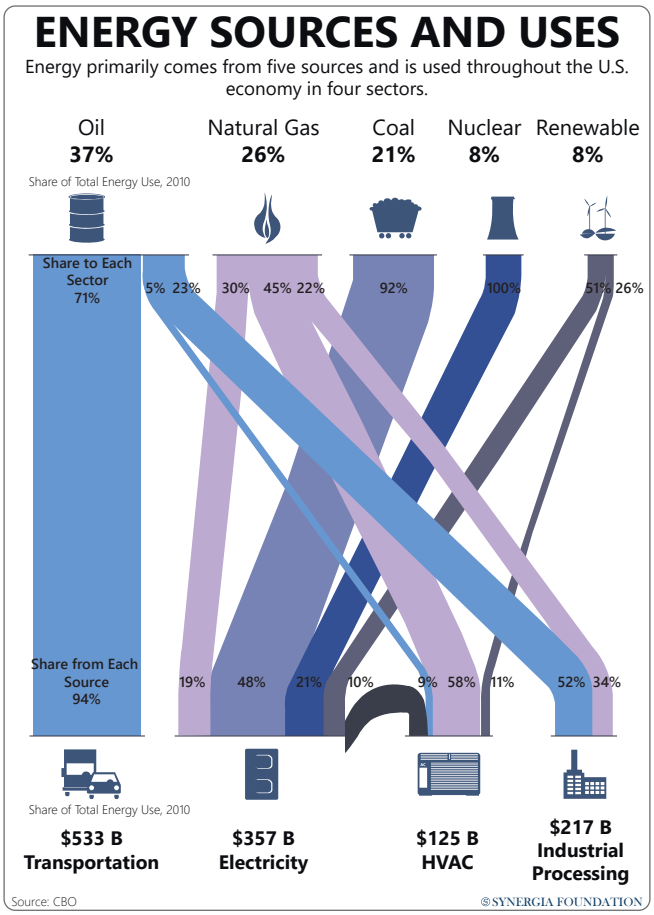
While in the past, oil was the principal source of energy, the future is clean electricity, using more and more renewable energy sources. Indeed, this process has been very much accelerated after the ongoing pandemic.

Mr. Tanaka reiterates, "We cannot wait until 2050, but changes should happen quickly. The wind and solar capacity should be quadrupled. Electric car sales should increase by the factor of 18.

Energy intensity should decrease substantially. This is the future direction. If net zero emission by 2050 happens, then the supply mix for the future is 20 percent of fossil fuels, down from the current 80 per cent."

To achieve these ambitious targets, clean energy must be ramped up by 2030.

The increase in solar power promises hope and



sustainability, especially in India. However, much more solar energy is required for net-zero by 2050 than is currently envisaged.

There are other aspects that will also be important, like biofuels and alternate technologies, which will provide a good base for certain sectors.

CHALLENGES FOR CLEAN ENERGY

An important element for carbon neutrality is the current infrastructure. How can the current infrastructure in coal, cement, steel, trucks and cars be decarbonised? The power and industrial sectors, in particular, are very hard to decarbonise because the existing infrastructure will take years to be depleted. This is especially true for emerging Asia because its infrastructure is relatively new compared to the developed countries.

The road to decarbonisation is an extremely difficult one, and if 'Net-Zero by 2050' fails, this could be the causative factor. A J.P Morgan report notes that both the funding and the human behavioural changes needed for decarbonisation has so far been grossly underestimated.

As articulated by Mr. Rajan Mathai, "Although decarbonization of electricity is on the technical horizon, it is currently only 18 per cent of the total final energy consumption in the world."

Yet another issue is carbon pricing. The IEA report on 'Net-zero by 2050' makes certain assumptions - one being that the carbon price should go as high as $250 per ton. In the emerging economies, especially in the major ones, very high carbon pricing like $200 is probably required.

A senior executive in an oil and gas company, who spoke to the Synergia Foundation, clearly defines the challenges facing countries like India. "The reality is that it is incredibly difficult for any country to achieve these targets by itself. As a result, the ability of nations to collaborate and share technology, finances and resources is one of the issues that will constantly crop up".

Observers warn that the closing of oil and gas suddenly could bring life on earth to an economic stand still. Therefore, as per Mr. Ranjan Mathai, we are more likely to be following the path of what is called the IEA's 'stated policies' scenario rather than the 'net zero emission' scenario. In this scenario, gas particularly, but also oil, will remain a significant part of global energy requirements.

In 1974, when the IEA was set up, the role of oil in all fuels combined was 45 per cent to 50 per cent, and with all the changes that have come, it is still over 31 per cent. It will decline gradually, but from 100 million barrels per day of production to perhaps 67 million barrels in 2040," says Mr. Mathai.

In this situation, if oil and gas exploration gets curtailed, the concentration of oil production will be in the Gulf and in Russia; and the geopolitical centrality of West Asia will continue. Eurasia will remain the main battleground, and the Straits of Hormuz will continue to be one of the most vital choke points in the world.

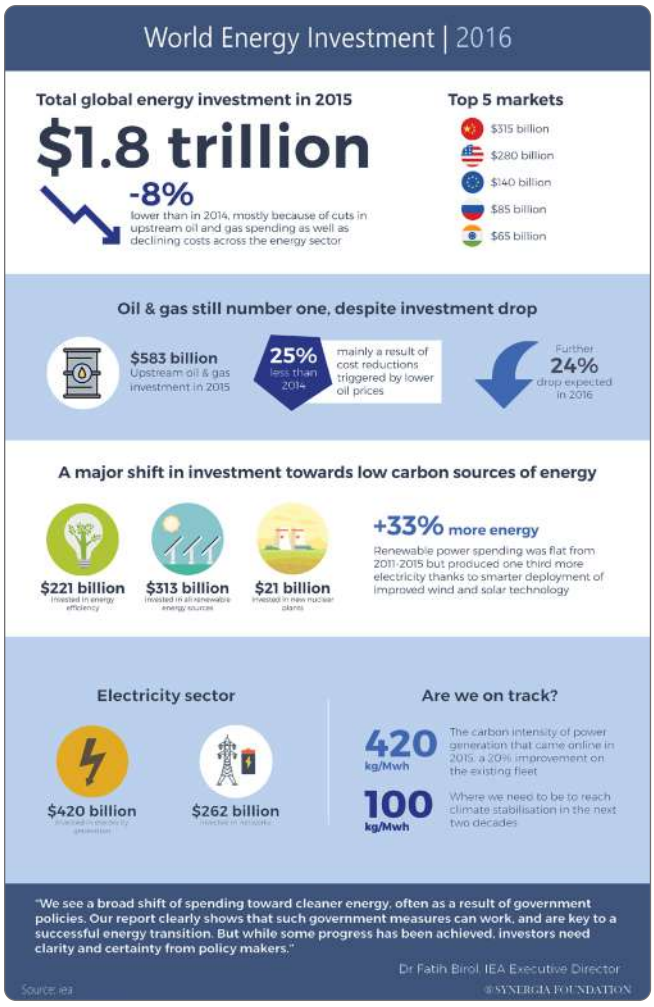
INDIAN CONCERNS

Relating his personal experiences while serving in Iran during the 1990 oil crisis, triggered by the Iraqi invasion of Kuwait, Mr. Mathai warns of the consequences of a sudden disruption in supply, "It is often forgotten that one of the triggers of India's financial crisis was the sudden spike in oil prices and also the fear that we are running out of oil."

In those days, we had no strategic stockpile, and our oil refineries also did not maintain the large stocks that they do today. This is what energy security is. If one day you do not have the fuel to run your vehicles and to man your security systems, then you are seriously in a crisis."

Carbon neutrality is leading us to a more disruptive scenario with sharper geopolitical competition, even as global cooperation is the need of the hour. The focus on Aatmanirbhar Bharat, which the Prime Minister has articulated, should cover all systems of energy.

As we cooperate with the rest of the world in seeking an answer to the challenges of climate change, we must implement decarbonisation through mechanisms such as the International Solar alliance. At the same time, we need huge investments that stabilise the supply of renewables and increase flexibility through technological innovation.



AR. NO. 03

GEOPOLITICS OF ENERGY SECURITY

The route to carbon neutrality will affect global power plays and lead to fresh geopolitical alignments.

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Energy has been the principal driver of the modern industrialised world. It is, therefore, hardly surprising that this gargantuan appetite remains at the heart of geopolitical tensions. Every aspect of the energy supply chain - production, control and consumption- has been bitterly contested in corporate boardrooms and in far-flung battlefields spread across the world. This insatiable hunger has created a new challenge - the very survival of planet Earth. It is an irrefutable fact that the unfettered consumption of fossil fuels over the last century-and-a-half has dangerously afflicted Earth's delicate environment. Thus, the traditional geopolitical pulls and pressures, which were based on owning/ controlling the flow of fossil fuels, have been made even more complex by climate change. From now on, those who own, produce and control green energy sources will be calling the shots. As per Mr Ranjan Mathai, the route to carbon neutrality will affect global power plays, just like every single energy system in play has been built around existing power relationships.

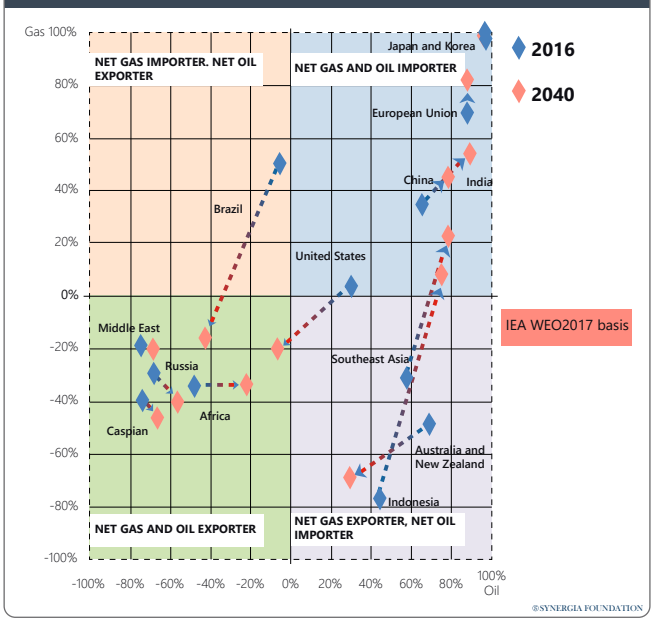
ENERGY INTERDEPENDENCE

Energy remains a constant factor in all calculations relating to the prosperity and growth of a nation-state. For developed countries, it is undeniably a means to retain the high quality of life that their citizens have become accustomed to, while for nations like China and India, it is the foundation on which they can hope to compete with their richer counterparts. Then there are countries who have been at the centre of the oil industry for almost a century, growing rich on oil surpluses. A global shift to renewables will prove to be a disruptive event for their national destinies.

As explained by Mr. Nobuo Tanaka, the oil and gas import dependency of different countries can be discerned from the accompanying quadrant.The blue area indicates the importers of oil and gas, while the green quadrant denotes countries that are exporters. Currently, China, India, Europe, Japan and Korea are importing more and more, destined to increase their dependence over the coming years. On the other hand, the U.S. is moving away from a net importer status to a net exporter, thus joining Russia and the Middle East. This move will result in the country's interests becoming more aligned with that of the exporters. This was seen very clearly during the pandemic when the U.S., Russia and Saudi Arabia came together to reduce oil/ gas productions.

> "The net importers - China, Europe, Japan, Korea, and India - have no option but to look towards renewable energy to reduce the stranglehold of oil/ gas producers on their economic jugular"

TWO SCENARIOS FOR ENERGY INDEPENDENCE:
A) US, RUSSIA, SAUDI AND OPEC BY FOSSIL FUELS;
B) CHINA, INDIA AND EU BY RENEWABLE ENERGY.



Renewables are now driving energy strategies with a national security connotation. The natural fallout of this directional change would be the coming together of such countries to create energy security and sustainability, relative to oil and gas producers. The icing on the cake is that renewables will make a sustainable climate policy more achievable.

Under these competing compulsions, there are bound to be security risks that have to be tackled amicably. While the world remains largely dependent on Middle East oil, the stability of that region remains a paramount concern. Similarly, newer pressures like the demand for critical metals and minerals are emerging, most of which have a bearing on renewables.

New rivalries will raise their head, as nations compete to garner these resources in the underdeveloped parts of the globe.

The International Energy Agency (IEA) is of the belief that energy security is moving away from oil to renewables. In fact, we may see a greater balance between the two types of energy, as comprehensive energy supply strategies are being conceptualised. IEA's ambitious goal of 'net zero' by 2050 is unachievable, unless there is an international collaboration.

Mr Nobuo Tanaka cautions, "If international collaboration cannot happen, we cannot achieve net-zero by 2050; it will take much, much longer time to reach there. So, the priority of action in international collaboration is very important."

Citing from Yuval Noah Harari's book, '21 Lessons for the 21st Century,' Mr Tanaka shortlists the three most prominent risks faced by mankind - nuclear threats and weapons proliferation, technological breakthroughs in artificial intelligence, and climate change.

It will be vainglorious to imagine that one country on its own can overcome these risks. "Nationalism cannot provide the answer for these global issues. Only global identity or international collaboration will have the answer," emphasises Mr Tanaka.

EXPERT INSIGHTS

Mr. Ranjan Mathai, Former Indian Foreign Secretary and High Commissioner to the U.K, 106th Synergia Forum: 'Geopolitics of Energy in the Transformation towards Carbon Neutrality?'

"We can now see new trading rules coming in, which will create protectionism by the raising of carbon-related barriers like border taxes. Already, the EU has commenced this, creating huge problems for the Global South. The global dialogue gets skewed, as the debate shifts away from what we had all agreed was 'common but differentiated responsibilities', to the sharing of the common carbon space in a very inequitable way. So, this is one geopolitical element that needs to be taken care of."

WHAT LIES AHEAD

As we transit from a phase of total dependence upon oil/gas energy to a combination of fossil energy and renewables, the nature of interdependence and geopolitical linkages to energy may witness some changes, albeit not too drastic at this early stage.

Take, for example, electrification, which is a big part of the future. Electricity is a local issue, it is easily generatable, and there are myriad sources for this. However, it has spread risks to both the demand side as well as the supply side.

The supply-side issues would include factors like the availability of critical minerals, whether it is lithium, cobalt or rare earths. This is creating new power centres, new centres of concern, as well as opportunities for different countries in the world.

There will be challenges when countries like China occupy a dominant position in the renewable energy sector, through its monopoly over critical minerals and materials like solar panels. The impact will be felt globally if China or other controlling nations choose to increase prices by 10 or 20 per cent.

This potential shift has been fuelling the current technology race. Europeans, in particular, see great opportunities in taking the lead as technology providers. This has also spurred the desire to create global partnerships. The interest in India is growing, as it may see a tripling of its energy consumption from present levels.

It is also important to recognise that net-zero does not imply zero oil and gas. What it means is that there may be fewer investments in these sectors over the following years.

This means that there will be more concentration of oil and gas in fewer areas, with the price being determined by a few sets of players, 52 per cent is already concentrated in the OPEC. This will have its own reverberations in various sectors, like, for example, in aviation.

Hydrogen introduces a whole new set of opportunities and shifts. Granted, there are certain challenges and problems associated with it that still need to be resolved, but in theory, it is true energy independence. This, in turn, will reshape global geopolitics, in terms of how countries associate with each other.

RESET IN ENERGY GEOPOLITICS

There is a strong possibility that energy independence will be based upon renewable energy and hydrogen. It is the practical application of this idea that will require collaboration amongst nations-sharing technology, finances, brains, and resources as no single country will have all the

answers and the means.

This will see different countries looking for different partnerships. For instance, the EU or the U.S. may align with India, Russia may draw closer to China, etc.

The world is poised for a great reset in energy, in terms of production and distribution, as also in terms of financing. All this will impact geopolitics, both regional and global.

However, the question arises whether there will be genuine collaboration/ cooperation or whether nations will pander to their own nationalistic ideals.

"Newer technology and systems that are on the anvil, and some that are being closely held, if they are not shared as 'global commons' would only reinforce the dominance of current major technological powers," warns Mr Ranjan Mathai.

New trading rules are being introduced that could generate protectionism by raising carbon-related barriers, a sort of border tax. EU has already introduced its Carbon Border Adjustment Mechanism (CBAM) that portends to create a huge problem for the Global South.

The global dialogue then gets skewed, as the debate shifts from what had been agreed as 'common but differentiated responsibilities' to simply sharing the common carbon space in a very inequitable way.

Consequently, the shift in the balance of power within countries, as one moves from one set of industries to another will also play out on a global scale.

This will strengthen the EU and the U.S., and perhaps Japan. China, too will benefit, and it is no surprise that efforts to build the Belt & Road Initiative includes energy connectivity as an important element.

As per Mr Tanaka, even the new hydrogen-based grid would run partly along the lines of the BRI.

Of course, other countries have recognised this and are trying to counter it. Japan and India have engaged in talks about energy connectivity, right from the Indo-Pacific to all the way to Africa. The U.S and EU have also considered similar plans.

The critical part now is how to mesh it all together. To transform any form of energy in the atmosphere to usable electricity or usable heat and light, certain catalysts are required.

Explaining this further, Mr Ranjan Mathai says, "For example, if hydrogen is touted as one of the most important elements in the future, I look forward to hearing whether the technologies are available to do away with Iridium, Platinum and Palladium, which are used in electrolysers. Suddenly this could become an absolutely new bottleneck."

Obviously, the security of supply and volatility of prices of some of these elements will play a big role in geopolitics. After all, the geographical concentration of critical minerals is even more acute than that of oil and gas. This will also create new revenue streams. Mr Mathai referred to studies that showed that while in 2020, the total revenue stream from coal was around $400 billion and the so-called transformative minerals was $50 billion, by 2040, coal will be down to $150 billion, and transformative minerals will be hovering just below $300 billion.

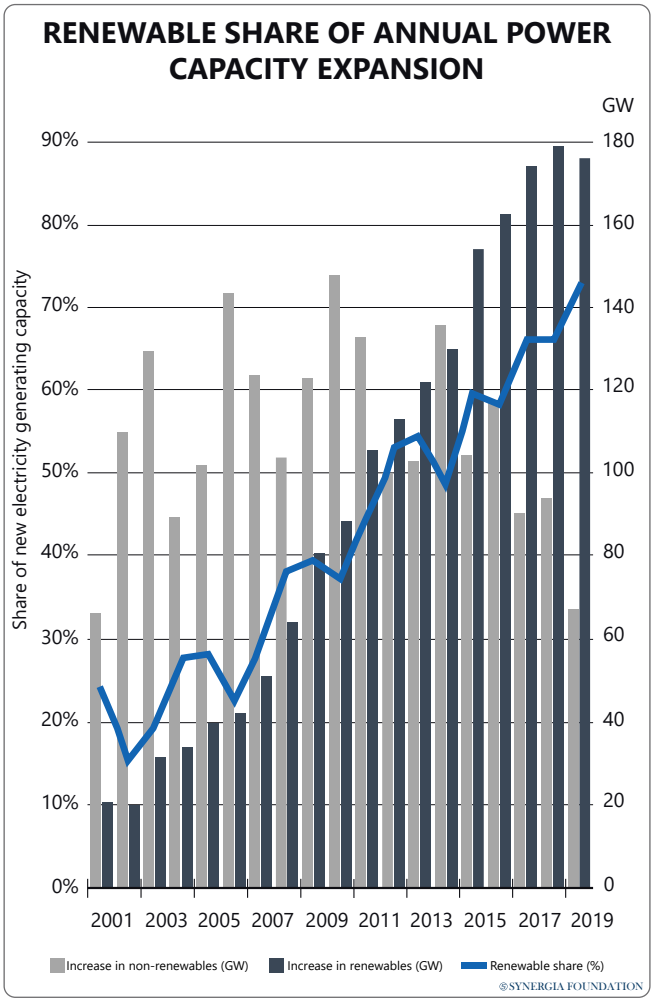
This money will flow into a very limited number of countries.

In lithium, cobalt, and rare earths, the top three producers control over 75 per cent of current production - China alone is over 60 per cent.

In rare earths, it is closer to 90 per cent, if the processed minerals are included. How is the world going to manage this kind of transition? Even with recycling, the dependence on supply chains, countries, regions, and supply routes will open a new era of geopolitics, which is why former U.S. President Donald Trump had come out with his critical mineral strategy.

The EU has also done the same. Meanwhile, India has created a company called Kabil that intends to go out and look for critical minerals.

However, the country is still far behind the rest of the world. It needs to catch up and make sure that these critical producers do not get locked into exclusive relationships.



AR. NO. 04

THE ENERGY SQUEEZE

A wholesale deployment of renewable energy may spell the creation of new strategic chokepoints, rendering the geopolitical arena as volatile and uncertain as before.

SYNERGIA FOUNDATION
RESEARCH TEAM

For centuries, global power structures have been shaped by the production, distribution, and consumption of energy. While coal and steam power had dominated the energy landscape during the Industrial Revolution, they were soon replaced by the oil and gas industry in the 20th century. Oil, in particular, had evolved into a multimillion-dollar enterprise, influencing the course of relations between nation-states.

In recent years, however, the deleterious impact of fossil-fuel usage has become hard to ignore, forcing governments to respond to the clarion call for 'net-zero emissions'. Renewables have been increasingly deployed as a sustainable energy source, with technological innovations rendering them more economically feasible than before.

As this global energy transformation gathers steam, it is hoped that it can drastically reduce the risk of conflicts and geopolitical instability. Unlike oil and gas, which are concentrated in a few geographical areas, renewables are less dense and more widely distributed around the world. This means that the energy security of countries is no longer dependent on specific producers who control supply chains and manipulate prices.

> "More importantly, the stability of the energy economy will not be predicated on the safety of geographical choke points like the Straits of Hormuz"

In other words, 'supply-side geopolitics' is expected to be less significant in the post-fossil-fuel era. Others, however, contend that renewables will trigger new types of conflict in the geostrategic sphere. Given that critical materials are required to harness such energy sources, regions that possess substantial reserves of rare earths and other minerals are likely to wield considerable power. In this context, it is imperative to analyse this contrast between the de-concentration of renewables and the sub-concentration of critical minerals.

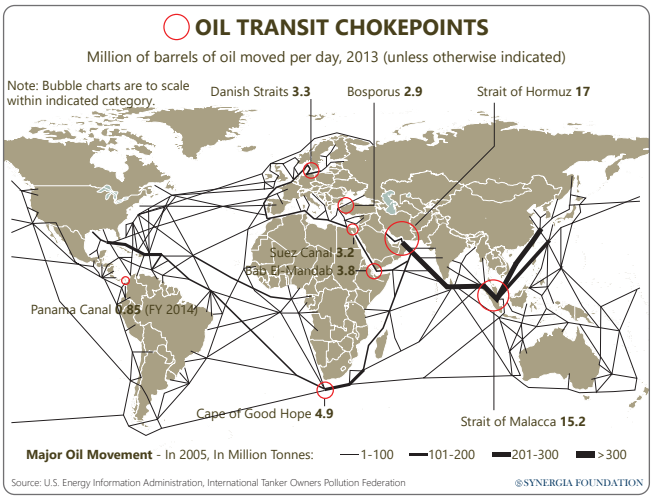
END TO ENERGY DEPENDENCIES?

Owing to their uneven geographical distribution, fossil fuels are currently shipped overseas for the benefit of energy-deficient countries. In this veritable milieu, the safety of maritime trade routes takes on paramount importance for global stability. For instance, the Straits of Hormuz and Malacca are some of the world's most important oil arteries, linking crude producers in the Middle East to key global markets. Other important shipping lanes include the Cape of Good Hope, Suez Canal, the Bab el Mandeb straits, the Turkish straits, Panama Canal and the Danish Straits.

EXPERT INSIGHTS

Mr. Ranjan Mathai, Former Indian Foreign Secretary and High Commissioner to the U.K, 106th Synergia Forum: 'Geopolitics of Energy in the Transformation towards Carbon Neutrality?'

"The security of supply and volatility of prices in critical minerals will play a big role in geopolitics. In lithium, cobalt and rare earths, the top three producers control over 75 percent of current production. China alone is over 60%. In rare earths, if you include the processed materials, it is closer to 90%. Even with recycling, the dependence on supply chains, countries, regions and if I may say, supply routes will open a new era of geopolitics. There is a possibility of technology overcoming this, but in the short run, there is no getting away from the fact that if an export control closes down one of your industries, you are in serious trouble."



These constricted passages can potentially be shut down by littoral states or hegemonic global powers to disrupt oil supplies if they so desire. For instance, in 2018, Iran had hinted that it would block oil flows through the Strait of Hormuz in response to the sanctions announced by the U.S., leading to a sudden spurt in prices for the end consumer. Therefore, oil importer countries are at the mercy of these limited maritime sea routes, which weigh heavily upon their energy security. Moreover, oil tankers traversing predictable waterways are extremely vulnerable to attacks by pirates, terrorists, and other armed groups.

Although many of these traditional chokepoints can be circumvented by using other shipping passages, the rerouting will significantly increase the transit time and cause substantial disruptions. In fact, the shorter Arctic route, or the fabled North-West Passage, if opened round the year thanks to global warming, would be a veritable bonanza for China. As of now however, it remains iced up for a major part of the year. In contrast to this, renewables are not susceptible to energy chokepoints. Whether it is wind, solar energy, biomass, hydropower, ocean energy or geothermal sources, they are available in one form or another in most geographical locations. As a result, countries can harness them from their immediate environment without relying on overseas trade and shipping lanes. This also implies that they can achieve energy independence and economic security without being subject to the currency fluctuations and volatile prices associated with fossil fuel imports.

RENEWABLE BOTTLENECKS

While theoretically, renewables have the potential to 'democratise' energy supplies, sheer greed, nationalistic fervour, and the inherent competition between nation-states can raise fresh barriers which may be even harder to surmount. With the accelerated transition to a net-zero future, the demand for solar panels, electric motors, batteries, wind turbines and other renewable energy technologies are likely to spike. Given that critical minerals and rare earths are essential components of this hardware, players that dominate the mining, production and processing of such resources will call the shots in the near and middle term.

Currently, China has a near-monopoly on many rare earths. It has managed to corner the market with its abundant reserves, low costs, and lax environmental standards in mining. From a geostrategic perspective, this is a potential energy chokepoint in global supply chains, which can be weaponised for narrow political and economic gain. In fact, the country has a history of doing this. As can be recalled, in 2010, Beijing had imposed an export embargo on rare earths after a territorial dispute with Japan. Similar events can be anticipated in the future if the supply of rare earths is not decentralised. Even worse, there is a growing fear that with the growing deployment of renewable energy systems, cartels may be formed around these critical minerals in a manner that is reminiscent of bodies like the OPEC.Ironically, rare earths are not as 'rare' as their name would signify.

Most of the 17 rare earth minerals are geologically abundant and can be found in Australia, Russia, Brazil, Thailand, Malaysia, U.S and even India. In many places, however, they are only available in diluted concentrations, rendering it economically unviable to extract and process these resources. As far as other critical minerals are concerned, there are certain regions that benefit from substantially higher reserves. For example, Latin America has rich deposits of copper, aluminium, iron ore, zinc, silver, nickel, lithium, and manganese.

Meanwhile, Africa is flush with platinum, manganese, bauxite, and chromium. Finally, battery supply is also susceptible to potential bottlenecks. From the cobalt mines in the Democratic Republic of Congo to the final production of lithium-ion batteries, Beijing controls the entire value chain. Countries like Australia, Chile and Argentina also dominate the production of lithium. If the future is indeed electric, then such geographical concentration of battery supply chains can be devastating in the event of trade wars or other geopolitical disruptions.

Assessment

The euphoria over the substantial gains made in renewables during the last decade and the universal acceptance of Net Zero-2050 can be dampened by the rise of new bottlenecks in the energy landscape. Therefore, it would be too premature to draw definitive conclusions about the impact of renewable energy in geopolitical equations at this juncture.

In the long run, technological innovation may lead to a true equitable energy supply devoid of the geographical concentration of supply chains. New solutions that reduce the need for rare earths and other critical minerals in renewable energy systems could possibly be developed. In fact, efforts are already being made to build cobalt-free batteries and wind turbines without rare earth materials.

State actors are also exploring the prospect of deep-sea bed mining to extract rare earths and critical minerals. If successful, this would expand global supplies and contribute to distributed energy systems in the world. However, the international community should strive for norms and standards that mitigate environmental damage and reduce frictions between littoral states and external powers over exclusive economic zones and international waters.

AR. NO. 05

GREEN ELECTRICITY: THE SOLUTION

With the ever-diminishing costs of renewable technologies, electric grids are becoming greener by the day.

SYNERGIA FOUNDATION
RESEARCH TEAM

As the clean energy movement picks up pace around the world, electricity is touted to be a key part of the decarbonisation solution. It is expected to replace a whole range of technologies that currently run on combust fuels like oil, gasoline, natural gas and biomass. Apart from reducing greenhouse gas (GHG) emissions, the use of electricity-based technologies is predicted to ensure more affordability and energy efficiency in the long run. To reap its full benefits, however, it will be critical to ensure that the process of electricity generation is as emission-free as its anticipated end-uses.

Currently, renewable energy resources only make up 26 per cent of the world's electricity production. According to the International Energy Agency (IEA), this will rise to 30 per cent by 2024. However, as economies bounce back from the effects of the COVID-19 pandemic, global power consumption is slated to increase at an unprecedented rate. With renewable energy capacity struggling to catch up, the growing demand for electricity will inevitably be met through fossil fuel generation. Eventually, however, technological innovation and policy incentives will guarantee the large-scale deployment of electricity-based technologies powered by renewable resources. This decarbonisation of the electric grid will, in turn, reduce carbon emissions in sectors like habitation, transportation and industry.

DECARBONISING ELECTRICITY

The use of renewable resources to produce electricity is hardly a novel concept. As early as 1893, the U.S. had established an alternating current hydropower plant, which supplied power to certain parts of California. The potential of tidal, wind and solar power were also discovered a century later. Nonetheless, the process of burning fossil fuels had proceeded unimpeded, as the generation and transmission of decarbonised electricity entailed substantial costs.

In recent years, however, the growing appetite for electrification in net-zero economies and the ever-decreasing prices of renewable technologies has spurred fresh momentum in this space. Solar panels, in particular, have become exceedingly popular with businesses, governments, and homeowners, as they are highly competitive and relatively low-margin.

They can be easily installed in large farms or on the roofs of buildings, with photovoltaic cells absorbing sunlight and creating electrical charges. Moreover, solar facilities can reduce their variability rates by storing electricity during the day and running at night. It is no surprise, therefore, that residential solar power is projected to expand to 142 GW by 2024. Even onshore wind capacity will increase, with the U.S. and China leading the way. Hydropower, however, will remain the world's primary source of renewable energy over the next few years.

EVOLVING APPLICATIONS

As economies accelerate their decarbonisation plans, it is envisaged that electrification will revolutionise three sectors – habitation, mobility, and industry. At present, a majority of commercial and residential buildings rely on fossil fuels to meet their energy needs. This includes space heating, water heating, and cooking, which can take up significant carbon space. For instance, the use of natural gas cooking stoves can release carbon monoxide, nitrogen dioxide, and other harmful pollutants into the air.

Switching to electrical appliances, on the other hand, promises to reduce these emissions. A case in point is the use of all-electric heat pumps, which can swap out gas furnaces and water tanks. Similarly, induction models can replace gas stoves or ovens. This progressive reduction of fossil fuel usage in buildings is not just helpful in stabilising the climate but also in reducing economic costs. In fact, a study by Rewiring America research has found that 85

per cent of U.S. households will save money on monthly energy bills if they resort to the use of modern all-electric equipment. Similarly, the electrification of the mobility sector is yet another critical opportunity. Currently, it accounts for approximately a quarter of greenhouse gas (GHG) emissions, with road transport being the primary culprit.

This is not helped by the fact that the private vehicle ownership and mobility needs of the global population continues to increase. In this context, replacing the internal combustion engine (ICE) in vehicles with electric batteries is expected to moderate the existing dependency on oil. Apart from its obvious climate benefits, this is a strategic advantage for importer nations who spend a large chunk of their foreign exchange reserves on steep petroleum bills. Moreover, the shift to electric cars and trucks will reduce air pollution by tempering tailpipe emissions. In fact, studies suggest that electrified transport offers significant opportunities for low-carbon transition, even in the absence of a decarbonised power sector. Of course, 'greening' the grid will only amplify the benefits, with an ever-decreasing amount of carbon emissions per mile. Such integration of vehicles into an efficient, clean energy network, however, will be predicated on the quality of associated infrastructure such as reliable recharging points.

Recognising the potential of electric vehicles (EV), the European Union has already assembled a series of measures to reinvigorate the automotive sector and emerge as a leader in EVs. In the U.S., President Joe Biden has issued an executive order that seeks to make half of all new vehicles sold in 2030 electric. Other countries like India and Japan have also established concrete strategies for transport electrification.

As a result, it is envisioned that the EV sector will scale new heights over the coming years. In fact, it has already registered record sales and penetration in key markets, despite the economic crisis triggered by the ongoing pandemic. Finally, electrification is expected to find important applications in the industrial sector. As per the 2020 database prepared by 'Our World in Data', direct industrial processes alone contribute to 5.2 per cent of GHG emissions. Driven primarily by the production of materials such as cement, chemicals and petrochemicals, these processes use fossil fuels in heating as well as in feedstock or raw material. When heated to very high temperatures, the materials emit carbon dioxide, necessitating a shift to clean energy substitutes. In this regard, electricity can theoretically be employed as an energy source in processes like heating. For instance, electrolytic reduction technology is considered to be a potential alternative to natural gas furnaces, with the ability to reduce CO_2 emissions in several industries, including chemicals, textile, paper and wood.

CHALLENGES AHEAD

Despite their many advantages, renewables are only available intermittently, posing challenges for the reliability and resiliency of electric grids. For example, wind or solar power is not comparable to conventional power sources, which can be turned on and off. Their availability is subject to variables like the weather or time of day, requiring grid operators to adjust the demand and supply accordingly.

In other words, renewables may generate more power than what the grid uses at certain times, while it produces only a fraction of what the grid needs on other occasions. Against this backdrop, it becomes important to plan a demand-supply response and peak load management. Depending on the geographical conditions and other particularities, every community may have to devise its own portfolio of options, including grid storage, more responsive loads, flexible conventional generation, new transmission and changes in power system operations.

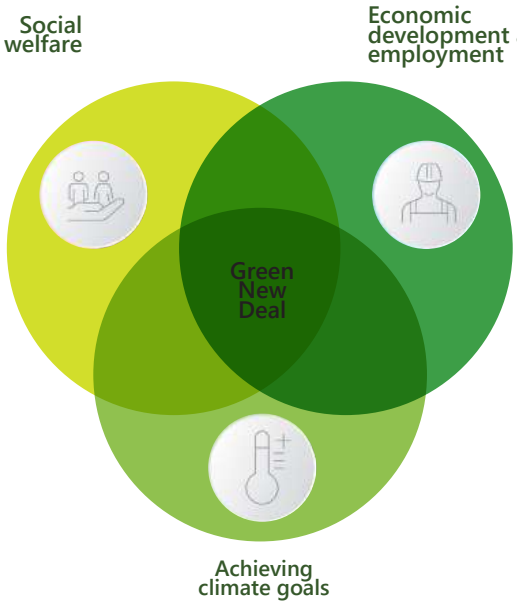
Yet another concern is the high costs associated with electrification, including the upgradation of existing infrastructure. If humans are to achieve their clean energy goals through decarbonised grids, this would entail the establishment of thousands of solar farms, wind turbines, storage batteries, transmission lines and other capacities. Even the installation of heat pumps in buildings, charging infrastructure for EVs, and the electrification of industrial processes will carry high upfront costs. Owing to such barriers in economic and technological feasibility, policymakers need to provide tax credits and other price benefits that incentivise the transition to electric technologies.

> "For buildings, in particular, prescribing all-electric codes and updating standards for new appliances will go a long way in accelerating the process of electrification"

In this regard, it is encouraging to note that jurisdictions like India are working towards a definitive roadmap for the electrification of the economy.

Together with hydrogen, clean electrification lies at the heart of energy transformation.

THE ENERGY TRANSITION IS AT THE HEART OF THE GREEN NEW DEAL



Source: Global Renewables Outlook

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AR. NO. 06

INDIAN QUEST FOR ENERGY INDEPENDENCE

Several obstacles need to be surmounted in India's quest for oil and gas-based energy independence.

SYNERGIA FOUNDATION
RESEARCH TEAM

The transition path from oil-based energy would be different for every country. Therefore, it would be prudent to assume that India's transition too would be specific to its own peculiar requirements and compulsions.

As per Mr. Vivek Rae, the former Secretary of the Indian Ministry of Petroleum and Natural Gas, India represents a very complex and unique case. Citing the latest International Energy Agency's (IEA) report on India, he explains, "India imports 40 per cent of its primary energy requirements. Its dependency on imported energy is 40 per cent overall when one considers primary energy consumption. The oil dependency is much higher, at about 75 per cent, and this is not going to change. This is going to remain 40 per cent till 2040." This underscores the complexity of securing reliable supply chains, negotiating contracts and a continuous search for newer sources.

THE GROWING APPETITE

As the Indian economy grows, so does its energy demands; the net dependency on oil imports is expected to increase from 75 per cent to 90 per cent by 2040. A similar trajectory is being projected for natural gas - from 20 per cent in 2010 to 50 per cent in 2020 and likely to rise to 60 per cent in the next two decades. Therefore, the Indian path will largely be confined to high import-dependence. From a foreign policy perspective, therefore, it becomes important for the country to effectively manage its relations with the Middle East.

There are several underlying causes for this surge in demand. A major reason is that vehicle ownership per thousand population in India today is about 70 and rising. This makes India an attractive market for automobile manufacturers, even though the vehicle density remains much lower than the U.S. (800 per thousand) and China (200 per thousand). One can only imagine the spike in demand for fuel, when the vehicle density rises to 350 per thousand, a five-fold jump, in the next few decades!

The obvious solution lies in Electric Vehicles (EV). Mr. Rae opines that it is imperative for India to turn 30 per cent of its vehicles into EVs by 2030, even though by global standards, this percentage would be small. Many western countries intend to do away entirely with the internal combustion-powered vehicles by this timeline, in order to achieve Net Zero by 2050.

However, for India, back calculations make it amply clear that supply chain constraints would make it impossible to

EXPERT INSIGHTS

Mr. Vivek Rae, Former Secretary, Ministry of Petroleum and Natural Gas, Government of India, 106th Synergia Forum: 'Geopolitics of Energy in the Transformation towards Carbon Neutrality.'

"So far, our production trends have been dismal. The Explorations and Productions sector was opened to the private sector in 1991, and for the last three decades, the government has been striving to attract private investments through different policy regimes, the largest of them being the exploration and licensing policy launched in 1999. This has actually not been very successful. Of the 250 contracts which were signed, 80% of them have been relinquished by the bidders. They did not think it worth their while to proceed with those contracts. Therefore, what India urgently requires is a policy framework that encourages investments in E&P and makes every effort to bring out every molecule of gas and every drop of oil, so that we reduce our import dependence."

raise it any further.

Clearly, this will have huge implications on transportation fuel and gas because these could also be fuelled by LG or CNG. Therefore, there is no escape from the fact that Indian demand for fossil fuels is going to be increasing substantially - doubling or tripling in the next two to three decades.

BUILDING ENERGY INDEPENDENCE

For the last fifty years, India has been spending a considerable amount of its precious resources to seek new oil finds within its boundaries and at times, overseas. As per Mr. Rae, the Indian resource base is spread over 26 sedimentary basins stretching over about 3 million sq km of area. However, only 50 per cent of the basins have been appraised so far, that is, surveys, exploratory wells etc. In the remaining sedimentary basin, there lies untapped potential; a study by BP and IHS assesses this at approximately 100 trillion cubic feet, which is equivalent to 20 billion barrels of oil.

Therefore, notwithstanding the constraints of investments, India must have a more vigorous exploration and development programme, even if it runs contrary to the latest IEA advisory that discourages fresh investment into Explorations & Production (E&P). "What India urgently requires is a policy framework that encourages investments in E&P and makes every effort to bring out every molecule of gas and every drop of oil, so that we reduce our import dependence," counsels Mr. Rae.

A CHALLENGING QUEST

Sadly, Indian production trends have been dismal. The E&P sector was opened to the private sector in 1991, and for the last three decades, the government has been striving to attract private investments through different policy regimes, the largest of them being the exploration and licensing policy launched in 1999. The scheme has not been very successful, and as per Mr. Rae, out of about 250 contracts signed, 80 per cent were ultimately relinquished by the bidders as they did not appear worth their while to proceed further. This lack of progress is validated by oil production figures which peaked about a decade ago at 38 million today, which today has shrunk to about 30 million tons. Similarly, peak gas production, which was 52 billion cubic metres a decade ago, is now at 28 billion cubic metres.

Now, one of the most important critical factors which come into play is the pricing regime because the signals that the price sends out are ones based on which investment decisions are taken. As far as crude oil is concerned, India moved to import parity pricing in 2001-2002. When you produce a barrel of crude in India, you get the same price as the international market, whether it is Brent or Dubai or a mix of the two.

But on gas pricing, there has been a huge problem. The gas pricing formula that the government has adopted from time to time has really under-priced a very scarce resource and therefore imposes a huge penalty on producers. The IEA 2021 report puts it very succinctly, "[...] relatively low level of gas prices over the past few years has, however, acted as a disincentive for significant investments in domestic production."

In the same vein, Rajiv Kumar of BP is quoted by Vikram Mehta in his recent book as saying, "While there is significant potential, it has not been realised due to suboptimal gas pricing policies coupled with issues related to contract management."

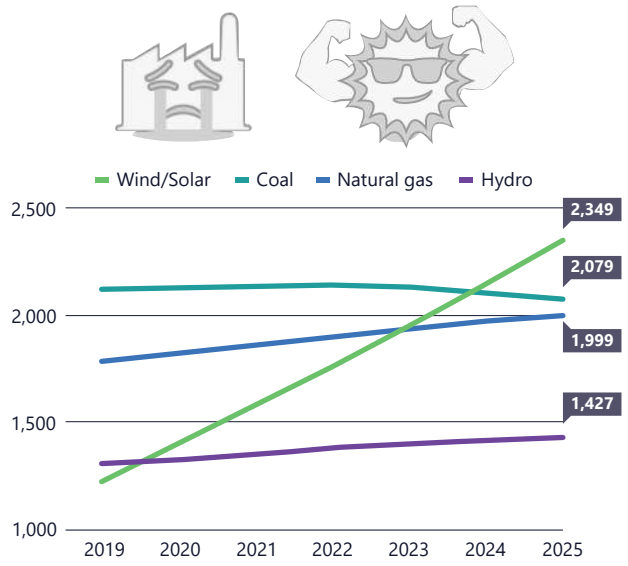
> "Therefore, it goes without saying that India needs to further revolutionise the gas pricing framework, despite its efforts in the last five years to liberalise the pricing regimes. The production must be rewarded through remunerated pricing"

"No company will conduct the E&P business by producing gas at $ 5-6 for a MMBtu to be paid only 1.5 or $2 per MMBtu", says Mr. Rae. The current gas pricing, $1.79 per MMBtu for fields where the government controls pricing, is about the lowest in the world. In some contracts, the government does not have a role. But in those that it does, 85 per cent of the gas produced is governed by this gas pricing regime. It is only 15 per cent, which escapes the regime. While some liberalisation has happened for new fields and new production, where there is freedom of pricing and marketing, legacy production is constrained by the old policy framework.

There is no incentive for production enhancement, for bringing in new technology, for enhanced oil recovery or for more investment in increasing the productivity and output of the existing gas fields. If the gas pricing policy for legacy production is also liberalised, it would create an incentive and reap quick returns, by increasing the profitability and viability of investments in existing fields.

WIND, SOLAR DOMINATE ENERGY FUTURE

Total global installed power capacity from 2019-2025, by fuel and technology (in gigawatts)



Source: IEA

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AR. NO. 07

A FUEL FOR THE FUTURE

Hydrogen-based technologies hold out the promise of a more sustainable energy supply, within the ambit of existing energy models.

SYNERGIA FOUNDATION
RESEARCH TEAM

Hydrogen holds out a glimmer of hope to a world staring at climate change of calamitous proportions. From the days of the first manned balloons to the zeppelins of World War I, hydrogen has always held out the promise as a fuel for the future.

The Green Hydrogen Catapult Initiative endeavours to turn this dream into a reality. Launched last December by the UN Climate Change, it aims to scale up green hydrogen production over the next six years by incorporating industry leaders like ACWA Power, CWP Renewables, Envision, Iberdrola, Orsted, Snam and Yara.

The proposed target is the production of 25 gigawatts by 2026 from renewables-based hydrogen production, cutting the cost below $2 per kg. This would be an increase of 50-fold!

GOLDEN AGE OF HYDROGEN

Since 2014, companies like Toyota in Japan, used to be the leader in the production of hydrogen. Now, Europe and China have also joined the race, because they are more serious about the use of hydrogen in industry and heavy transportation segments.

> "The European hydrogen strategy is especially remarkable. The region is trying to use the current natural gas pipelines as a backbone for hydrogen, gradually replacing natural gas with the hydrogen network"

Thus, not only power grids but hydrogen connection could be a very interesting way forward for net-zero economies.

After the Japanese prime minister announced carbon neutrality last October, the Japanese Ministry of Economy, Trade and Industry has released its energy outlook for carbon neutrality by 2050.

The electric power sector will be fully decarbonized, while lots of electrification by renewable hydrogen may happen in the industrial sector.

Fourteen priority industrial sectors will see the use of hydrogen. Even the nuclear power sector could be used for hydrogen production.

JAPAN TAKES THE LEAD

In Japan, there is an interesting model proposed by JERA, which is a joint venture of Tokyo Electric and Chubu Electric.

This is the largest thermal power company in Japan and the largest procurer of natural gas or liquid natural gas in the world.

They have announced targets for carbon neutrality by

EXPERT INSIGHTS

Mr. Nobuo Tanaka, Former Executive Director of the International Energy Agency, 106th Synergia Forum: 'Geopolitics of Energy in the Transformation towards Carbon Neutrality.'

> "50 years ago, Japan successfully converted LNG as a global commodity, replacing oil and coal. But maybe now Japan should move towards clean hydrogen or clean ammonia to reduce its carbon emissions further."

2050 through the use of ammonia and hydrogen.

Today, co-power plants in Japan use 20 per cent of Ammonia. However, eventually, total ammonia plants will replace them along with gas turbine power plants running on hydrogen.

Hopefully, clean ammonia and clean hydrogen will drastically reduce CO2 emissions.

The Japanese government is now testing how this hydrogen can be transported around the world. For the Middle East, Australia, or North America, it can be transported as liquid hydrogen ammonia or as organic hydrate.

Pushing the case for greener fuels, Mr. Nobuo Tanaka, the former executive director of the International Energy Agency (IEA), says, "50 years ago, Japan successfully converted LNG as a global commodity, replacing oil and coal.

But maybe now Japan should move towards clean hydrogen or clean ammonia to reduce its carbon emissions further".

Meanwhile, Mr. Katsuhiko Hirose, the former head of engineering in Toyota, has proposed the idea of a hydrogen pipeline in Japan. There are also murmurs of a pipeline network in Northeast Asia.

Russia is interested in selling hydrogen to Japan, in addition to its supplies of natural gas.

As a result, a similar kind of pipeline connection for hydrogen could be considered in Asia, just as it is being contemplated in Europe.

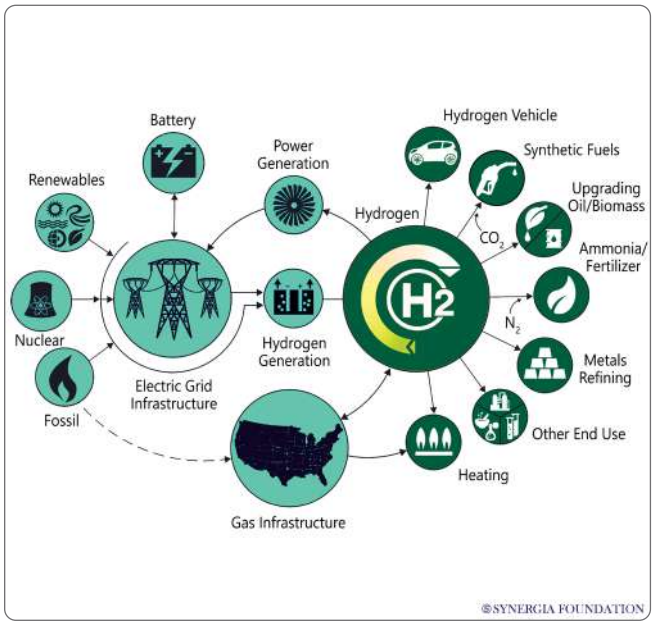
Alternatively, there is an idea for connecting power grid lines to enhance the use of green renewables.

Masayoshi Son of Softbank has proposed this concept of an Asian Super grid. Together with this grid connectivity, a hydrogen pipeline can enhance the global use of clean energy.

With the large-scale deployment of hydrogen, a whole new set of opportunities and shifts can be expected in the geopolitical chessboard.

Granted, there are some challenges that need to be overcome to achieve true energy independence.

Nevertheless, the use of hydrogen genuinely allows countries to consider a combination of clean energy sources, triggering geopolitical realignments and altering the ways in which countries associate with each other.



Did You Know?

On 8th July 2020, the EU published a comprehensive 'Hydrogen Strategy for a Climate-Neutral Europe', with the objective of making the region a pioneer in the use of hydrogen. It was perceived as a critical vector for bridging the gap between electricity production from renewable energy and the goal of decarbonisation by 2050.

Although emphasis was placed on green hydrogen, the bloc also recognised the role of other low-carbon hydrogen in the interim phase. As per the published strategy, the EU would achieve its objectives in three phases:

First Phase (2020-2024)**:** The strategic objective is to decarbonise existing hydrogen production. This phase relies on the installation of at least six gigawatts of renewable hydrogen electrolysers in the EU by 2024 and the production of up to one million tonnes of renewable hydrogen.

Second Phase (2025 -2030)**:** The strategic objective is to make hydrogen an intrinsic part of the integrated energy system in Europe. During this phase, the EU will aim to install at least forty gigawatts of renewable hydrogen electrolysers by 2030 and the production of up to ten million tonnes of renewable hydrogen.

Third Phase (2030-2050)**:** The strategic objective is to ensure that renewable hydrogen technologies reach their maturity and are deployed at a large scale in "hard-to-decarbonise sectors."

AR. NO. 08

ELECTING 'GREEN' LEADERS

A truly effective climate change mitigation strategy is predicated on an informed and effective leadership with a diverse global perspective.

SYNERGIA FOUNDATION
RESEARCH TEAM

Rife with bleak projections about the Anthropocene, the latest report by the Intergovernmental Panel on Climate Change (IPCC) has reinvigorated the global call to action. Yet again, it underscores the pressing need to put an effective climate policy in place by 2030. Declaring their willingness to adhere to new targets for reduced emissions, China, Japan, South Korea, and the European Union have shown the way. Although India is an outlier, there is considerable pressure on the country to announce its own net-zero deadline, as the third-largest emitter in the world. Other state parties to the Paris Agreement are also expected to update their pledges, prior to the meeting of the 'Conference of the Parties' (COP 26) in November, 2021.

Despite the considerable strides made in international collaboration, however, there is much to be desired. Most importantly, it is important to acknowledge that the climate crisis is deeply interwoven with a leadership crisis. Decision-makers in governments, industries and nongovernmental bodies are continuing to dither as the planet runs out of time. They tend to prioritise national interests or profits, deferring meaningful action in the environmental policy space. As a result, a radical overhaul of governance frameworks is the need of the hour, especially in global, national, subnational, and corporate bodies. This can only be achieved by instituting a young, diverse, and intersectional leadership.

IS NATIONALISM COUNTERPRODUCTIVE?

Climate change is a global phenomenon that makes no concessions for geographical, political, or ethnonational boundaries. Therefore, all nations, without exception, have a critical stake in addressing the shared threats of greenhouse gas emissions, with mitigation strategies spilling over jurisdictional constraints. However, such emphasis on 'universal solidarity' often comes into conflict with the 'nationalist' world view espoused by many people. The Westphalian model has encouraged relentless competition between states, requiring governments to look out for their own. This translates into political rhetoric that seeks to maximise short-term gains for domestic companies and individuals while ignoring the larger good or global commons. Climate change has become its most agonising battlefield. For example, in richer countries, nationalists often object to the principle of 'common, but differentiated responsibilities', which requires them to cede carbon space and compensate less developed economies for their historical emissions. This was particularly evident in the political stance adopted by former President Donald Trump, who had critiqued the Paris Agreement for damaging the domestic economy and 'unfairly' benefiting large developing countries like India and China. Meanwhile, populist national leaders in developing countries seek to prolong the status quo on carbon emissions by citing the developmental needs of their population. For instance, President Jair Bolsonaro of Brazil has issued multiple public statements that indicate his perception of environmental protection as 'limiting' Brazilian businesses. This has been most evident in his

EXPERT INSIGHTS

Mr. Nobuo Tanaka, Former Executive Director of the International Energy Agency, 106th Synergia Forum: 'Geopolitics of Energy in the Transformation towards Carbon Neutrality?'

"Nationalism cannot provide us the answer for global issues (like climate change). Only global identity or international collaboration can pave the way for future sustainability. Other than nation-states, stakeholders like women and the youth will play a much more important role in the future."

ruthless exploitation of the Amazon forests, the carbon sink of the globe. As climate change and ecological damage exacerbate resource constraints, this exclusionary rhetoric can potentially manifest in the form of xenophobia, further undermining international collaboration. To prevent such eventualities, it is imperative to elect into power leaders with a truly global vision who can reconcile the short-term energy needs of their countries with long-term emission-reduction goals. The same leadership qualities are also desirable in decentralised bodies like sub-national governments and corporate governance structures, which pursue their own climate targets.

A GENDERED LEADERSHIP

Over the years, several studies have indicated that women are disproportionately affected by environmental disasters and the collapse of ecosystems. For instance, UN figures suggest that 80 per cent of the climate-induced displaced populations are women. Gender-based barriers prevent them from accessing land, financial services, social capital, and technology which can be useful in mitigating the effects of climate change. They also tend to be more economically disadvantaged than men, forced to undertake unpaid roles relating to housework or physical and emotional caring, which puts them at special risk of environmental injustice (Source: UN Environment Programme). These vulnerabilities are amplified when gender intersects with race, religion, class, caste, ethnicity, national origin, disability or other historically marginalised identities. To take an example, women from indigenous communities may be more susceptible to climate risks, as centuries of settler colonialism and industrialisation would have degraded their ecological landscape, rendering them vulnerable to natural disasters.

Similarly, Adivasi women in India who depend on the forests and other natural resources for their livelihood are more severely impacted by climate change as compared to their urban counterparts.

> "Against this backdrop, it is important to account for the nuances of social hierarchies and privileges when tackling climate change"

However, many of the environmental movements today lack a diversity of perspectives and people, with men from developed countries dominating leadership positions and corporate boards.

This skewed participation in decision-making processes can compound inequalities and prevent women from fully contributing to climate-related planning. Therefore, to incorporate a gendered and intersectional lens in policymaking, it is critical to elevate a new kind of climate leadership, which devises solutions based on empathy and empowerment.

In this context, there is a growing body of scholarship which demonstrates that women's leadership and equal participation can result in better outcomes for climate policy.

They are particularly adept at sustainable resource management, whether it is at the household or the larger community level. It is also observed that women in government positions are more likely to conclude international treaties that seek to reduce climate change and global warming. Going forward, therefore, it is exceedingly important to increase their involvement as agents of change.

VOICE OF THE YOUTH

Climate change threatens future generations who have a critical stake in the health and safety of the planet. As articulated by the Paris Agreement, 'intergenerational equity' is a guiding principle of climate action. Far from being passive victims of ecological damage, however, the youth are increasingly adopting a greater role as active contributors in the field of environmental policy. Through their decisive interventions in education, science, technology, and law, they have generated momentum towards building a climate-resilient society. By virtue of their social media skills, they have also spearheaded campaigns for behavioural change, which encourage sustainable production and consumption patterns. Children and teenagers, in particular, are perceived to have higher integrity and greater moral authority in environmental advocacy. Unlike adults who need to balance their activism with the pressures of finding employment and earning a stable income, young climate advocates are not bound by any socio-political constraints. They are free to protest and voice their concern without any filters whatsoever. Recognising this, it is vital to incorporate the perspectives of the younger generation in global strategies for climate change mitigation and adaptation. Partnerships should be developed between governments, international bodies, nongovernmental groups, and youth organisations for joint environmental initiatives. It is also important to involve the youth in consultation processes that review the nationally determined contributions of every country, thereby paving the way for a more inclusive and sustainable policy in the long run. At the end of the day, younger generations are well-placed to helm decision-making processes, as they stand to lose the most from climate-related disasters. They need to be acknowledged not just as leaders of tomorrow but as trailblazers today!

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