ENERGY EFFICIENCY SERVICES LIMITED
A JV of PSUs under the Ministry of Power

# INNOVATING ENERGY

Edition 39 | April 2022

## Green Hydrogen: Fuel for a sustainable future


Top energy trends from India & across the globe







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# Editor's note

**Dear Reader,**

With an aim to limit the global temperature rise to 1.5 °C, an urgent and swift adoption of multipronged approach is required. The first approach is Energy Efficiency followed by developing clean and environmentally sustainable alternative fuels, transition to newer and promising technologies, switching fuels are of utmost importance. Very recently on 26 April 2022, the country observed a rise in power demand by more than 201 GW and coal supply falling short. This poses a challenge in meeting the ever-growing energy needs, more importantly through clean and sustainable energy resources. Production of hydrogen must be switched to green hydrogen by utilizing renewable energy resources. Storing variable renewable energy by producing green hydrogen overcomes the intermittent nature of renewable energy. Targeting strategic demand centers and supplying green hydrogen through pipeline will not only overcome the challenge of meeting RPO but also reduce transportation costs and emissions, making logistics greener.

Across the world, hydrogen is being regarded as the fuel for the future and a key enabler for sustainable energy security. Hydrogen can also compliment India achieve its targets of generating 500 GW of renewable energy, decarbonising the power sector by reducing dependency on oil and coal, and delivering on its commitment to achieve net-zero carbon emissions by 2070.

The country has outlined aggressive plans to include green hydrogen in its energy mix. The focus was evident in the announcement to demonstrate hydrogen-fueled transportation. Prime Minister Narendra Modi has launched National Hydrogen Mission (NHM) on August 15, 2021. Within eight months of the announcement, the Government notified the Green Hydrogen Policy in February 2022. A month later, Union Transport Minister Nitin Gadkari, who has been championing alternative fuel, drove to the Parliament in a hydrogen-powered car. Minister's office explained on a social media platform that the move was aimed at spreading awareness about Hydrogen-based Fuel Cell Electric Vehicle technology and the benefits of a hydrogen-based economy in India.

Hydrogen had been spoken about for a long time before this, but it is only in the past couple of years that it has truly come into the spotlight in the context of a net-zero economy. Back in 2008, when I was working with Electrical Research and Development Association, hydrogen storage was a topic of academic interest, a topic that required more research & development before real-life applications could be identified. Now, 14 years later, Green Hydrogen is more than just theory; it is potentially the answer to many questions on how we can use alternate energy sources for our industrial and transportation needs. The UK, for instance, has introduced HydroFLEX, a hydrogen-powered train, as a part of its efforts to reduce its emissions. In November last year, there were reports abroad on the launch of a hydrogen-powered bike that's designed to take advantage of the higher energy-to-weight ratio offered by hydrogen fuel cells.

Now, as we gear up to celebrate "***Azadi Ka Amrit Mahotsav***" in India, it is clear that the transition to Green Hydrogen will be crucial in making our country ***aatmanirbhar*** on the energy front.

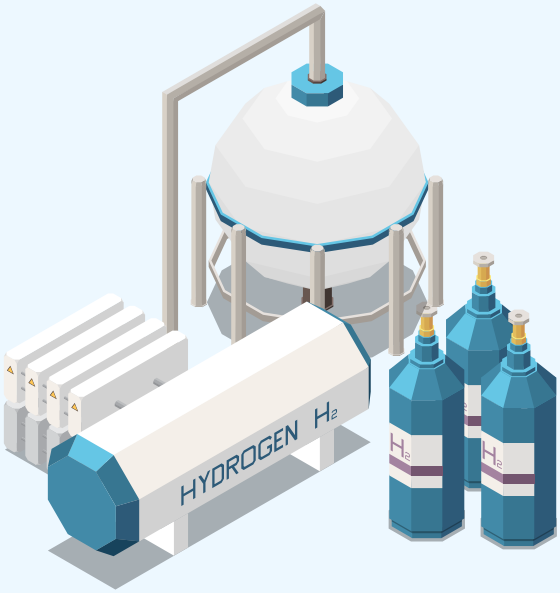
The Government of India has set a target of producing 5 million tonnes of Green Hydrogen by 2030. This is at once a challenge and an opportunity for the public and private sectors to find ways to produce Green Hydrogen for $1/kg and then develop wide-scale commercial solutions for our industrial needs. This might sound ambitious, but it is certainly doable. If we want inspiration, we need look back only so far as the Mars Mission, which we accomplished against all odds.

The co-existence and co-usage of renewable energy and Green Hydrogen will yield not just tangible environmental benefits such as net-zero and reduced emissions but also improvements in important socio-economic indicators such as health, gender neutrality, and employment, besides opening new opportunities for startups across the country.

In this newsletter, we have tried to examine different aspects of green hydrogen, including its potential, benefits, and avenues for swift adoption. For this, we have invited, as guest authors, both international and national experts who work on policy, commercial and well proven technologies.

The article '***Green hydrogen can reduce our imports dependence and mitigate emissions***' explores the myriad use cases of hydrogen and its economic and environmental benefits. In '***Three routes to Hydrogen adoption in rail,***' we look at how hydrogen can be a part of the rail decarbonisation journey. The article, '***Clean backup power solutions with hydrogen fuel cell systems***' talks about hydrogen as a clean alternative to traditional diesel and gas solutions for reliable backup power supply for data centres, hospitals and industrial applications. '***Exploring a solar - hydrogen based cooking system for remote, undeveloped and backward communities in India***' deep-dives into the potential of solar-hydrogen-based cooking systems. Finally, '***How will green hydrogen be a watershed moment for India's energy transition***' provides an overview of this highly versatile solution in decarbonizing various sectors.

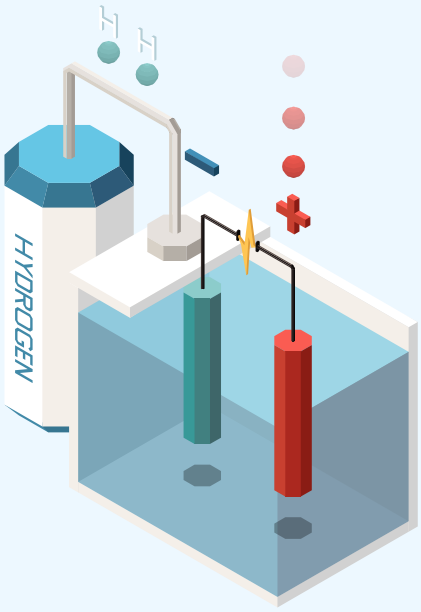
India has already taken a giant stride towards tapping the immense potential of hydrogen with the launch of the National Hydrogen Mission and the Green Hydrogen policy. I hope this newsletter will synergize the efforts of all concerned private and government stakeholders in achieving the climate targets we have set for ourselves.




**HYDROGEN STORAGE**

**HYDROGEN -POWERED TRANSPORT**


**HYDROGEN GAS STATION**




**WATER ELECTROLYSIS**

# GREEN HYDROGEN CAN REDUCE OUR IMPORTS DEPENDENCE AND MITIGATE EMISSIONS

The Russia-Ukraine conflict and the resulting surge in prices of crude oil and natural gas have yet again highlighted the importance of energy security for developing countries like India. In FY2019-20, fossil fuels constituted more than 25 per cent of India's import bill. However, the foundations of India's economy cannot perpetually hinge on the vagaries of the oil-and-gas markets. Moreover, fossil fuels are responsible for the emission of greenhouse gases. In view of the need to decarbonise the economy, Green Hydrogen can allow India to reduce imports of fossil fuels and achieve the "***Panchamrit***" commitments made at COP26.

Green Hydrogen is obtained from water by using renewable energy and has wide applications in industry, mobility and power. It can be a viable option for long-range heavy-duty vehicles such as trucks and buses. Blending Green Hydrogen in natural gas pipelines in 15-20 per cent volume proportions can reduce natural gas consumption and $CO_2$ emissions. In the power sector, Green Hydrogen can complement battery storage in minigrid and microgrid applications.

## National Green Hydrogen Mission: The first step in the right direction

In his 2021 Independence Day speech, India's Prime Minister announced the National Green Hydrogen Mission (NGHM). The government then notified the ammonia/hydrogen policy in February 2022 – the first step toward NGHM. Both the policy and the mission aim to reduce the cost of Green Hydrogen by creating demand for it and encouraging domestic manufacturing of components such as electrolysers.

The Green Hydrogen/ammonia policy notified targets of producing 5 MTPA of green hydrogen by 2030. Achieving this target would reduce India's liquefied natural gas (LNG) imports by 68 per cent, save INR 40,000 crore in import bills, and reduce India's GHG emissions by 1.6 per cent. The NGHM will also help achieve India's 500 GW non-fossil energy target since producing 5 MTPA of green hydrogen alone needs at least 100 GW of renewable power.

## Green Hydrogen opens up export opportunities for India

There is a global surge in the use of Green Hydrogen across various end-use applications. According to the Council on Energy, Environment and Water (CEEW), about 33 countries have announced hydrogen missions or are developing national-level policies and strategies for hydrogen. In a net-zero scenario, the global demand for electrolysers is expected to be 850 GW by 2030. This opens up an export market worth INR 32 lakh crore, and India can carve out a healthy market share by foraying early into the manufacturing supply chains. The trade volumes for Green Hydrogen and derivatives like ammonia and methanol are also expected to increase. India is strategically placed to become an exporter of Green Hydrogen and its derivatives to large consumers of energy like Japan, Singapore and South Korea, who do not have enough cost-competitive renewable energy to meet their climate commitments.

Green Hydrogen-derived fuels can create significant refuelling opportunities for flights and ships originating from or transiting through India. The International Air Transport Association (IATA) has committed to net-zero by 2050. The enforcement of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) and the Carbon Border Adjustment Mechanism (CBAM) could also provide an opportunity for India to blend sustainable aviation fuel in flights headed for the EU and other countries. The International Maritime Organisation, meanwhile, aims to halve greenhouse gas emissions by 2050. As ships need frequent refuelling, green ammonia as a maritime fuel could present India with significant refuelling opportunities.

## Green Hydrogen mission faces many challenges

To succeed, NGHM will need heavy capital investments and easy access to huge amounts of affordable finance. Green Hydrogen blending in refineries and fertilisers will increase the retail price of petroleum commodities and fertilisers, which will impact citizens. Safety and regulatory standards for hydrogen are a prerequisite for single-window clearance of Green Hydrogen projects. Currently, there are none.

To reduce the cost of Green Hydrogen, the central government has waived interstate transmission charges for Green Hydrogen projects. However, the financial health of many state DISCOMs is not encouraging, and offering similar incentives, the interstate wheeling of renewable energy will be a challenge. On the export front, with countries like Australia, Saudi Arabia and Chile already establishing bilateral agreements with Europe and East Asia, India's prospects as a clean-fuel exporter will largely depend on its competitiveness with other countries.

The success of NGHM will depend on how well India overcomes the aforesaid challenges. A vibrant Green Hydrogen economy could greatly help India become atmanirbhar in energy supply and meet its panchamrit commitments. The Mission is, therefore, a step in the right direction and must be appreciated.

# THREE ROUTES TO HYDROGEN ADOPTION IN RAIL

Countries around the world are trying to figure out effective and viable ways to decarbonize their industries and infrastructure. The UK, for one, has committed to reduce its emissions to net-zero by 2050. As a part of its efforts in this direction, it developed HydroFLEX, the country's first mainline hydrogen-powered train. Based on the Class 319 electric multiple unit, the HydroFLEX vehicle is fitted with hydrogen fuel tanks, a fuel cell, and battery pack to provide independent traction power capable of operation with zero carbon emissions.

Hydrogen offers significant potential to help decarbonise railway networks by replacing diesel power systems and eliminating emissions at the point of use. The advantages of using hydrogen as an alternative fuel are well-known. As early as 2008, the European Commission had identified hydrogen as one of the technologies that could help achieve a 60-80% reduction in greenhouse gases by 2050. Today, if you wish to use hydrogen as a part of your rail decarbonisation journey, there are three available pathways to choose from.

## 1. The Big Bang: Everything shiny and new

New trains powered by fuel cells from green hydrogen are a good solution, especially when battery power is insufficient for long distances or conventional electrification isn't financially viable.

However, this approach entails the additional cost of new trains and the fuel infrastructure to power them. Whilst hydrogen production serving only a rail site may be viable, investments work better when they are a part of a holistic strategy to share asset costs across rail and road transport.

Then, there are hidden costs. Replacing serviceable diesel trains and locomotives, perhaps midway through their 40-plus year lifespan, will entail balance sheet costs as diesel asset values reduce to near zero.

Building, maintaining, and repairing hydrogen systems, fuel cells, and battery energy storage will require reskilling the workforce. Furthermore, most commercial hydrogen available is seen as "dirty", being fossil fuel-based. Using renewables to generate hydrogen at scale is not yet a mature technology.

While several automakers are manufacturing vehicles on a commercial scale, and several train manufacturers are offering vehicles to the market, there are still many barriers to achieving hydrogen adoption through this method in isolation.

## 2. The Supernova: The birth of something new from something old

Existing rail fleets often contain a significant proportion of diesel rolling stock, which are environmentally unpopular. Moreover, this stock has long lifespans, leaving fleet owners with the challenge of dealing with assets that have their lives cut short by environmental pressures. The "Supernova" route to hydrogen adoption utilises retrofits existing diesel engines with hydrogen fuel-cells for emission-free operations. This solution can lower barriers to hydrogen adoption by enabling cost savings. Firstly, the cost of an entirely new vehicle is avoided. Secondly, the balance sheet impact is mitigated as vehicle and loco asset lives are not written off early. Thirdly, it yields savings on people investments, since the vehicle remains largely the same and doesn't require as extensive re-training as for a completely new fleet.

However, the challenges about hydrogen source and infrastructure investments, as mentioned in the Big Bang approach, still apply.

## 3. The Gravity Slingshot: Using the environment to speed up progress

Just like the gravity of planets enables us to slingshot spacecraft across the solar system, we can use the existing railway environment to propel the transition to hydrogen rail transport.

At any point in time, railways often have many diesel trains and locomotives with a long remaining lifespan. This fleet inertia can be seen as a costly barrier to large-scale hydrogen adoption. However, it can also be an opportunity to drive hydrogen adoption in an evolutionary manner rather than a revolutionary one, by burning hydrogen instead of diesel in existing engines. It is perfectly possible to create a Hydrogen Internal Combustion Engine ($H_2$ICE) and modify existing diesel engines to run on hydrogen.

Lowering many of the barriers to large-scale hydrogen adoption, this option reduces the initial upfront investment in vehicles. Instead of replacing entire drive trains, we are simply modifying existing engines. It also offers people-cost benefits, as the training requirements are much simpler. Like with the fuel-cell retrofit option, existing fleet lifetimes are preserved or extended instead of being cut short.

Although the investment barrier for hydrogen production infrastructure remains, a useful trait of IC engines is that they are far more tolerant of lower purity fuel than that needed for fuel cells. This tolerance could potentially reduce the requirements of the hydrogen production infrastructure, thus lowering this particular barrier to adoption.

While modifying existing engines may not grab headlines, the use of $H_2$ICE as a steppingstone technology could enable an efficient path to decarbonised transport.

There is no one perfect solution that fits all situations. The diverse and complex financial, governmental, and societal contexts call for applying all three paths to aid hydrogen adoption. With experience across all these routes and our technology-agnostic approach, the Ricardo rail teams look forward to helping your rail network to find its optimal route to decarbonisation. Please get in touch at ***ricardorail@ricardo.com***

**About Ricardo:**

Ricardo plc is a world-class environmental, engineering, and strategic consulting company listed on the London Stock Exchange. With over 100 years of engineering excellence, we provide exceptional levels of expertise in delivering leading-edge and innovative cross-sector sustainable products and solutions, helping our global customers increase efficiencies, achieve growth, and create a cleaner and safer future. Our mission is clear – to create a safe and sustainable world.

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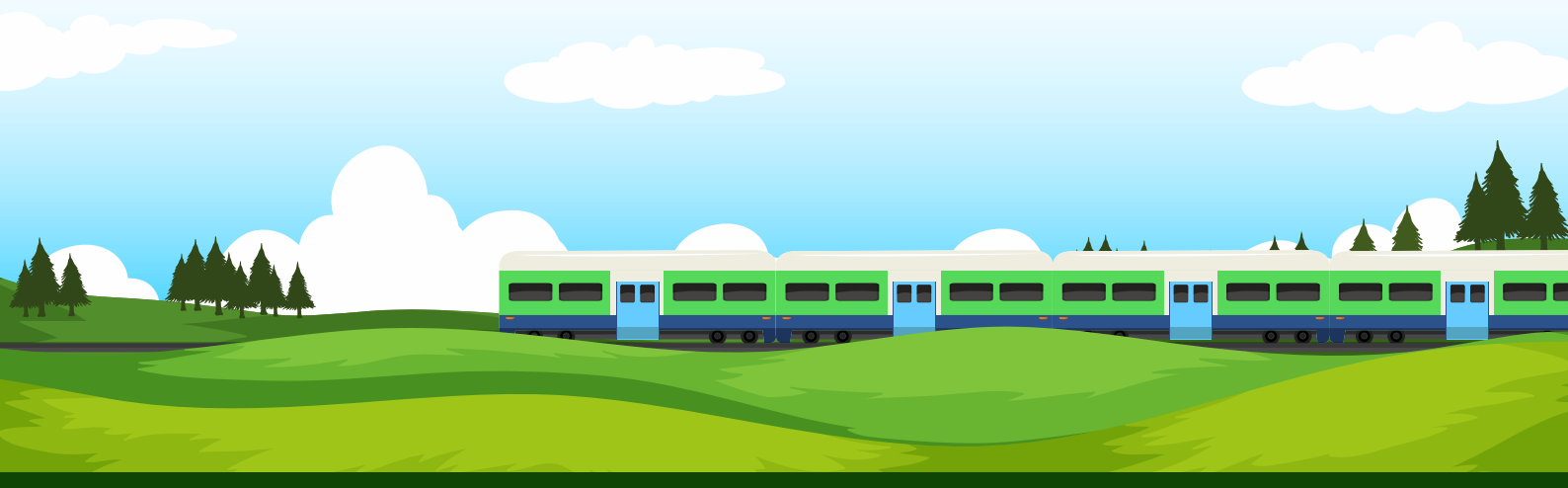
*The 30-year-old Diesel Multiple Unit HydroFLEX vehicle has been converted to Hydrogen fuel cell power*

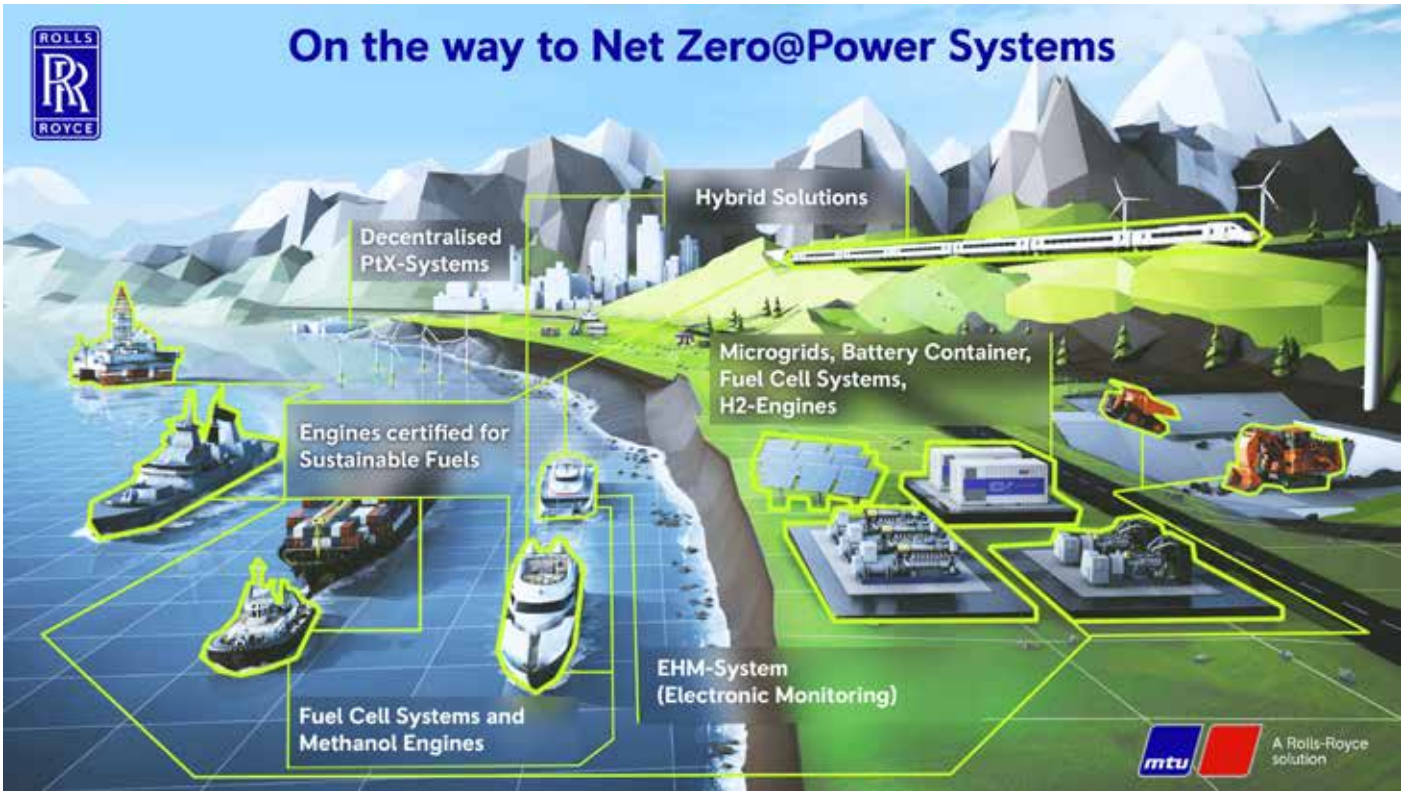
*Ricardo prepares to test a hydrogen heavy-duty engine*



# CLEAN BACKUP POWER SOLUTIONS WITH HYDROGEN FUEL CELL SYSTEMS

Rolls-Royce Power Systems announced its climate protection program "Net Zero at Power Systems" in 2021. Thereby the company is clearly committed to the Paris Climate Agreement and its goal of reducing global warming to well below two degrees Celsius with efforts to limit it to 1.5 degrees Celsius compared to the pre-industrial era through climate action. In order to become climate neutral by 2050 at the latest, the Rolls-Royce business unit Power Systems, aims to reduce 35% of greenhouse gases by 2030 with new products compared to 2019 as a first near-term step. Key elements to achieve this include new technologies such as $H_2$ engines, $CO_2$-free fuel cell systems and the release of the main mtu engine series for sustainable fuels from 2023, in some cases earlier.

On the way to Net Zero: Rolls-Royce recognises great potential for reducing greenhouse gas emissions in all its products – be it by the means of electrification, hybridisation, system integration or sustainable fuels.

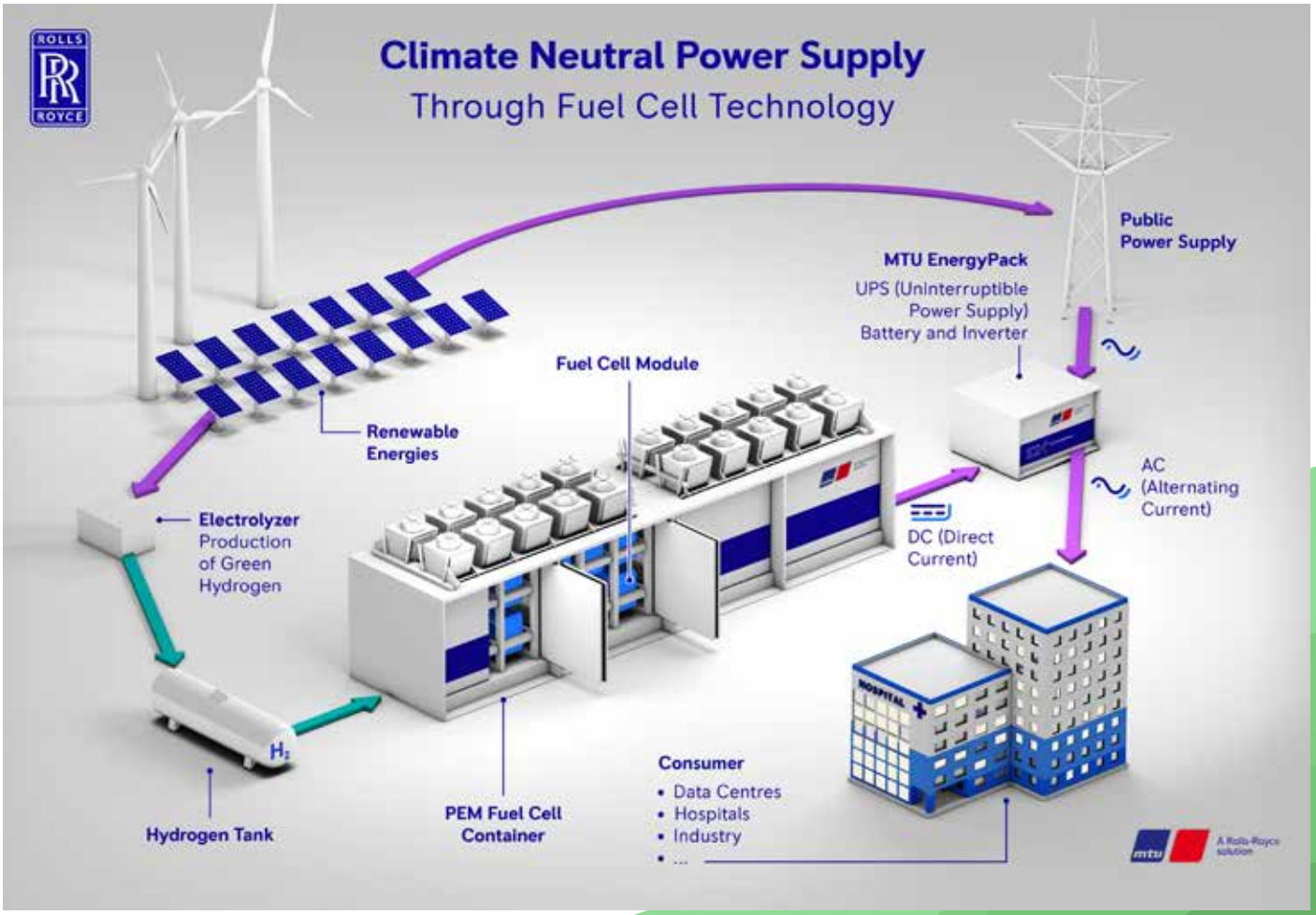



Green Hydrogen can be used as a clean alternative to traditional diesel and gas solutions for reliable backup power supply for data centres, hospitals and industrial applications. Electrical power can be generated from hydrogen through a chemical reaction in a fuel cell, or through combustion in a hydrogen engine, with dynamic response supported through batteries. To ensure that carbon-free power is generated, green hydrogen must be used. This means that the hydrogen is produced through electrolysis, using electricity from renewables such as photovoltaics or wind.

## BENEFITS OF GREEN HYDROGEN SOLUTIONS

Decarbonising backup power is both a challenge and an opportunity. All major players in the hyperscale data centre market have committed to net zero emissions targets by 2030 or earlier and this means removing carbon emissions not just from their continuous power demands, but also from their backup power solutions. Hydrogen fuel cell systems provide some additional benefits over traditional diesel backup solutions. One such benefit is that the system, through its high dynamic response and integrated battery storage, enables customers to participate in new revenue streams or to save money on their existing electricity bills.

The hydrogen can either be brought in, or the customer can take advantage of the opportunity to produce the fuel on-site through the installation, for example, of photovoltaic panels on the roof of their buildings and the use of an electrolyser. Through on-site production the customer additionally becomes self-sufficient, completely de-risking fuel supply. The electrolyser can produce hydrogen when renewable sources (e.g., sunshine/wind) are abundant and store this in tanks for a reliable and continuous supply when needed. Excess hydrogen can also be fed into the natural gas grid (dependent on location) supporting the wider energy transition and providing a further revenue stream for the customer. Although investment costs for fuel cells are currently higher for traditional diesel backup solutions, these costs are expected to dramatically fall over the next 5 years as volumes increase and the technology further develops. This cost difference can be offset in the short term by the above-mentioned additional revenue opportunities of grid services or through saving money on electricity bills via peak shaving. With falling costs of fuel cell technology coupled with expected rising diesel fuel costs and carbon taxes in the future, the fuel cell is seen as a key technology for the decarbonisation of the backup power market for a range of customer segments including data centre, hospitals, and industrial applications.



## CUSTOMER SEGMENTS

### a) Data centres

Data centres are a mission critical application and highly reliant on a continuous, high quality and uninterrupted supply of power. Whenever the grid fails, data centres have to maintain full operation until the grid supply is reinstated. With very ambitious emission targets and a high importance placed on global reputation, data centres are one example of a customer segment which is already proactively considering green backup solutions with initial pilot projects coming into operation.

### b) Hospitals, municipalities, industrial applications

Other customer segments like hospitals, industrial customers, transport hubs and municipalities also need to be protected from power outages by backup systems. This is particularly the case in areas with more unstable grids, for example due to extreme weather conditions, high renewable energy shares, or aged power plants and grid infrastructure. Many customers in these sectors are also looking to reduce carbon emissions and find clean alternatives for backup power, where diesel is currently used.

# EXPLORING A SOLAR - HYDROGEN BASED COOKING SYSTEM FOR REMOTE, UNDEVELOPED AND BACKWARD COMMUNITIES IN INDIA

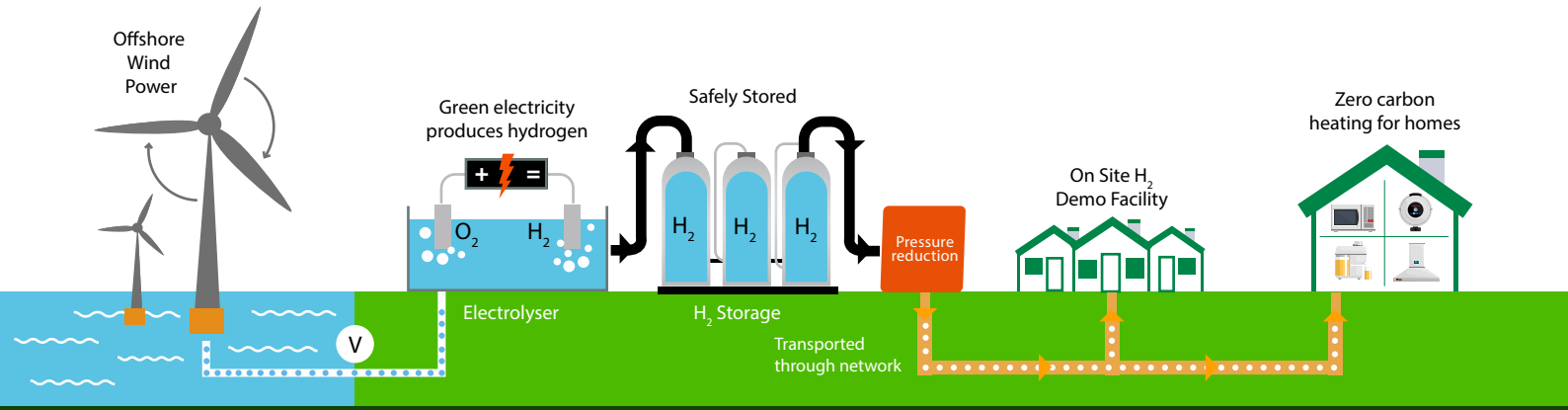
India faces formidable challenges in meeting its energy needs and in providing adequate energy. About 30% India's energy needs are being met through imports, which is likely to increase further in future. To eradicate poverty and deliver 8-10% economic growth rate, India needs to increase electrical generation capacity by 5 to 6 times of their 2003-04 levels. This requires enormous amount of expenditure. About two third of total electrical energy is generated by thermal power plants, where coal is the major fuel. Indigenous coal suffers from poor calorific value and result in high levels of pollution. Coal is likely to remain the most important energy source in the near future. However, search for a sustainable, pollution free, indigenous fuel for energy security is essential. Unfortunately, all known renewable energy sources such as solar are not yet reached a stage to meet growing demand.

India is a vast country with the second largest population in the world. More than two thirds of its population lives in rural areas. The rural population is widely spread and does not have easy access to LPG (Liquid Petroleum Gas) or natural gas pipeline as cooking fuel at affordable prices due to poor logistics. Furthermore, natural gas has limited reserves and may last for only few more decades. All existing cooking fuels such as wood, natural gas, biomass, kerosene etc. are also major contributors to pollution. At present, wood and cow dung are being used as fuel for cooking in rural India. It has resulted in fast depletion of our forests. In view of above, there is a need to search for a green, renewable, inexhaustible, economical and easily available alternate fuel to replace existing fuels for cooking application. Hydrogen meets these criteria, if it is made available in remote places, economical and is stored safely.

For remote and isolated communities, stand-alone distributed generation is of major relevance. Such a system has several advantages such as negligible transmission and distribution losses, lower capital cost, lesser gestation period, etc. ERDA is exploring the concept of a stand-alone Solar-Hydrogen based system for meeting the kitchen gas needs of isolated communities. This simple system consists of solar panels, an electrolyser, Hydrogen storage mechanism and Hydrogen delivery, which may be through pipeline or pressurised gas cylinder. The electrical output of solar panels is supplied to water electrolyser, which generates hydrogen and oxygen through electrolysis of water. Since the solar power is not going to remain throughout the day, the generated hydrogen can be collected in a pressure vessel. The collected hydrogen can be distributed either through a pipeline or pressurised cylinder to the community households depending upon economics, terrain etc.

Solar panels and electrolyser are commercially available and storage tank and hydrogen delivery system can be made as per specific location. The proposed system will become more economical with increase in capacity. The system is technically feasible, along with several other advantages such as energy security, job employment etc. This system has enormous potential to serve several other applications wherever heating, sintering and hydrogenation processes are involved. Similarly, oxygen is a by-product of this system, which can be used as combustion enhancer in metal/ chemical/ petrochemical industries, as bleaching agent (replacing chlorine in pulp/ paper industries), and to increase yield in aquaculture, etc.

We are increasingly seeing the potential of substituting the existing fossil fuel systems with Hydrogen based energy systems. Hydrogen has several advantages over other renewable energy sources and, owing to its neat and efficient burning properties is being considered as the fuel of the next generation. Its combustion does not produce any greenhouse gases, which makes it a viable and efficient alternative for various applications, including cooking. Thus, this Solar-Hydrogen based cooking system has the potential to be a great boon to India and would significantly help in energy independence for the nation.



# HOW WILL GREEN HYDROGEN BE A WATERSHED MOMENT FOR INDIA'S ENERGY TRANSITION?

There has been a marked rise in emissions, as we are increasingly witnessing the effects of climate change across the world. In India, nearly half of the population is living in regions with fewer than 200 clean air days a year. Furthermore, India also saw the output of its workforce decline by 7% — equivalent to 75 billion man-hours in 2017 due to heatwave conditions. The cost of emissions has been steep for India, as it continues to lose $210 billion per year to emissions.

These conditions are only set to exacerbate, as India's energy consumption is pegged to double by 2040. India has begun moving in the right direction and has surpassed the renewable energy capacity target committed during Paris Climate Agreement. Renewable energy currently makes up for 40% of India's total installed power capacity, however, contributes only 25% to total electricity generation. This is where Hydrogen has a key role to play, as it can increase the share of renewables in the overall energy pool.

Hydrogen ($H_2$) is an energy carrier, not an energy source, which can deliver and store a large amount of energy and be used in various ways. It can also act as an energy buffer or storage, which can potentially solve the intermittency problem of large-scale renewables. $H_2$ is a highly versatile solution capable of decarbonizing the hard-to-abate sectors. It is also highly sustainable with no residue or emission except water.

Recent developments have made it possible for Hydrogen to go from hype to hope due to confluence of factors like declining costs, breakthroughs in technology and carbon taxes. Hydrogen for India can go beyond just a decarbonization strategy, emerging as the new economic growth engine, transforming India from an energy-deficient to an energy surplus, perhaps even a net energy exporter. Our Hon'ble Prime Minister Narendra Modi had announced the aspirational Hydrogen Mission, which is a watershed moment in India's energy transition journey. The new Green Hydrogen/Green Ammonia policy also makes India the 18$^{th}$ country in the world to release a comprehensive green hydrogen policy. Under the policy, the Government of India has set a target of production of 5 million tonnes of green hydrogen by 2030 and the related development of renewable energy capacity. The new policy will help cut the cost of manufacturing green hydrogen by 40-50%.

Reliance Industries Limited is keen to support India in its clean energy ambitions, and will invest USD 10 billion in new energy by 2024, and a further USD 70-80 billion by 2030. With India's comprehensive hydrogen policy, increased public-private collaboration and a sharpened focus on clean energy solutions, India is poised to become the new green hydrogen global hub. Green hydrogen will be India's biggest strategy for a 'Quantum Jump' to address the perils of climate change.

# TOP ENERGY TRENDS FROM INDIA & ACROSS THE GLOBE

## Will India's green hydrogen projects fuel its future needs?

Hyderabad-based Greenko group and Belgium-based John Cockeril recently announced that they would build a hydrogen electrolyser gigafactory targeting 2-gigawatt in India. Reliance Industries, Larsen & Toubro and Adani, together, have also earmarked investments of close to Rs 6 trillion in green hydrogen projects. Clearly, Green Hydrogen is powering the ambitions of India. And, this push by major corporate names comes as the government, which launched a green hydrogen policy in February, bets big on the sector. However, becoming a major exporter of green hydrogen will not be feasible until 2030, given our stated target, domestic requirements, and planned capacities. India plans to manufacture 5 million tonnes of green hydrogen per year by 2030. This would be half of the European Union's 2030 target of 10 million tonnes. According to S&P Global Commodity Insights data cited by a financial daily, there are 26 hydrogen projects in India, with a total capacity of 255,000 tonnes per year. However, only around 8,000 tonnes per year of capacity is expected to be operational by 2024.

## Massive Australian green hydrogen project moves forward with new Japanese partner

Back in December 2021, the Northern Territory (NT) government granted Major Project Status to water-from-air technology company Aqua Aerem to develop its $15 billion 10 GW Desert Bloom Green Hydrogen project in Tennant Creek, NT, with ambitious plans for commercial production by 2023. Considering the scale of renewable energy required for Green Hydrogen production, necessarily requiring lots of sun and wind, usually hot and arid regions are best situated. Technology that enables significant quantities of water to be obtained from the atmosphere provides a serious advantage and are demonstrable of the increasingly fecund solar-water nexus. The joint agreement will see the two companies develop the project, which Aqua Aerem said will produce approximately 410,000 metric tonnes of Green Hydrogen annually when it is completed.

## Renewable energy to climate action – how India can achieve sustainable development in 2022

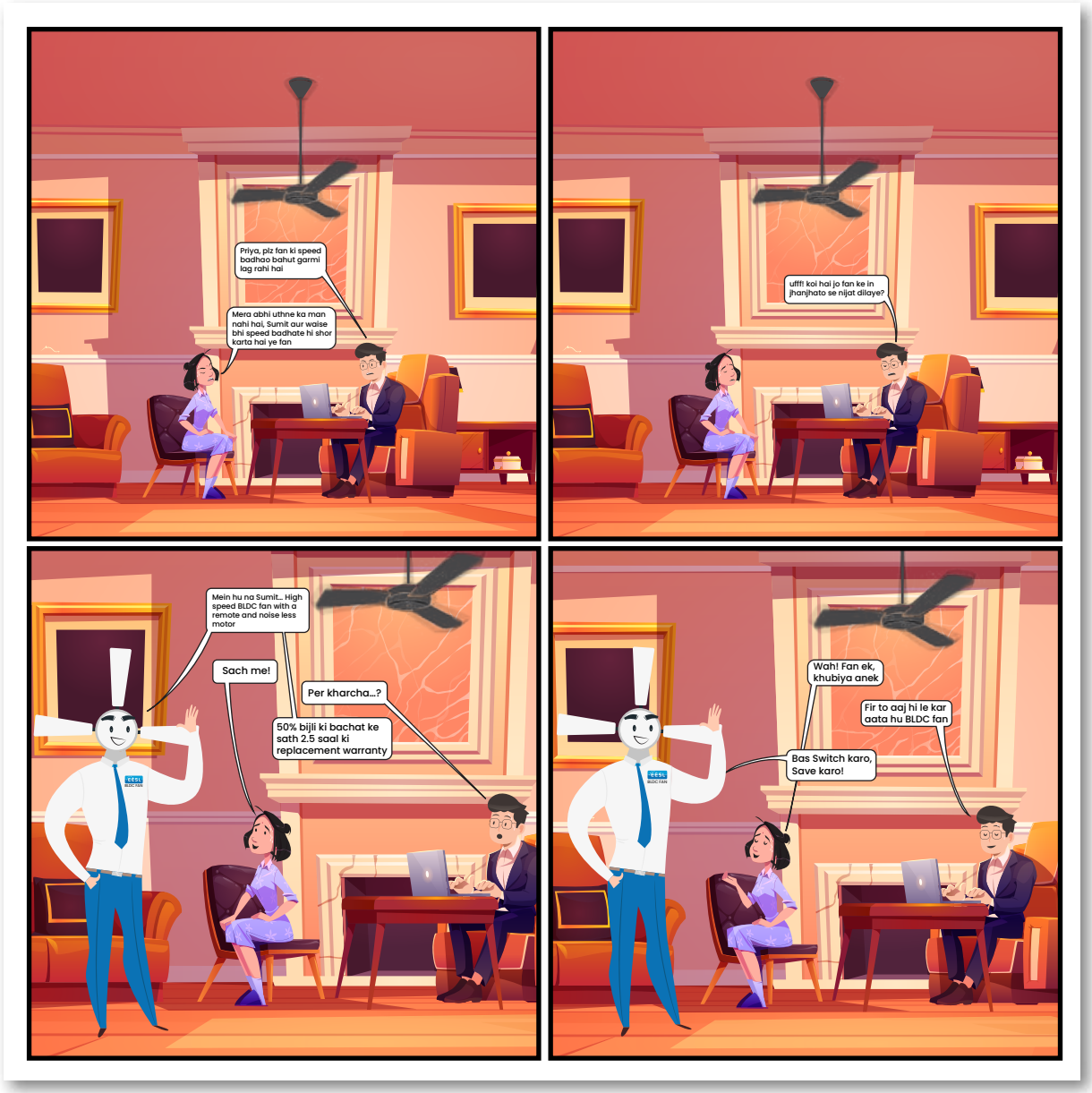
India's COP26 commitment to achieve net-zero emissions by 2070 is poised to lead the nation on a path to clean, green, and sustainable economic development. If climate change is not managed well, it can be inequitable, especially for the poor and marginalised communities. Renewable energy currently accounts for 10 per cent of the electricity generated in India. Reaching the capacity of 500 gigawatts by 2030, while sourcing 50 per cent of the energy requirement from such sources, calls for a transition at a massive scale. If managed right, a clean energy transition can improve the quality of life of rural communities, especially for women. It could also improve healthcare & education and facilitate a host of local economic activities to create new jobs. Transport contributes around 13.5 per cent of India's energy-related greenhouse gas emissions. The Gati Shakti Master Plan proposes an integrated approach for seamless multimodal connectivity. This will not only help in shifting demand toward cleaner modes but also in improving India's competitiveness as an exporting nation.

## Is the climate tech opportunity real this time around?

Climate tech is increasingly being seen as an exciting opportunity in the world of technology startups and venture capital, globally and in India. But it is not the first time that startups focused on climate and the environment are getting this attention. The massive rise in climate-related disasters has had a significant economic and political impact. Various national and international commitments to achieve net zero emissions are broadly starting to align, even if significant differences remain. India notably also committed to achieving net zero by 2070. Significant technological breakthroughs in recent years offer the biggest hope that climate tech could actually change the game this time around. Renewable energy production — especially of solar energy — has become cost effective and in many cases cheaper than fossil-fuel driven energy production. Carbon capture technology is also improving more rapidly than before. Furthermore, satellite and space tech offer potential applications that could help us transform our energy systems. Remote sensing technology, for example, is making wind turbines more efficient while weather satellites are making solar cells more productive.

## IPCC report on 'Mitigation of Climate Change': An explainer

The Inter-governmental Panel on Climate Change (IPCC) approved the Summary for Policy Makers (SPM) of the Working Group III contribution to the Sixth Assessment Cycle (AR6 WGIII) titled 'Mitigation of Climate Change'. The WGIII report examines the current trends of emissions, projected levels of future warming, and how to transition to a low carbon economy in order to limit global warming to 1.5 degrees Celsius by 2100. The report shows how transformative systems can ensure a safer climate and a sustainable economy. The report further highlights that reduction in greenhouse gas emissions, phasing out all fossil fuels, transformative shifts to scale up energy efficiency, renewable energy & electrification, and conservation & restoration of forests and lands - all aligned with sustainable development, accompanied by substantially increased finance and underpinned by principles of equity - offers the only real chance to avert runaway climate change.





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# EMPANELMENT PROPOSAL FOR CHANNEL PARTNERSHIP PHASE-II

**EESL invites proposals to expand the sale of its various existing and new products & services in the markets like :**

- 1. SEAC – Super-Efficient Air-Conditioner Programme
- 2. UJALA – Unnat Jyoti by Affordable LEDs for All (LED Bulb, Tubelights and BLDC fans)
- 3. NMRP – National Motor Replacement Programme
- 4. IEES – Integrated Energy Efficiency Services
- 5. OTHERS – New Programmes [Products & Services] under EESL BRAND [On Separate Approval Only]
- 6. SLNP – Street Light National Programme

Scan the QR code to open the registration form.

Join us in making India sustainable and energy efficient

For more information :
https://eeslindia.org/en/cpe/

EESL is looking forward to empanel Corporate Sales Agency, Direct Sales Agency, Dealers & Retailers and other Demand Aggregators phase-II including ESCOs with requisite Scope of Work under Success Fee Model.

Last date of registration: **31st May 2022**

For more information, please contact us:


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