INDIA'S NO.1 ENERGY MAGAZINE

ENERSIDER™

MONTHLY



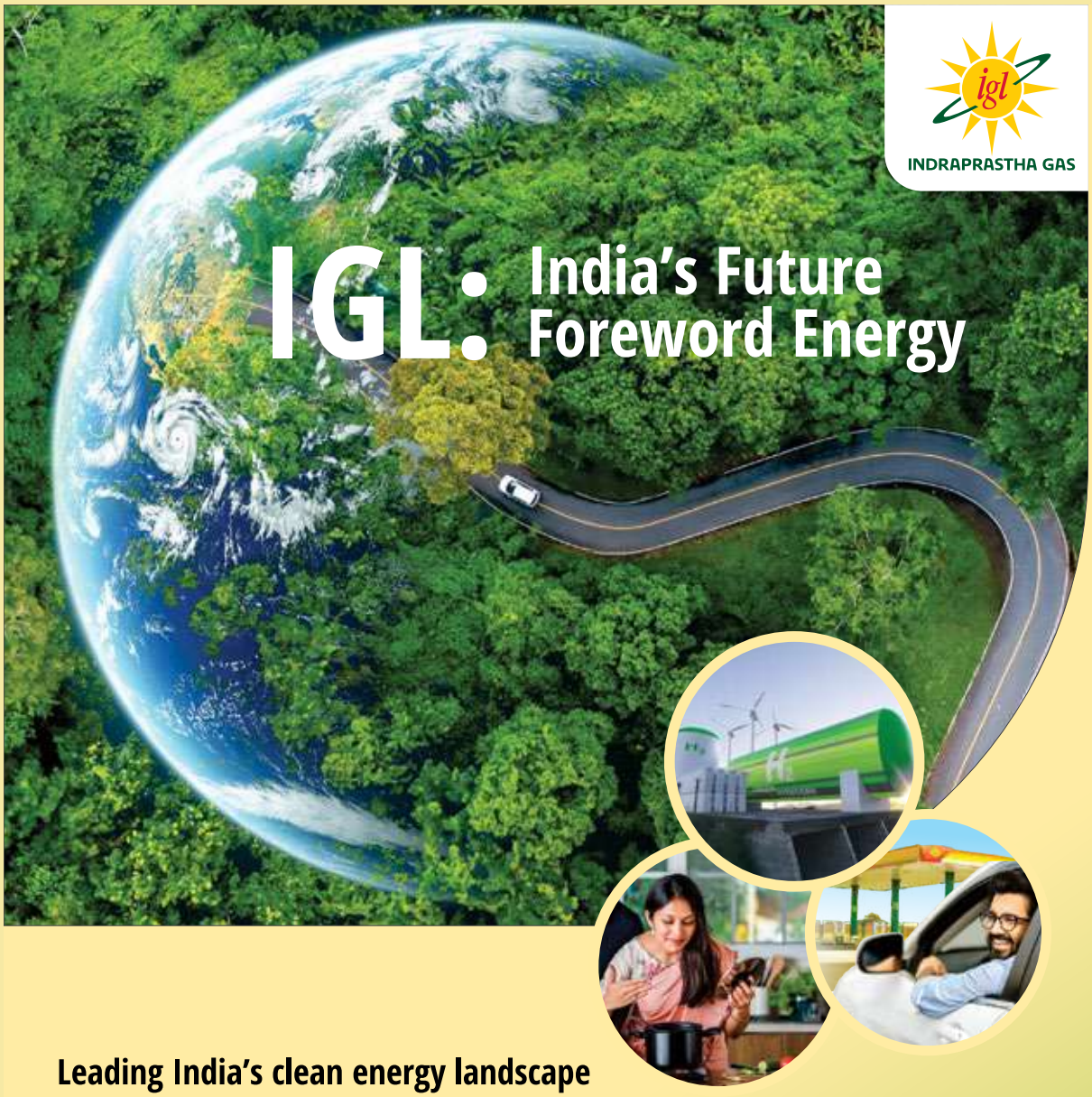
POWERING THE GREEN HYDROGEN FRONTIER

COVER STORY: COP31: INTERDEPENDENCE UNDER FRAGMENTATION I ENERSIDER VIEW: THE HUMAN ANGLE
Q&A: SAVIR JHULKA, GLOBAL HEAD (IG), DIRECTOR - INOXCVA I INDUSTRY REPORT: IRENA ENERGY TRANSITION OUTLOOK 2026

DIGITAL MAGAZINE | NOVEMBER 2026 | VOLUME 2 | ISSUE 11

INDRAPRASTHA GAS

IGL: India's Future Foreword Energy



Leading India's clean energy landscape

IGL believes in a customer-centric approach and provides clean energy solutions through innovative technology and diversification in India and abroad. IGL is playing a crucial role in the emerging scenario, in augmenting its compression capacity by adding new stations and investing in new-age fuels like Liquefied Natural Gas (LNG), Compressed Bio Gas (CBG) and Hydrogen to address changing energy needs.

IGL's core deliverables include:

- IGL is a leading provider of clean and convenient Piped Natural Gas (PNG) and Compressed Natural Gas (CNG).
- IGL offers various services to meet the needs of Residential, Commercial and Industrial customers.
- IGL is a growing company, strongly committed to safety, innovation, and customer satisfaction.



INDRAPRASTHA GAS LIMITED

An ISO 9001, ISO 14001 & OHSMS 45001 Certified Company

CIN No.: L23201DL1998PLC097614

IGL Bhawan, 4 Community Center, Sector-9, R.K. Puram, New Delhi-110022. Website: www.iglonline.net

Follow us:

Customer Care

1800 102 5109 / 1800 180 5109 (24x7 Toll Free)

ENERSIDER

NOVEMBER 2026

Volume 02 | Issue 11

INSIDENERGY



28

COVER STORY

Interdependence Under Fragmentation

In a world where geopolitical rivalries are deepening, and climate risks are increasingly interconnected, can nations afford to tackle shared challenges in isolation?

Our November cover story explores the critical intersections of climate change, energy security, climate finance, critical minerals and biodiversity. A collaborative work of Enersider and Chintan Research Foundation (CRF), authored by Meheli Roy Choudhury and Shagun Mamgain, the cover story examines the evolving Global North–South divide and makes a compelling case for collective resilience and meaningful global cooperation.

AN ENERSIDER EXCLUSIVE IN COLLABORATION WITH CHINTAN RESEARCH FOUNDATION

ENERSIDER

NOVEMBER 2026

Volume 02 | Issue 11

CONTENTS







10

THE NEWSMAKERS

From seasoned industry professionals to emerging leadership, Jatin Kumar Nayak, Sunil Kumar and Pankaj Pandey take on pivotal responsibilities across India's energy PSU landscape. While Nayak assumes charge as CMD of IREDA, Kumar is set to lead ONGC as its next Chairman, and Pandey takes over as Director (Operations) at POWERGRID. Their appointments mark important milestones in the leadership journeys of these organisations.

BY ENERSIDER DESK



20

Q & A

As India's hydrogen ambitions grow, building reliable storage and transportation infrastructure will be critical to scaling the sector. In an interaction with Enersider, Savir Jhulka, Global Head (IG) and Director, INOXCVA, discusses the engineering innovations, cryogenic technologies and indigenous capabilities needed to make hydrogen logistics safer, more efficient and commercially viable.

BY ENERSIDER DESK

SAVIR JHULKA, GLOBAL HEAD (IG), DIRECTOR - INOXCVA

13

ENERSIDER EXCLUSIVE

Powering The Green Hydrogen Frontier

As India's green hydrogen ecosystem gathers momentum, Organisations are pushing the boundaries of what the energy transition can achieve. From green ammonia production and electrolysers to cryogenic storage, firm renewable power and port infrastructure, this Enersider exclusive spotlights the capabilities, innovations and ambitions shaping the next phase of India's hydrogen economy, ahead of IGHA–Hyvolution India 2026.

AN ENERSIDER EXCLUSIVE IN COLLABORATION WITH GH2 INDIA



AUTHORED ARTICLES

22

COP31 And The Case For A Systemic Transition: Linking Development, Resilience And Equity

As COP31 brings the Global South's development challenges into sharper focus, this article calls for a fundamental rethink of how progress is defined. Moving beyond conventional decarbonisation, it explores the idea of responsible energy, climate resilience and equitable development, making a case for a transition that balances human well-being, economic aspirations and ecological limits.




BY AKANKSHA JAIN DEBAJIT PALIT

52

The Role Of Local Knowledge In Forest Landscape Restoration

India's forest restoration efforts must go beyond paying communities for labour to recognising the knowledge they bring to the process. Drawing on the Soligas' experience in Karnataka's BRT Tiger Reserve, this article explores how traditional ecological knowledge can be formally valued, fairly compensated and passed on to strengthen restoration and biodiversity conservation.





BY GOJESH KONSAM VARUN GROVER NEHA SHARMA

54

COP 31: Global Effort Under A Threatened Energy Security Scenario

As geopolitical conflicts, energy security concerns and climate commitments collide, COP31 faces a defining test of global climate cooperation. This article examines the widening gap between climate ambitions and action, the shifting energy priorities of major economies, and India's push for equitable, solution-oriented climate action, with the future of multilateralism hanging in the balance.



BY MOHD JAMSHED

What Made News? 68

Stay abreast of key energy sector developments, including government initiatives, regulatory changes, major tenders, policy decisions and official announcements.

Beyond Boundaries 64

A focused section covering major energy developments and emerging trends across ASEAN, the Middle East, and North Africa. It offers global perspectives and market insights, providing a broader view of the evolving international energy landscape.

ENERSIDER

NOVEMBER 2026

Volume 02 | Issue 11

CONTENTS



26

ENERSIDER VIEW

The Human Angle

India's clean energy transition must be measured by more than renewable capacity added and emissions reduced. From land acquisition for solar parks to critical mineral mining and the future of coal-dependent communities, this article examines the human cost of the transition and why community rights, livelihoods and fairness must remain central to green growth.

BY VANDANA MAJUMDAR



56

INDUSTRY REPORT

The global energy landscape is at a turning point, with security and economic priorities reshaping the path to decarbonisation. IRENA's World Energy Transition Outlook 2026 examines the pathways to a 1.5°C future, highlighting the scale of renewable energy expansion, investment, infrastructure and international cooperation needed to accelerate a just transition.

BY IRENA

Industry Events 72

A roundup of the major events and conferences shaping the energy sector across India, the Middle East, and ASEAN.



43

ENERSIDER INFRASTRUCTURE

Monitoring key milestones, policy shifts, investments, and innovations, our infrastructure section captures the forces transforming India's built environment. Spanning 10 vital sectors—ports, railways, aviation, roads, construction, mining, urban transport, tunnels and bridges, and water and waste management—this coverage spotlights rising trends and the pioneers spearheading the country's infrastructure expansion.

SPOTLIGHT

UPDATES FROM OUR STRATEGIC PARTNERS

Explore how worldwide market-shaping trends impact India through a global lens. Drawing on exclusive perspectives from international energy leaders, analysts, and experts, this section unpacks the domestic implications of global developments.



62

Indian Biogas Association



66

NetZero Energy Transition Association



38

Green Hydrogen India

INDUSTRY GRAPHICS

58

Global Hydrogen Compass 2026

Drawing on the Hydrogen Council's latest report, this data-led feature tracks the progress of clean hydrogen projects, from pipeline development to capacity expected online by 2030. We examine project maturity, emerging capacity and how policy interventions are shaping demand and the sector's growth trajectory.

STRATEGIC PARTNERS

CONTENTS

Foreword

The world is becoming more interconnected, even as nations grow increasingly divided. That contradiction lies at the heart of today's energy and climate debate. India must meet its growing energy needs while moving towards cleaner energy, reducing its dependence on imports and ensuring access to the resources and technology it needs. For the country, the transition is not just about cutting emissions, but also about supporting growth and keeping energy secure and affordable.

These competing priorities form the backdrop to our November cover story, Interdependence Under Fragmentation, developed in collaboration with Chintan Research Foundation. Examining the widening Global North–South divide, it makes a case for more equitable international cooperation. For India and other developing economies, the question is not simply how quickly the transition can happen, but whether the resources and opportunities needed to achieve it are accessible and fair.

This edition brings these questions closer to India's ground realities. Our exclusive feature on organisations powering the hydrogen frontier highlights the companies building capabilities across green ammonia, electrolysers, storage and renewable power. As India's green hydrogen ambitions gather momentum, these developments offer a glimpse into the industrial ecosystem taking shape. Our industry report from IRENA and data-led feature drawing on the Hydrogen Council's latest report further examine the investments, infrastructure and policy developments shaping the transition.

Our authored articles explore the difficult choices facing India and the Global South ahead of COP31, the need to align development with resilience and equity, and the role of indigenous knowledge in forest restoration.
In The Human Angle, we turn to a question that must remain central to India's transition: who bears its costs? From land acquisition and mineral extraction to communities dependent on coal, clean energy must not come at the expense of livelihoods and community rights.

India's transition is a defining national undertaking, but its success will depend on the choices it makes at home and the partnerships it builds globally. The challenge is not merely to build a cleaner energy future, but to make it secure, equitable and within reach of all.

Happy reading!



Vandana Majumdar

**This issue is for private circulation only. Digital copy available on our website.*

***Cover Credits: Enersider*

Know Us –

ENERSIDER Monthly is your gateway to the evolving energy landscape—offering in-depth coverage, sharp insights, and compelling stories across gas, renewables, and beyond. As India's leading energy magazine, it connects you to key developments, influential voices, and strategic trends, keeping you informed, empowered, and ahead of the curve.

Copyright@2026 Enersider Markets Media. All rights reserved. This title is registered trademark with the Trademark Registry, Government of India, New Delhi.

For queries: support@enersider.com
Website: www.enersider.com
LinkedIn: www.linkedin.com/showcase/enersider

ENERSIDER

NOVEMBER 2026 . VOLUME 2 . ISSUE 11

Partner
Zeba Khan

Partner
Anand Gautam

Head of Content
Vandana Majumdar

Design Consultant
Mohd. Shariq Ansari

Photography
Bhuvan Chawla

Digital Support
Atalia Marketing

Executive Support
Shyla Majumdar

Print Support
CreativAge
Mahesh Pal

Accountant
Dheeraj Joshi

Founder's Note

At Enersider Markets Media, our vision has always been clear - to build a future-forward, premium media platform dedicated exclusively to the energy sector. As the industry undergoes rapid transformation, the need for credible insights, meaningful dialogue, and informed perspectives has never been greater.

Today, Enersider Markets Media stands as a 360-degree platform, bringing together multiple avenues of engagement. Through our monthly digital magazine, Enersider, our podcast, Signed-in with Enersider and our high-impact industry forums and networking platforms, designed to foster dialogue, we continue to spotlight the ideas, leaders, and innovations shaping the future of energy.

Building on the success of our flagship events—the Annual Business Conclave and the Future Energy Leaders Award Show, we are now gearing up to launch a series of sector-focused, niche forums. These upcoming engagements will be sharper in focus, deeper in insight, and richer in conversation. Stay tuned.

As India steps into a decisive decade for energy, we remain committed to connecting stakeholders, amplifying voices, and telling the stories that matter most.

Thank you for being part of this journey.

SIDDARTH GAUTAM



More hydrogen. Less energy. Lower production cost.

Why you need a ZIRFON membrane inside your electrolyzer:

Lowest energy consumption, highest yield

Up to 6x more hydrogen per active area

Ideal for renewables

High efficiency and flexible operation under fluctuating power

Guaranteed safe operations

High gas purity, even at low loads • Zero incidents since 2007

Proven, and available at scale

10+ years proven lifetime • 4+ GW powered • 20 GW/year capacity

Visit us at IGHA-Hyvolution India:
17-18 november 2026, Booth 20&21, India Expo Mart, Greater Noida (Delhi NCR)

Learn more at
www.agfa.com/zirfon

AGFA
ZIRFON

The Newsmaker

BY ENERSIDER DESK

A NEW FORCE IN GREEN FINANCE

JATIN KUMAR NAYAK
Chairman & Managing Director,
IREDA

Jatin Kumar Nayak took charge as Chairman and Managing Director (CMD) of the Indian Renewable Energy Development Agency Limited (IREDA) on 30 October 2026, following approval from the Appointments Committee of the Cabinet (ACC) and the Ministry of New and Renewable Energy (MNRE). He will hold the position until 30 September 2029, or until further orders, whichever is earlier.

With over 34 years of professional experience, Nayak brings a strong background in finance, power-sector operations and public-sector management. Before taking charge at IREDA, he served as Executive Director (Finance) at REC Limited, a Maharatna public sector enterprise under the Ministry of Power. He also served as Chief Financial Officer of the erstwhile REC Transmission Projects Company Limited, a subsidiary of REC.

Earlier in his career, he worked with several major public-sector organisations, including NHPC Limited, Hindustan Copper Limited, National Aluminium Company Limited (NALCO) and Neelachal Ispat Nigam Limited. His experience across the power, mining and metals sectors has given him an understanding of the financial and operational challenges faced by large infrastructure and energy organisations.

An alumnus of Utkal University, Bhubaneswar, Nayak holds a Master's degree in Commerce. He is also a Fellow Member of the Institute of Cost and Management Accountants of India and a qualified Company Secretary. His professional expertise covers resource mobilisation, treasury management, corporate finance, taxation, legal affairs, project appraisal, loan disbursement and recovery, and the management of stressed assets. This combination of financial and sectoral experience is expected to support IREDA's role in financing India's growing clean energy requirements.

Established in 1987, IREDA, a Navratna PSU under MNRE and a non-banking financial institution, finances renewable energy, energy efficiency and conservation projects across sectors including solar, wind, hydro, energy storage and green hydrogen. It plays a key role in mobilising funds for India's clean energy transition and its 2030 target of 500 GW of non-fossil fuel capacity.

IREDA has recorded steady growth in its lending operations. In the second quarter of FY 2026–27, announced in October 2026, loan disbursements stood at ₹10,579 crore, marking a 31% increase over the corresponding quarter of the previous year. Its outstanding loan book grew by 15% to ₹97,411 crore, while net non-performing assets improved from 1.97% to 1.08%.

As Nayak takes over the organisation's leadership, his experience in financial management, resource mobilisation and project financing comes at an important time for India's renewable energy sector. With growing investment requirements and the emergence of new clean energy technologies, strengthening IREDA's lending operations, maintaining financial discipline and expanding access to finance will be central to its continued contribution to India's energy transition.



image source: IREDA

The Newsmaker

BY ENERSIDER DESK

Marking a new chapter in ONGC's leadership, Sunil Kumar has been appointed as the company's next Chairman. Currently serving as Executive Director and Asset Manager, he will take charge for a three-year tenure on or after December 7, 2026, succeeding Arun Kumar Singh. He will also become the first ONGC executive to rise directly from the Executive Director rank to the top post.

Kumar brings over three decades of experience within ONGC, having joined the organisation in 1991 as an Assistant Executive Engineer (Production) in Sivasagar-Nazira, Assam. A petroleum engineering graduate from the Indian School of Mines, Dhanbad, he holds a postgraduate diploma in Business Management, specialising in Marketing and Finance, from the Management Development Institute (MDI), Gurugram.

Over the years, his professional journey has taken him to several key ONGC locations, including Mumbai, Delhi, Hazira, and Kakinada. His experience spans production operations, well services, offshore engineering, and deepwater development. He also contributed to ONGC's organizational transformation initiatives, including the shift toward an asset-based management structure.

Among his notable assignments was his involvement in planning and executing the Vasistha and S1 deepwater project on India's eastern coast. He subsequently led the development of a major shallow-water subsea project at Mumbai, overseeing the drilling and commissioning of 11 subsea wells.

In Kakinada, as Project Manager of the KG-DWN-98/2 Cluster II project, he played a key role in bringing the fields into production, which achieved approximately 35,000 barrels of oil per day and 1.4 million standard cubic metres of associated gas production.

In January 2025, he took charge as Executive Director and Asset Manager of ONGC's Mehsana Asset in Gujarat.

As Kumar prepares to take the helm, ONGC is at an important stage in its growth journey. The Maharatna PSU continues to play a central role in India's energy security, contributing around 73% of the country's crude oil and 57% of its natural gas production. The company reported an oil and gas production volume of 40.46 million tonnes of oil equivalent (MMTOE), including joint ventures, in FY2025-26. It has also been advancing its exploration activities, with a recent gas discovery in the Mahanadi deepwater block under its Samudra Manthan mission.

Kumar's experience in operations will be valuable as ONGC works to increase production from existing fields, explore new reserves and strengthen India's domestic oil and gas supply. He will lead the company as it continues to grow its core business while exploring new energy opportunities.

COMMANDING THE OILFIELDS

SUNIL KUMAR
Chairman, ONGC



image source: ONGC

The Newsmaker

BY ENERSIDER DESK

Pankaj Pandey, currently serving as Executive Director at POWERGRID, has been appointed Director (Operations) of Power Grid Corporation of India Limited. The appointment was approved by the Ministry of Power on October 30, 2026. He is expected to take charge on or after December 1, 2026, and will serve in the position until his superannuation on June 30, 2030, or until further orders, whichever is earlier.

With over three decades of experience in the power transmission sector, Pandey has spent his professional career with POWERGRID, gaining experience across project execution, transmission infrastructure, asset management and operations. His career has involved responsibilities across locations including Delhi, Gurugram, Lucknow and Barabanki, giving him exposure to different aspects of the organisation's transmission network.

In his recent role, Pandey was associated with POWERGRID's Tariff Based Competitive Bidding (TBCB) division, which handles an important part of the company's transmission business. This experience will be particularly useful as India expands its transmission network to meet rising power demand and connect more renewable energy projects to the grid. His earlier responsibilities as Chief General Manager also added to his experience in managing transmission projects and assets.

As Director (Operations), he will be responsible for overseeing the operation of POWERGRID's transmission assets, improving their reliability and efficiency, and adopting new technologies to strengthen network performance. His role will also involve supporting the company's efforts towards greater indigenisation of transmission equipment and systems.

A Maharatna Central Public Sector Enterprise under the Ministry of Power, POWERGRID plays a key role in India's electricity transmission infrastructure. The company is responsible for developing and maintaining a nationwide transmission network that enables the transfer of electricity across regions.

As of December 31, 2025, POWERGRID operated approximately 1,81,894 circuit kilometres of transmission lines, 287 substations and a transformation capacity of around 5,94,016 MVA. During calendar year 2025, it added 2,300 circuit kilometres of transmission lines, seven substations and 47,555 MVA of transformation capacity.

The company is also expanding beyond conventional transmission infrastructure. Its recent initiatives include its first Battery Energy Storage System (BESS) project, with a capacity of 150 MW/300 MWh, and the commissioning of a large digital substation.

With India's power demand rising and renewable energy capacity expanding, strengthening the transmission network will remain an important priority. Pandey's experience across transmission projects and infrastructure development will be valuable as POWERGRID works towards building a more reliable, efficient, and future-ready electricity network.

AT THE FOREFRONT OF TRANSMISSION

PANKAJ PANDEY
Director (Operations),
POWERGRID



image source: POWERGRID



INDIA GREEN HYDROGEN ASSEMBLY

Hyvolution INDIA

Powering the Green Hydrogen Frontier

India's green hydrogen journey is beginning to take shape, with companies across the energy sector stepping in to turn ambition into action. From producing green ammonia and manufacturing electrolysers to developing storage solutions, renewable power and port infrastructure, each is contributing to a different part of the growing hydrogen ecosystem. This exclusive feature, in association with GH2 India, looks at six such organisations, exploring their projects, partnerships and efforts to build India's green hydrogen economy.

Ahead of IGHA–Hyvolution India 2026, it offers a glimpse into the companies driving this change and the developments, technologies and opportunities that will be part of the conversations at the event.

Few projects capture India's green hydrogen ambition as literally as AM Green's Kakinada complex. Founded by Greenko founders Anil Chalamalasetty and Mahesh Kolli, AM Green is converting a brownfield ammonia-urea site in Andhra Pradesh into what it describes as one of the world's largest renewable ammonia facilities. The first phase is built around 1.3 GW of pressurised alkaline electrolysers from Belgium's John Cockerill, running on round-the-clock renewable power. AM Green reached Final Investment Decision on this first million-tonne-per-year phase in August 2024.

What distinguishes AM Green is how early it has lined up demand. Germany's Uniper has signed a long-term offtake agreement for up to 500,000 tonnes a year and Japan's JERA a binding heads of agreement for 70,000 tonnes a year, alongside offtake term sheets with Norway's Yara and Singapore's Keppel. Few Indian hydrogen developers have secured buyers this far ahead of first production. Backed by Gentari and GIC, AM Green is targeting 5 million tonnes of green ammonia capacity by 2030, which the company estimates at roughly one-fifth of the National Green Hydrogen Mission's production target and about 10% of Europe's projected import demand.

At IGHA–Hyvolution, AM Green's story is less about potential and more about proof: a 1.3 GW first phase past FID, with buyers already contracted.

1.3 GW
ELECTROLYSER CAPACITY (PHASE 1)

570,000 TPA
OFFTAKE COMMITMENTS FROM UNIPER AND JERA.

5 MTPA BY 2030
GREEN AMMONIA CAPACITY TARGET.



GAUTAM REDDY

Chief Executive Officer,
AM Green Group

am green



Oriana Power is expanding beyond its solar EPC roots into green hydrogen and ammonia through its subsidiary, TrueRE Oriana Power. Under the SECI SIGHT programme, the company has secured a 10-year agreement worth approximately ₹3,135 crore to supply 60,000 tonnes of green ammonia annually at ₹52.25/kg. The plant will be established in Sagar, Madhya Pradesh, with Madhya Bharat Agro Products as the end-offtaker.

The company is also transitioning towards owning utility-scale renewable energy and battery storage assets, while developing an integrated green molecules ecosystem. Its partnerships with the Governments of Maharashtra and Andhra Pradesh, along with VOC Port Authority, support this ambition. The proposed Maharashtra project alone involves an investment of around ₹4,500 crore.

Oriana is also building international partnerships and offtake channels across Europe, Japan, Korea and Singapore, targeting demand for green ammonia and methanol in fertilisers, industry, shipping and marine fuels. By connecting renewable generation, green molecule production, industrial demand and export infrastructure, the company is positioning itself across the green hydrogen value chain. Its SECI-backed agreement provides a significant example of India's emerging green ammonia market moving towards commercial viability.

60,000 TPA
GREEN AMMONIA SUPPLY COMMITMENT TO SECI.

₹3,135 CRORE
VALUE OF 10-YEAR SECI AGREEMENT.

₹52.25/KG
GREEN AMMONIA PRICE SECURED IN SECI'S 2025 AUCTION.

PARVEEN JANGRA

Founder, Chief Technical Officer &
Chief Operating Officer,
TrueRE - Oriana Power Ltd

TrueRE
ORIANA POWER LIMITED

Avaada is attempting something few Indian energy groups have: running generation, manufacturing and green fuels as one integrated model. Alongside a renewable portfolio scaling toward 30 GW, its manufacturing arm Avaada Electro has commissioned the first 3 GW line of a 6 GW TOPCon solar cell facility in Nagpur, and has filed confidential papers for an IPO of ₹9,000 to 10,000 crore, among the largest clean-energy manufacturing listings proposed in India.

On hydrogen, Avaada signed a ₹40,000 crore MoU with the Government of Rajasthan in 2022 for a green ammonia plant, and is developing a 1,500 tonnes-per-day green ammonia facility in Odisha with Swiss technology licensor Casale.

The platform is backed by USD 1.3 billion raised from Brookfield and Thailand's GPSC in 2023. Chairman Vineet Mittal also chairs the CII Taskforce on Green Hydrogen, a policy role few promoters combine with active project execution.

At IGHA–Hyvolution, Avaada's relevance is structural: it is manufacturing hardware, building a molecules business and contributing to the policy framework the sector operates within. The Rajasthan and Odisha projects are worth watching as they move from commitment to construction.

30 GW
TARGETED RENEWABLE ENERGY PORTFOLIO.

6 GW
TOPCON SOLAR CELL MANUFACTURING CAPACITY PLANNED IN NAGPUR.

1,500 TPD
GREEN AMMONIA FACILITY UNDER DEVELOPMENT IN ODISHA.



VINEET MITTAL

Founder & Chairman,
Avaada Group

AVAADA



Deendayal Port Authority's hydrogen programme is a useful reminder that the sector is not built by private capital alone. At Kandla, DPA commissioned a 1 MW green hydrogen plant in July 2025, delivered with L&T on indigenously manufactured electrolysers. Designed to produce about 140 tonnes of green hydrogen a year, it is the first module of a 10 MW project whose foundation stone was laid in May 2025.

The port has positioned it as a live test case for Make in India hydrogen infrastructure, built and operated by a public port authority rather than a private developer.

The choice of location matters. Ports are natural hydrogen hubs, close to shipping demand, industrial clusters and export infrastructure, and DPA's willingness to build and operate hydrogen production directly, rather than simply leasing land to private players, marks a distinct model for how public infrastructure can participate in the transition.

At IGHA–Hyvolution, DPA's story speaks directly to the policymakers and PSU delegates in the room: proof that public port infrastructure can host functioning green hydrogen production today. It is a plant in operation, not a pilot on paper, and a template other ports and public authorities may look to replicate.

1 MW
OPERATIONAL GREEN HYDROGEN PLANT AT KANDLA.

140 TPA
ANNUAL GREEN HYDROGEN PRODUCTION CAPACITY.

10 MW
TOTAL PROJECT CAPACITY PLANNED.

SUSHIL KUMAR SINGH

Chairperson,
Deendayal Port Authority

DEENDAYAL PORT AUTHORITY

Few Indian groups have moved from renewable generation into green fuels at the scale ACME has. Its listed arm, ACME Solar Holdings, has a renewable portfolio of about 8.1 GW, of which about 3 GW is operational. The wider ACME group is developing green hydrogen and ammonia projects in Duqm, Oman, and in Odisha, the latter anchored by a binding agreement signed in 2024 to supply 100,000 tonnes a year of green ammonia to Norway's Yara.

ACME Solar's FY26 results (April 2025 to March 2026) show the pace of the platform: consolidated revenue of ₹2,507 crore, up 59% year on year, with profit nearly doubling to ₹498 crore. Battery storage is a growing part of the story, with about 2.3 GWh commissioned and a target of 20 GWh by 2030.

At IGHA–Hyvolution, ACME's relevance lies in sequencing: a group that built scale in generation first and is now extending into green hydrogen exports, a pathway other large Indian IPPs weighing the same transition may follow.

8.1 GW
RENEWABLE ENERGY PORTFOLIO.

100,000 TPA
GREEN AMMONIA SUPPLY COMMITMENT TO YARA.

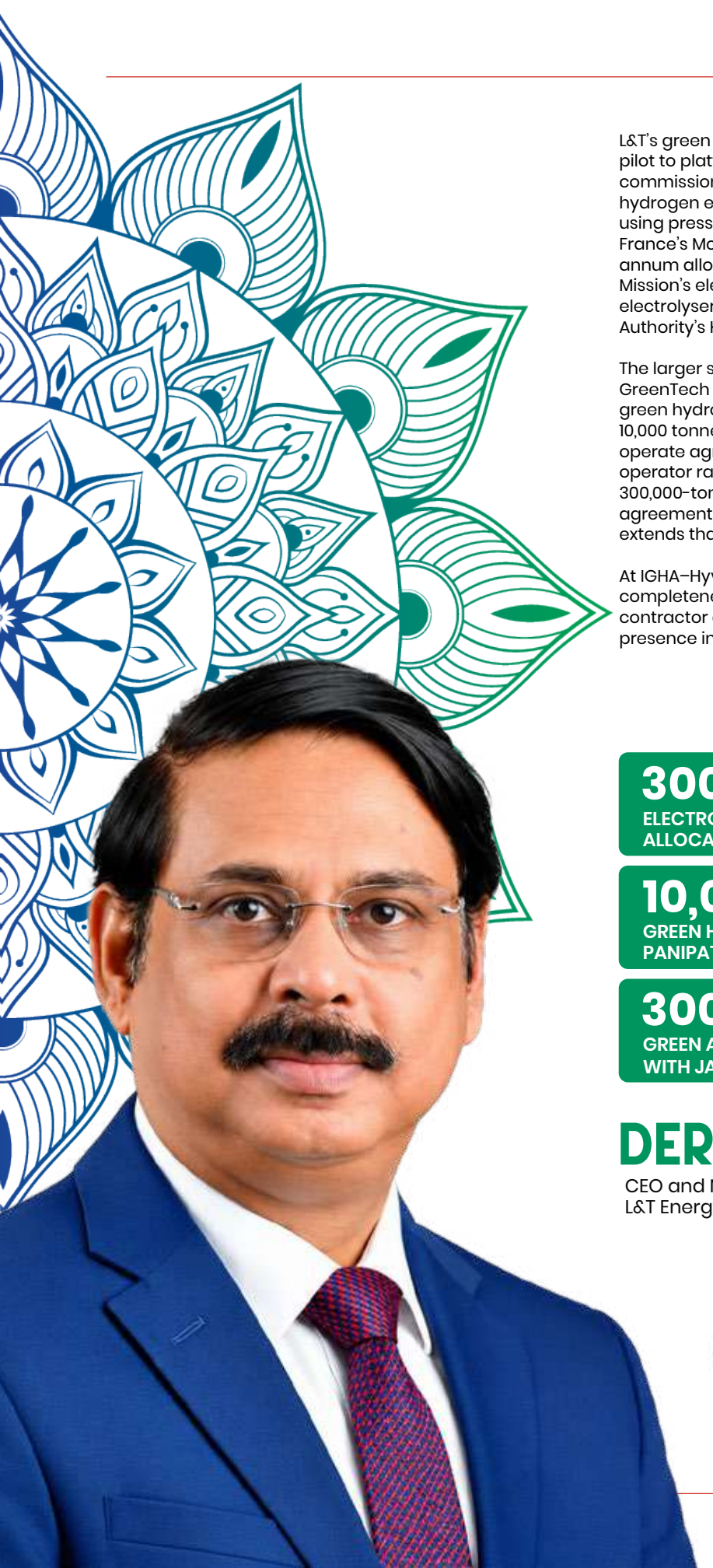
20 GWH
BY 2030 BATTERY STORAGE CAPACITY TARGET.



ANIL TAPARIA

Chief Executive Officer
Green Hydrogen & Ammonia,
ACME Group

ACME
Leading Through Innovation



L&T's green hydrogen strategy has moved from pilot to platform quickly. Through L&T Electrolysers, it commissioned its first indigenously manufactured hydrogen electrolyser at its Hazira complex in 2024, using pressurised alkaline technology licensed from France's McPhy Energy, and holds a 300 MW-per-annum allocation under the National Green Hydrogen Mission's electrolyser manufacturing incentive. Its electrolysers are already in service at Deendayal Port Authority's Kandla plant.

The larger signal came in July 2025, when L&T Energy GreenTech was selected to build India's largest green hydrogen plant at Indian Oil's Panipat refinery: 10,000 tonnes a year under a 25-year build-own-operate agreement, positioning L&T as a long-term operator rather than a one-time EPC contractor. A 300,000-tonne-per-year green ammonia supply agreement with Japan's ITOCHU, signed in April 2026, extends that ambition toward exports.

At IGHA–Hyvolution, L&T's position is unusual in its completeness: manufacturer of core equipment, EPC contractor and now long-term producer, a full-stack presence in India's hydrogen economy.

300 MW/YEAR
ELECTROLYSER MANUFACTURING ALLOCATION.

10,000 TPA
GREEN HYDROGEN PLANT AT IOCL PANIPAT.

300,000 TPA
GREEN AMMONIA SUPPLY AGREEMENT WITH JAPAN'S ITOCHU.

DEREK SHAH

CEO and Managing Director,
L&T Energy GreenTech

L&T Energy GreenTech

Q

As the hydrogen economy gathers momentum in India, companies with deep expertise in industrial gases and cryogenic engineering are finding themselves at the centre of this emerging transition. With its experience in advanced cryogenic solutions, INOXCVA is among the companies contributing to the development of this evolving sector.

In this exclusive interview, Mr. Savir Jhulka, Global Head (IG) and Director, INOXCVA, shares his perspective on India's hydrogen landscape, the opportunities ahead and the role of engineering and innovation in supporting the country's clean energy ambitions.

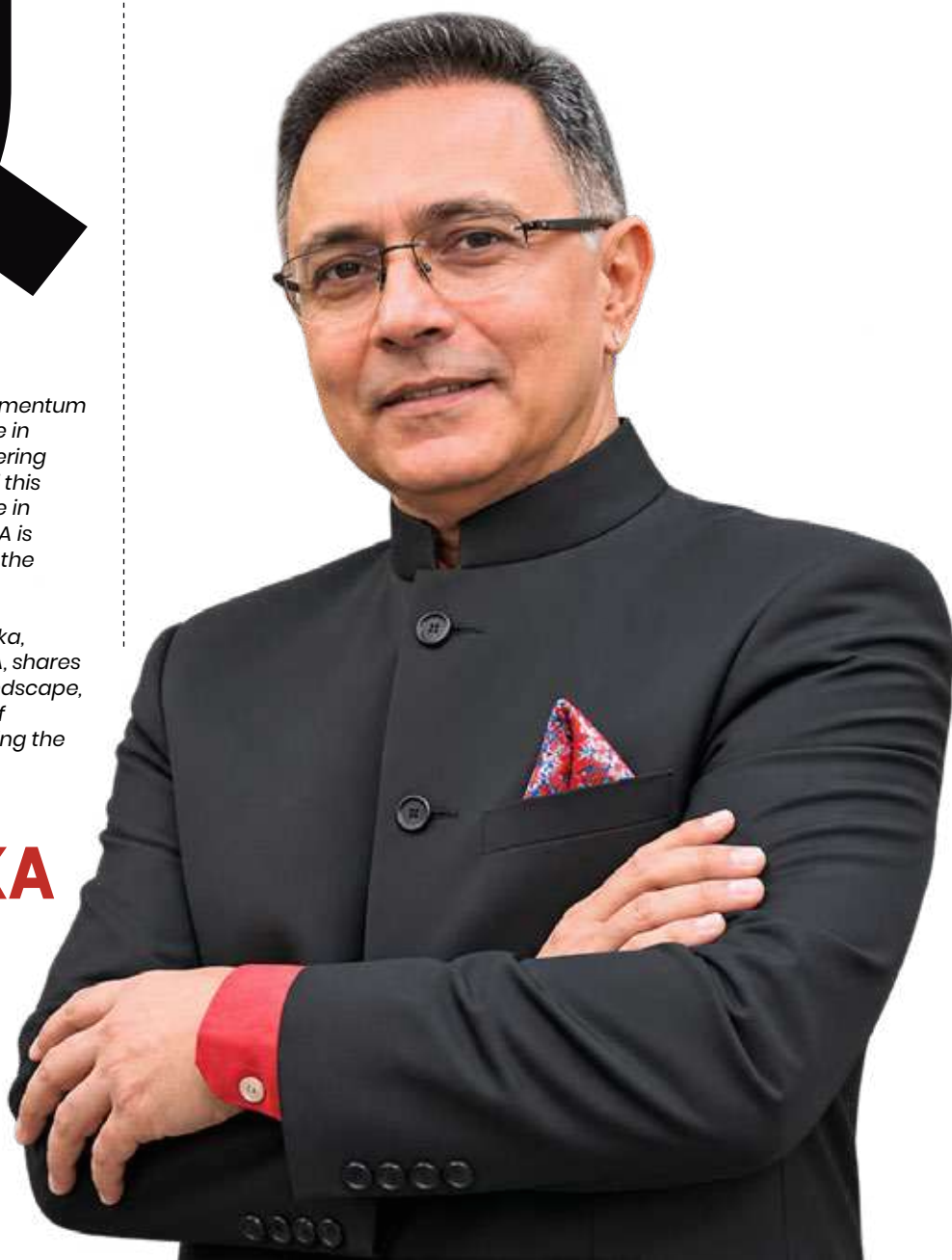
SAVIR JHULKA

Global Head (IG) & Director,
INOXCVA

As India's hydrogen production pipeline scales, storage and transport—not electrolysis—often becomes the real bottleneck. What specific infrastructure gaps is INOXCVA solving right now?

India's ambition to produce 5 MTPA of green hydrogen annually by 2030 presents a significant opportunity. However, its success will depend equally on the ability to store, transport and deliver hydrogen safely, reliably and economically.

Liquefaction increases hydrogen's volumetric density approximately 800-fold compared with gas at atmospheric pressure, making it attractive for bulk storage and transportation. However, maintaining temperatures of –253°C demands advanced cryogenic systems, vacuum insulation and effective boil-off management.



At INOXCVA, we are addressing these challenges through indigenous engineering and manufacturing of high-integrity liquid hydrogen infrastructure, including large-capacity vacuum-insulated storage tanks and specialised transportation solutions.

The priority is to build an integrated supply chain connecting production hubs, storage facilities, transportation networks and end users. Much like LNG, hydrogen will require a flexible, multimodal infrastructure ecosystem.

Our focus is on delivering advanced cryogenic solutions that make hydrogen storage and distribution safer, more efficient and commercially scalable.

Your ISRO collaboration produced India's first trailer-mounted liquid hydrogen tank. What does the next generation of hydrogen logistics infrastructure look like for the country?

Our collaboration with ISRO to develop India's first trailer-mounted liquid hydrogen tank marked a significant milestone in indigenous hydrogen logistics. We have further demonstrated our capabilities through the supply of a 238 m^3 liquid hydrogen storage tank to South Korea and four tanks of 311 m^3 capacity each for another international project, showcasing India's ability to deliver world-class hydrogen infrastructure.

Looking ahead, I believe the next generation of hydrogen logistics will be defined by three attributes: integration, flexibility and scalability.

In the near term, cryogenic trailers for liquid hydrogen and high-pressure tube trailers for gaseous hydrogen will enable flexible distribution, particularly where pipelines are not yet viable. Strategically located bulk storage facilities and efficient transfer systems will complement these networks.

As demand grows, integrated hydrogen hubs combining production, liquefaction, storage and distribution will become essential. Dedicated pipelines and suitably assessed existing gas networks could support high-volume transportation, while green ammonia may offer an alternative for long-distance movement.

India can leverage its established LNG and industrial gas expertise in cryogenic engineering, vacuum insulation, thermal management and safe fuel handling. However, liquid hydrogen's extremely low operating temperature demands specialised materials, advanced insulation and stringent safety systems.

The opportunity is to translate India's indigenous engineering strengths into commercially viable infrastructure serving domestic and global markets. At INOXCVA, we aim to enable this transition through advanced cryogenic engineering, manufacturing excellence and integrated hydrogen storage and transportation solutions.

Ultimately, producing green hydrogen is only the beginning. Making it accessible, affordable and reliably deliverable at scale will transform hydrogen from an emerging energy alternative into a mainstream industrial solution.

A

COP31 And The Case For A Systemic Transition: Linking Development, Resilience And Equity

By Dr. Akanksha Jain & Dr. Debajit Palit

As global leaders gather in Antalya for the 31st Conference of the Parties (COP31), the international climate agenda faces a defining test. It tests whether decades of climate negotiations can translate into tangible improvements in the resilience of economies, ecosystems and communities.

Across the Global South, retreating Himalayan glaciers, erratic rainfall, prolonged droughts, extreme heat and increasingly destructive floods are disrupting the foundations of economic development. Climate change is no longer simply an environmental externality to be managed alongside economic growth. It is increasingly a determinant of food security, water availability, energy reliability, industrial productivity and infrastructure stability.

For the Global South, the challenge is particularly complex. They must simultaneously expand energy access, industrialise, urbanise, secure food and water supplies and improve living standards, while reducing emissions and preparing for increasingly severe climate disruptions.

These demands unfold against an unequal global distribution of historical emissions, financial resources and technological capabilities. For instance, India's contribution to cumulative global CO emissions remains below 4%, despite accounting for more than 17% of the world's population. The distinction between historical responsibility, present-day emissions and capacity to respond therefore remains fundamental to climate equity.





DR AKANKSHA JAIN
Research Associate,
Chintan Research Foundation

DR DEBAJIT PALIT
Centre Head at Centre for Climate Change and Energy Transition,
Chintan Research Foundation

The central question for COP31 is consequently not whether countries should pursue mitigation or adaptation, but whether the international climate architecture can support development pathways that deliver both. This requires moving beyond the treatment of climate change as a collection of independent sectoral challenges towards recognising it as a systemic risk. It also requires a deeper question: what kind of development should the Global South pursue in a world of finite ecological resources and intensifying climate risks?

Climate vulnerability as a systemic development risk

Climate impacts rarely remain confined to the sector or geographical location in which they originate. A rainfall deficit can reduce agricultural output, increase groundwater extraction, raise electricity demand for irrigation and intensify pressure on already stressed water resources.

On the other hand, intense rainfall can damage crops, roads and electricity distribution infrastructure, disrupt industrial operations and increase public expenditure on reconstruction. Similarly, glacier retreat and changing Himalayan hydrology has implications not only for mountain ecosystems but also for downstream agriculture, drinking water, hydropower and infrastructure.

The problem, therefore, is not simply the frequency or intensity of individual climate hazards. It is the vulnerability of interconnected systems through which their consequences propagate. Infrastructure designed around historical climatic conditions, agricultural systems dependent on increasingly uncertain water availability and energy networks exposed to extreme weather can collectively amplify the consequences of a single climate event.

Adaptation therefore cannot remain restricted to isolated interventions such as flood barriers, drought-resistant crops or disaster-relief mechanisms. These are important, but their effectiveness depends on the institutional, technological and economic systems surrounding them.

Climate risk must become an integral consideration in public investment appraisal, infrastructure design, financial risk assessment, land-use planning and economic governance. In other words, resilience must be built into the development process, rather than added after development decisions have already created new vulnerabilities.

From renewable energy to responsible development

The Global South must move beyond the binary of fossil versus non-fossil energy and reconsider how energy systems are structured, delivered and sustained by making a distinction between renewable energy and responsible energy. The renewable energy asks only if the process of production of electricity is low carbon, whereas responsible energy asks whether the energy value chain is low-carbon, resource-efficient, socially inclusive, and systemically sustainable over time.

This distinction has significant implications. A technology may reduce carbon emissions while placing additional pressure on land, water, biodiversity or critical mineral supply chains. Its environmental and social consequences cannot be assessed through generation costs or carbon intensity alone.

We need to move beyond the levelised cost of energy (LCOE) to also include lifecycle assessment (LCA), accounting for resource use, material intensity, biodiversity impacts and end-of-life disposal. Infrastructure decisions made today can persist for 40–50 years; the Global South thus cannot afford to solve one problem only to create another that requires expensive correction.

A distinction between electrons and molecules as a way of designing differentiated transition pathways is also required. Electrification, supported by renewable power, storage and grid modernisation, should be prioritised wherever technically and economically feasible. Molecules such as hydrogen and biofuels remain relevant where direct electrification is difficult. The objective is not to impose a uniform technological pathway, but to align energy choices with domestic resources, industrial requirements, affordability and energy security.

This is especially important because energy is not merely another economic sector. It is an enabling foundation for development. Electricity supports industrial production, healthcare, education, digital connectivity and agricultural productivity. For countries still addressing energy poverty and industrialising, transition strategies that compromise affordability or reliability can undermine the very development gains that climate action is expected to protect.

The proposition for the Global South extends beyond decarbonisation to examine how energy systems can advance development and improve human well-being without replicating the resource-intensive growth pathways historically followed by the Global North. This calls for a rethinking of not only how energy is produced and consumed, but also the underlying purpose and pathways of development itself.

The deeper question: What constitutes progress?

The deeper civilisational question is: can the Global South pursue development without simply replicating the consumption patterns of the industrialised world? Drawing on planetary boundaries research and Kate Raworth's Doughnut Economics framework, sustainable development can be understood as creating a safe and just space between two imperatives: a social foundation that secures essential human needs and an ecological ceiling that respects the limits of the planet.

This represents an important departure from the assumption that development must necessarily follow an ever-expanding trajectory of material consumption. The Global South has legitimate aspirations for improved living standards, industrial development, infrastructure and economic opportunities.

However, the resource-intensive development model followed by high-income economies should not be regarded as the inevitable destination for all societies. Replicating these patterns of material consumption and resource use globally would place unprecedented pressure on natural ecosystems and risk transgressing planetary boundaries. The IPCC's Fifth Assessment Report, published in November 2014, recognised that human behaviour, lifestyles and culture significantly influence energy use and associated greenhouse gas emissions.

An energy transition informed by the civilisational ethos of Bharat can therefore offer a distinct epistemological perspective, by recognising diverse cultural and ethical traditions and incorporating the lived experiences and aspirations of different communities. Such perspectives should inform energy transition policies across the Global South.

The foundations of this transition must be anchored in ecological repair, co-existential development and the preservation of social cohesion. It should prioritise improved access to essential services, particularly healthcare, education and livelihood opportunities, while moving away from excessive consumerism towards a more responsible and sustainable patterns of production and consumption.

The concept of Arthayam, articulated by Pandit Deendayal Upadhyaya in 1960s, offers an important philosophical perspective on this relationship. Drawing an analogy with Pranayam, which regulates breathing to maintain a healthy body, Arthayam emphasises the regulation of production, distribution and consumption of wealth to ensure a healthy economic system. Its central premise is that economic activity must serve human needs and well-being rather than promote unlimited accumulation and consumption.

As articulated in this philosophy, "consumption should serve human interests and comforts, not luxuries". This is not an argument against development, aspiration or economic growth, but rather a reflection on the purpose and limits of economic activity. Production, distribution and consumption must be assessed not merely in terms of the wealth they generate, but also in terms of who benefits, what resources are consumed, and what ecological and social costs are imposed. Thus, the objective of any economic system should be not extravagant use of resources but a well-regulated use.

This perspective resonates with the principles of Integral Humanism, which emphasise decentralisation, human welfare and the need to avoid the unsustainable exploitation of nature. It also finds contemporary relevance in Mission LiFE, which seeks to shift society from "mindless consumption" towards "mindful utilisation" of resources. This underscores that responsible energy and development transitions cannot be achieved through technological substitution alone but require a fundamental reorientation of institutional priorities, production systems, consumption patterns and public behaviour.

This philosophical perspective offers the Global South an opportunity to shape a development model rooted in its own social and ecological realities. It does not mean that all countries must adopt identical approaches, nor that poorer populations should be asked to limit aspirations in the name of sustainability. Rather, it distinguishes between meeting unmet human needs and perpetuating forms of excessive resource consumption. Equity requires expanding access and opportunity while reducing wasteful and ecologically damaging patterns of production and consumption.

Making Systemic Transition operational: Technology, Finance and Institutions

This philosophy of restraint must, however, translate into practical reforms in the Global South countries. A systemic energy transition requires three mutually reinforcing foundations: technology, finance and strong institutions. This philosophy of restraint must, however, translate into practical reforms. A systemic energy transition requires three mutually reinforcing foundations: technology, finance and strong institutions.

Technology reforms must prioritise affordable access, localisation and context-specific innovation. Developing economies require investments not only in renewable energy but also in storage, grid modernisation, climate-resilient infrastructure, early-warning systems, water-efficient technologies and resilient agricultural practices.

International cooperation should extend beyond mere technology transfer towards joint research, manufacturing partnerships, technical capacity-building and South-South cooperation. Indigenous and traditional knowledge must also inform adaptation planning, particularly in ecosystems where communities possess long-standing experience of managing environmental variability.

Financial reforms must address the enormous gap between adaptation requirements and available resources. The UNEP Adaptation Gap Report of 2025, estimated that developing countries would require US 310$ billion annually, in contrast to the realised finance of US 26$ billion.

Adaptation investments in agriculture, water security, disaster preparedness, coastal protection, public health and livelihoods often generate long-term public benefits without immediate commercial returns. They cannot depend exclusively on private capital. Predictable grants, concessional lending, guarantees, local-currency instruments and lower costs of capital are essential. Public finance must be directed towards areas of greatest vulnerability, while private investment can be mobilised more extensively in commercially viable mitigation sectors.

Institutional reforms are the foundation that connects the other two. Transitions succeed not merely through the availability of technologies, but through the

capacity of institutions to absorb, govern, adapt and scale them effectively. Climate risks cross administrative and sectoral boundaries, whereas governance structures frequently remain organised around individual departments and mandates.

Agriculture, water, energy, urban development, disaster management and finance institutions must coordinate their decisions. State institutions, public utilities and local governments need the capacity to plan and implement resilience measures. Communities must be participants in adaptation and transition planning, not merely recipients of interventions.

These reforms also require equity to move from diplomatic language into operational design. The principle of common but differentiated responsibilities and respective capabilities (CBDR-RC) must inform access to finance, technology and decision-making. Transitions in fossil-dependent regions must address livelihoods, reskilling, regional diversification and social protection. A responsible transition must improve quality of life rather than simply compensate communities for the costs imposed upon them.

COP31: From climate commitments to a new development compact

COP31 offers an opportunity to connect these technological, financial, institutional and philosophical dimensions. Its implementation agenda must recognise that adaptation, mitigation and development cannot be pursued as separate policy tracks.

First, climate resilience must become a criterion for development planning and public investment. National adaptation commitments must translate into decisions at state and local levels, informing infrastructure design, agricultural policies, urban development, water governance and energy planning.

Second, climate finance must reflect the differentiated requirements of mitigation and adaptation with predictable public and concessional resources directed towards resilience-building.

Third, climate progress must be measured beyond emissions reductions and renewable capacity additions. Indicators of water and food security, infrastructure exposure, ecosystem health, early-warning coverage, energy reliability, livelihood protection and institutional preparedness are necessary to determine whether vulnerabilities are declining.

COP31 must also recognise a larger question: the purpose of the transition cannot be limited to replacing one set of technologies with another while leaving the underlying development model untouched. A climate-resilient future requires a more careful relationship between economic growth, human well-being and ecological limits. This is where the philosophical contribution of India becomes important to the global climate discourse.

The Global South does not ask for charity; it asks for equity, for genuine partnership, and for the space to chart its own path through a crisis it did not primarily create.

This is not a rejection of international cooperation. It is a call for cooperation that recognises inherently differentiated baseline, historical responsibility and the right to development. It is also a call to move from uniformity to differentiated readiness, from renewable energy to responsible energy, and from growth measured only through material expansion to development assessed through human and ecological well-being.

Ultimately, the success of COP31 should be judged not only by the carbon emissions that the countries commit to avoid, but by the vulnerabilities they prevent, the livelihoods they protect and the development opportunities they create.

The transition ahead is therefore not merely an energy transition. It is a systemic and philosophical transition in how societies produce, consume, govern resources and define progress. COP31 must help make that transition possible.

This article draws on ideas and arguments developed in the authors' recently published book titled Navigating the Climate Crisis: Perspectives and Actions from the Global South for Adaptation and Mitigation, published by Chintan Research Foundation & ADCS.

The views expressed are personal.

Chintan Research Foundation

ENERSIDER View

BY VANDANA MAJUMDAR

The clean energy debate often centres on how quickly India can expand its renewable energy capacity. But there is another side to this shift that deserves attention: what does it mean for a village that loses its grazing land to a solar park, or a community whose natural resources are taken up for mining? The impact on land, livelihoods and local communities must be part of the conversation if the transition is to be truly sustainable and fair.

Success cannot be measured only in megawatts installed or emissions avoided. It must also account for diverted land, disrupted livelihoods and the communities bearing the costs.

The Human *Angle*



The debate has become particularly relevant following Rajasthan's August 2026 amendments to its land allotment rules for renewable energy projects. The changes allow the state to allot land for large projects of 1,000 MW and above, with around five lakh acres of government land expected to be made available. However, the move has raised serious concerns over the possible loss of pasturelands, orans (sacred community groves), trees, and other resources that local communities depend on. As reported by The Times of India, local representatives are not opposed to renewable energy development but are calling for adequate safeguards to ensure that it does not come at the cost of traditional livelihoods and community resources.

Rajasthan and Gujarat are major destinations for renewable energy projects. But land that appears empty on a government map may be vital to local communities. Diverting it can disrupt rural economies.

The problem also lies in how land is viewed. What the government calls wasteland may still support grazing, water access, and local livelihoods. If communities lose these resources without fair compensation or a share in the benefits, it raises an important question: can a project truly be sustainable at their expense?

The transition to clean energy is also creating a race for critical minerals. Lithium, cobalt and nickel, essential to batteries and energy storage, are becoming increasingly important to countries looking to reduce their dependence on fossil fuels. The discovery of an estimated 5.9 million tonnes of lithium ore in Jammu and Kashmir's Reasi district in 2023 promised reduced import dependence but also raised concerns about the impact of mining on local land, agriculture and the environment. The proposed block failed to attract bidders in two auctions, as reported by The Indian Express in July 2024. Though mining has not begun, the case highlights the need for safeguards before extraction begins.

The question is not whether India should develop its critical minerals, but whether mineral security will overlook the rights of people. Communities that have borne the costs of fossil-fuel extraction should not face new pressures in the name of a cleaner economy.

For tribal and indigenous communities, forests and common lands are closely tied to their livelihoods, cultural identity and traditional knowledge. While the Forest Rights Act, 2006 recognises their rights over these resources, these protections must be upheld in practice.

An October 2026 report by Indigenous Peoples Rights International (IPRI) documented 48 human rights violations linked to transition projects across five Asian countries, finding that consent was absent, manipulated, or not genuinely obtained in 13 of the 14 cases studied.

The concerns included displacement, loss of livelihoods, and environmental damage. This highlights why communities must be involved in decisions from the outset, with access to clear information and a genuine say in projects that affect their lives.

Justice must also extend to communities dependent on fossil fuels. In India's coal-producing regions, moving away from coal will affect workers, small businesses and local economies. Renewable electricity will not automatically replace the jobs, incomes and public revenues that coal has supported.

TERI's 2024 Just Transition Framework for a Sustainable Future in India's Coal Mining Regions calls for planned change that addresses workers, communities, local industries and the environment. Without it, one region may lose coal-based livelihoods while another gives up agricultural or grazing land for renewable energy. The burden will have shifted, not disappeared.

India cannot afford to slow down its clean-energy ambitions, but the push for faster development must also be fair. A 2023 study in Energy Research & Social Science, titled "Analysing Intersections of Justice with Energy Transitions in India", highlights three key aspects of energy justice: how benefits and costs are shared, whether communities have a say in decisions, and whether their rights and needs are recognised.

These principles must guide project planning. Land assessments should look beyond government records to understand how communities actually use the land. Pasturelands, common lands, water bodies and sacred sites should not be treated as unused simply because they have no private owners. Gram Sabhas should be consulted before projects are approved, and the rights protected under the Forest Rights Act and the Panchayats (Extension to Scheduled Areas) Act must be respected.

These safeguards are not barriers to investment. They can prevent conflict, build trust and recognise communities as partners in development, not resources to be used. Benefit-sharing, local jobs and community development funds can return value to the people hosting projects.

People living beside solar parks should not have to choose between livelihoods and climate action. Tribal communities should not surrender their relationship with the land for mineral security, and coal workers should not face decarbonisation alone. A transition that leaves communities displaced, livelihoods disrupted and local voices unheard cannot claim to be truly sustainable. India has an opportunity to build an energy system that is not only cleaner but also fairer. The question is whether it will use this opportunity to break away from old inequalities or simply create new ones under the banner of green growth.

ENERSIDER

INTERDEPENDENCE UNDER FRAGMENTATION

WHY COP31 MUST BUILD A CLIMATE-SECURITY ARCHITECTURE

An Enersider Exclusive In Collaboration with Chintan Research Foundation



As the world navigates growing geopolitical tensions, climate vulnerabilities and competing economic interests, COP31 brings into focus a fundamental question: can nations work together to address shared climate risks in an increasingly fragmented world?

In this exclusive cover story, Enersider, in collaboration with Chintan Research Foundation (CRF), explores the critical intersections of energy security, climate finance, critical minerals, resilient infrastructure and biodiversity. The article examines the evolving Global North–Global South divide, the challenges of equitable energy transitions and the need to move beyond isolated climate commitments towards meaningful cooperation.

Drawing on research and policy perspectives, **Meheli Roy Choudhury**, Research Associate, and **Shagun Mamgain**, Research Analyst, at CRF's Centre for Climate Change and Energy Transition, present a compelling case for building shared resilience and translating global climate ambitions into collective action.



When geopolitical tensions force close shipping lanes, sending the markets, commodity and energy towards fuel hikes or a glacial flood collapses an entire hydel generation corridor, the effects spread well beyond the affected spot. Factories slow down, ports back up, power bills rise, and fiscal prudence shrinks. These shocks are routinely treated as separate problems: an energy crisis, a trade disruption, an isolated weather event. However, the common underlying thread, hitherto unconsidered, is now vastly becoming a central contention.

These are common problems - a world whose economic arteries are exposed to both geopolitics and a changing climate. As multilateralism enters another test phase amid rising protectionism and transactional foreign policies, the conversation and cooperation on climate-related issues must remain tactical and strategic.

In a world organised around competition, insecurity and fragmented economic interests, where supply chains are interconnected, no country can secure its energy sources, build infrastructure and industrial base alone. Yet cooperation is exactly what the current moment makes hardest.

COP31 is the thirty-first Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC), the principal multilateral forum for international climate negotiations. The process traces its origins to the 1992 Earth Summit in Rio de Janeiro, where countries adopted the UNFCCC to establish a framework for international cooperation to address climate change.

The Convention entered into force in 1994, and its first Conference of the Parties (COP1) was convened in Berlin, Germany, in 1995. Since then, COPs have been organised annually, providing a platform for Parties to review progress in implementing the Convention, assess collective efforts, negotiate commitments and strengthen mechanisms for climate action.

A landmark outcome of this process was the adoption of the Kyoto Protocol in 1997, followed by the Paris Agreement at COP21 in 2015.

The latter established a global framework under which countries submit and periodically strengthen their Nationally Determined Contributions (NDCs), with the objective of limiting global temperature rise to well below 2°C while pursuing efforts to restrict it to 1.5°C above pre-industrial levels. Against this backdrop, COP31, taking place in Antalya, Türkiye, from 9 to 20 November 2026, comes at a critical juncture, with resilient infrastructure, climate finance and the clean energy transition emerging as key areas of discussion.

Dubbed the "implementation COP" and "COP of the future", this year's focus is firmly on translating existing commitments into implementation. In addition, the dialogue recognises the heightened focus on Small Island Developing States (SIDS) and climate-vulnerable countries, underscoring the need to place their unique developmental challenges, disproportionate exposure to climate risks, and limited adaptive capacities at the centre of global climate action.

The old fault line, over who caused the climate problem and who should pay to fix it, has not closed. In fact, at COP31 another layer has been added: who controls the minerals, technologies and capital that the clean-energy transition depends on, with deep implications for how to achieve the 35 by 35 economy-wide electrification benchmark.

For India and much of the Global South, the question is no longer only what the North owes, but whether the transition will make them partners or leave them as passive dependents. COP31 must therefore make interdependence work in an age of fragmentation, as the real test of multilateralism is no longer whether countries can agree on shared climate goals, but whether they can cooperate when their economic and strategic interests diverge and compete for finite resources.



Image Source: COP31.tr

1992	1995	1997	2007	2015	2026
UNFCCC ESTABLISHED	COP1 – BERLIN – FIRST CONFERENCE OF THE PARTIES	COP3 – KYOTO – KYOTO PROTOCOL ADOPTED *(Binding emission reduction commitments)*	COP13 – BALI – BALI ROAD MAP ADOPTED *(Framework for future climate agreement)*	COP21 – PARIS – PARIS AGREEMENT ADOPTED *(Global commitment to 1.5°C)*	COP31– ANTALYA – NEXT CHAPTER OF CLIMATE NEGOTIATIONS *(Turning commitments into climate action)*

Source: UNFCCC

Separate Agendas, Shared Risk

The COP31 Presidency, in a joint partnership arrangement between Türkiye and Australia, has framed its approach around dialogue, consensus, and action, with an emphasis on measurable delivery rather than new declarations alone. This becomes necessary, especially given the dynamic geopolitical scenario.

India measures its climate security based on its energy security and impact on human livelihoods, and therefore, geopolitical uncertainties such as the West Asian crisis and the Russia-Ukraine conflict act as a direct threat. Particularly, the closure of trade routes like the Strait of Hormuz, directly affected India's exim and had a significant impact on the petroleum, agriculture, and textile industries, with the implications trickling down to the household level. Similar impacts were felt across the globe, therefore, re-drawing the focus towards energy independence.

To achieve the same, gaining competitive advantage over critical minerals and clean technologies has become the clear objective. Lithium, nickel, cobalt, copper, silicon and rare earths, and above all the processing capacity behind them, sit in a few hands with China leading the refined supply growth, while export controls and subsidy races turn supply chains into instruments of geopolitical leverage.

There are added fiscal constraints which sharpen the squeeze, as donor governments from the Global North, who face tighter budgets, lead to a sharp decline in international aid in 2025 with competing defence and debt demands. On the other hand, the developing countries have to borrow at high cost, focus on developmental needs, with little fiscal headroom to invest and innovate.

Biodiversity underpins all three issues - healthy mangroves, reefs and wetlands cut the damage storms inflict on infrastructure, ease the pressure on shrinking public budgets by offering cheaper natural protection. In response, our technological and mineral ambitions must also respect the boundaries of biodiversity. Lose them, and resilience costs more, finance stretches thinner and cooperation on technology becomes harder to sustain. Yet infrastructure, biodiversity, finance and technology are still negotiated as separate tracks. They are one climate-security problem, and treating them apart weakens each.



Image Source: COP31.tr

> The scale and urgency of the climate transition make partnership indispensable. We need greater mobilisation of private capital, particularly for countries facing the greatest financing constraints, and to close the persistent gap between climate commitments and delivery.

SHISHIR PRIYADARSHI
President,
Chintan Research Foundation (CRF)



COP31: Key Areas Of Discussion

CLIMATE AMBITION: Strengthening NDCs and achieving the 1.5°C target.

CLIMATE FINANCE: Mobilising investment and financial support for developing nations.

ADAPTATION & RESILIENCE: Strengthening climate preparedness and addressing loss and damage.

CLEAN ENERGY TRANSITION: Scaling renewables, electrification, energy storage and just transition.

GREEN INDUSTRIALISATION: Advancing low-carbon manufacturing and circular economy practices.

Source: UNFCCC

The Great Climate Divide: Then And Now

The principle of Common but Differentiated Responsibilities and Respective Capabilities (CBDR-RC) is a long-standing UN Principle adopted by the UNFCCC at the Earth Summit 1992. It acknowledges that, while globally all countries should put in efforts to mitigate the effects of climate change, a few have greater responsibility due to the huge contribution to historical GHG emissions also addressing the fact that the climate action would be taken according to the respective social and economic capabilities.

The principle of Common but Differentiated Responsibilities and Respective Capabilities (CBDR-RC) is a longstanding UN principle established under the UNFCCC at the 1992 Earth Summit. It recognises that while all countries share the responsibility to address climate change, their obligations must reflect differences in historical emissions, respective capabilities and national circumstances.

This principle was reaffirmed in the 2015 Paris Agreement, which provides the basis for contemporary climate negotiations. While all Parties are expected to submit and progressively strengthen their Nationally Determined Contributions (NDCs), developed countries are expected to take the lead in emissions reduction and provide financial and technological support to developing countries. However, the implementation of these differentiated responsibilities remains contested, particularly given persistent gaps in climate finance, technology access and the delivery of commitments by developed countries. At COP29 in Baku, developed countries agreed to a goal of $300 billion a year by 2035, with the aim of scaling total finance to $1.3 trillion.

The G77 and China had sought $1.3 trillion a year by 2030, including $600 billion in public finance from developed countries, later revised to $500 billion. The text also blurred provision and mobilisation, not make the goal additional to existing aid, and set no grant sub-goal. Further, COP30 in Belém noted a roadmap to $1.3 trillion and called for tripling adaptation finance by 2035 but set no baseline year or binding contributions.

The Loss and Damage Fund shows the gap in miniature. Pledges total about $822 million, with only about $449 million paid. Its first call drew requests worth about $2.8 billion against $250 million available.

Adding to this, aid from developed nations fell 23.1% in real terms in 2025, and the geopolitical fragility does not seem to strengthen the finance further. Where historically, the divide between developing and developed was on the basis of the equity principle and unmet finance promises, it has completely changed in the contemporary era.

The divide now seems to be running through industrial policy, technology access and cost of capital, with divergent interests setting the tone. Critical mineral producers no longer want to be quarries for the transition with countries like Indonesia, Zimbabwe and Namibia banning exports of unprocessed ores and mandating domestic value addition. Importers on the other hand want secure, affordable supply, and the IEA warns that export controls have turned supply concentration risks into reality.

Given the scenario where India is both an importer and aspiring processor of critical minerals, it must pursue energy security, affordable power, industrial growth and decarbonisation at once , in a sequentially synchronised manner.

> India is an indispensable voice in the future of climate and energy policy. It is showing the world that clean energy is not a brake on prosperity, but a pathway to it.

CHRIS BOWEN
Minister for Climate Change and Energy, Government of Australia



Global North–Global South: The Numbers Behind The Divide

$300 BILLION	Climate Finance Gap
-23.1%	Declining Development Aid in overall ODA
$822 MILLION	Loss and Damage Funding
72%	Critical Mineral Concentration
100%	India's import dependence (for lithium, cobalt and nickel in FY2022–23)

Source: UNFCCC, IEA, PIB

The New Energy Security Paradigm: Interdependence, Electrification And Resilience

The COP31 Presidency's proposed 35-by-35 benchmark, which seeks to increase electricity's share in global final energy consumption from 20 per cent to 35 per cent by 2035, brings renewed attention to the strategic importance of electrification.

This builds on an argument that Chintan Research Foundation (CRF) has previously advanced, at Enersider's March 2026 Annual Business Conclave, around positioning an electron-first economy and using molecules where indispensable.

The underlying proposition is that economies must progressively shift energy demand across transport, industry, buildings and other sectors from direct fossil-fuel consumption towards electricity, particularly in countries with substantial dependence on imported oil and LNG.

While electrification alone does not guarantee decarbonisation, its integration with renewable and other low-carbon electricity sources can substantially reduce fossil-fuel dependence and associated emissions.

The economic and strategic dividends are equally significant. According to the International Energy Agency (IEA), in a scenario where fuel-importing economies accelerate electrification considerably, their energy import bills could decline by more than USD 400 billion by 2035 compared with 2025 levels, alongside an emissions trajectory aligned with the Paris Agreement's 1.5°C ambition.

As per the NITI Aayog report, electricity's share in the final energy is expected to increase from ~21% in 2025 to ~40% in the Current Policy Scenario (CPS) and 60% in the Net Zero Scenario (NZS) by 2070. Per-capita electricity consumption is also expected to increased 4-5 times by2050 and 7 times by 2070. This was further reiterated by PM's Advisor Mr. Tarun Kapoor in the 2026 Bharat RE Summit, with an added focus electrifying the energy demand drivers such as electric vehicles, clean cooking, data centre needs, and cooling requirements.

The global energy landscape similarly reflects an accelerating shift towards electricity, albeit at different levels of ambition and sectoral maturity. According to the International Energy Agency (IEA), electricity currently accounts for approximately 21 per cent of global final energy consumption, while global electricity demand grew by around 3 per cent in 2025, adding nearly 800 TWh. IEA's 2026 electrification report 2026 identifies this transition as a defining feature of the emerging 'Age of Electricity'.

The imperative of electrification is particularly pronounced for the SIDS, where energy security, economic resilience and climate vulnerability are deeply intertwined. Geographical isolation, fragmented electricity markets and heavy dependence on imported fossil fuels expose these economies to global fuel-price volatility and supply-chain disruptions.

According to the World Bank's Energy Sector Management Assistance Program (ESMAP), approximately half of SIDS operate electricity systems smaller than 60 MW, while average electricity prices stand at approximately USD 0.31/kWh, reflecting the structural disadvantages of small and isolated power markets. Electrification, supported by indigenous renewable energy resources, therefore offers an opportunity to reduce import dependence, strengthen fiscal resilience and expand access to affordable energy.

> "Climate finance must be viewed as a strategic investment in global stability rather than simply a burden or a cost. Türkiye's priorities as the host of COP31 align with India's approach of Vasudhaiva Kutumbakam ("the world is one family") and climate action with sustainable development."

ALI MURAT ERSOY
Ambassador of the Republic of Türkiye to India



The vulnerability of island electricity systems is particularly acute given the concentration of generation assets, substations and distribution networks in low-lying coastal areas exposed to cyclones, storm surges, flooding and sea-level rise.

In 2017, Hurricane Maria left approximately 90 per cent of Dominica's population without electricity for more than four months, illustrating how extreme weather can disrupt essential services and economic activity for prolonged periods.

Moreover, the transition towards variable renewable electricity introduces additional technical requirements for small, isolated grids, particularly in maintaining frequency stability, managing intermittency and ensuring adequate system flexibility.

IRENA's 2025 Powering Resilient Islands report consequently emphasises grid modernisation, battery storage, advanced energy management systems and demand-side management as essential enablers of resilient island electrification.

Therefore, their contribution to the 35by35 target depends on grant or concessional finance, with climate-resilience considerations integrated into infrastructure planning and project design from the outset. Such support is essential to offset the higher per-unit costs of deploying clean-energy technologies in small and geographically dispersed electricity markets, while accounting for the additional capital expenditure required to climate-proof the electricity value chain.

Developed countries can reach 35% by electrifying their industrial base, increasing the renewable integration to the grid, shifting from a molecule based economy to an electron system, underlined by accessible capital and so should also manage the supply-side infrastructure.

This includes opening up technology transfer, financing cross-border grid build-out and storage build-out abroad, and not using export controls or subsidy races to lock others out.

Although it is important to note that even though electrification cuts dependence on volatile fuels, it creates another challenge – dependence on the primary inputs which build this infrastructure, i.e., critical minerals.

The supply chains for components, materials and technology are likewise concentrated. Therefore, resilient, stable supply chain is the missing link which would ensure that secure energy supply survives climate and trade shocks.

The Electrification Imperative

35% (BY 2035)	GLOBAL ELECTRIFICATION TARGET
60% (BY 2070)	INDIA'S ELECTRIFICATION AMBITION
$400B+ (BY 2035)	ENERGY IMPORT SAVINGS
18M (BARRELS/DAY)	REDUCED OIL DEPENDENCE

Source: UNFCCC, IEA, NITI Aayog

Three Vectors Underpinning 35 By 35

The target is best exemplified by looking at three specific and cross-cutting vectors: climate resilience, finance, critical minerals, and clean technologies. Climate resilience, especially for the Global South directly relates to economic and energy security. One damaged transmission corridor, port or transport network disrupts industry, trade and essential services. In such a case, countries often have to compete to secure access to build strategic infrastructure while climate hazards threaten its reliability.

> With critical climate commitments already on the table, the focus must now shift towards implementation.

KENNETH FELIX HACZYNSKI DA NOBREGA
Ambassador of Brazil to India



Climate finance is a geopolitical agency. It will be the nation with the lowest cost of capital leading the way. The geopolitical fragility creates a negative impact on the risk perception, which leads to higher financing costs in Global South countries. As availability and access to finance directly impacts capacity and capability, it would be the deciding factor on who will play a crucial role in setting up frameworks and shaping standards and who will continue to stay dependent.

Clean-technology cooperation is a test of strategic interdependence. While nations will compete to build indigenous technologies, resource availability of minerals and components, coupled with higher manufacturing and technological capabilities will need cooperation among nations. Although, there will always be an existing tension between domestic value addition and interdependent supply chains. Cooperation has to survive these diverging interests, which include competing domestic industrial policies of different nations.

SIDS And Biodiversity: Where The Inequities Show

Following the principle of CBDR-RC, it is equally important to address the capabilities of the SIDS. These are the nations that contribute little to the overall global GHG emissions but are yet facing direct impacts of climate change in the form of loss of livelihood, existential risk, high borrowing costs and limited fiscal space.

It should also be addressed, that SIDS should not be treated as a homogenous group, as some island states have extremely limited administrative, technical, and financial capabilities to access climate finance and implement projects.

Biodiversity in these regions should be treated as strategic infrastructure, not a competing environmental agenda. These regions are rich in ecosystems such as mangroves, reefs and wetlands which as natural protection and serve as nature-based solutions to building climate resilience and adaptation. The focus on blue carbon is equally necessary for India. With a coastline of more than 11,000 kilometres, it also cannot ignore the emissions-reduction potential of its ocean ecosystems with immense carbon sink potential.

Degraded ecosystems raise the cost and fragility of engineered resilience in these fragile regions. Oceans are closely linked to climate regulation, biodiversity, food security, livelihoods, and economic resilience. This makes it important to strengthen blue-economy project pipelines, improving access to appropriate financing instruments, and integrating ocean and water considerations into climate planning. Translating these priorities into action will require sustained finance, technical capacity, and effective institutional coordination.

The Global North-South Debate

HISTORICAL RESPONSIBILITY
Who caused the problem?

CLIMATE FINANCE
The gap between commitment and requirement

ADAPTATION
Who pays for climate resilience?

LOSS AND DAMAGE
Who compensates for irreversible climate impacts?

ENERGY TRANSITION
Who gets the carbon space to develop?

TECHNOLOGY TRANSFER
Who controls the clean-energy transition?

Source: UNFCCC, UNEP

> There is a disproportionate impact of climate change on vulnerable countries, and it calls for enhanced support and more direct access to climate finance.

JASON HALL
Ambassador of Jamaica to India



The chain Of Dependencies

The chain of dependencies is where the argument comes together. No country can meet an electrification target without resilient grids, and it cannot build those grids without finance and materials. Finance flows only when projects are not seen as too risky, and risk falls only if resilience lasts. Resilience cannot last if the mangroves, reefs and wetlands that shield coasts and infrastructure keep deteriorating. That returns us to the start: weaker ecosystems mean riskier infrastructure, costlier capital and slower electrification. For India and other emerging economies, which pay more to borrow and face harsher climate hazards, each link carries a heavier cost. A failure at any point weakens all the others, so separate negotiating tracks cannot deliver.

Ultimately, COP31 must recognise that climate security cannot be achieved through isolated commitments or competing national agendas. The 35-by-35 ambition, resilient infrastructure, biodiversity protection and clean-technology cooperation are interconnected, with climate finance determining the capacity to deliver each. The challenge, for India and the wider Global South, is to ensure that strategic autonomy does not come at the cost of international cooperation, and that the transition creates capabilities rather than new dependencies. Antalya must therefore move beyond declarations towards mechanisms that distribute finance, technology and resilience equitably. The true measure of multilateralism will be whether shared vulnerabilities translate into shared capacity to act.



Image Source: COP31.tr

HyChaser
Gas Equipments



ENGINEERING FOR GREEN HYDROGEN

(From Concept to Life-cycle Support)

- Alkaline Electrolyzer (10-1000Nm³ /hr)
- Gas-Liquid Separation System
- Gas Dryers & Purification System
- Hydrogen Storage System
- Hydrogen Blending & Burner System
- Skid Mounted & Containerized Solution

Low Current Density: 2000-2500 A/m²

Low Heat Generation

Long Service Life

99.99999% Pure H_2

SEC <4.5k Wh/Nm³

Low Operating Pressure

INDIA
Hadamtala Ind Area S/N 89, Hadamtala Ind.
NH-27, Dist. Rajkot - 360311, Gujarat - India
Mobile No. +91 75758 68679
Email - sales@hychaser.com

GERMANY
Klosterwiese 15, D-85764 Oberschleissheim..
Phone No. +49 89 6930 4333
Mobile No. +49 179 798 1942
Email - chintan@hychaser.com

www.hychaser.com

GREEN HYDROGEN

STRATEGIC PARTNER

GH2 India

FROM AMBITION TO OFFTAKE: INDIA'S GREEN HYDROGEN ECONOMY ENTERS A NEW PHASE AT BRES 2026

The Bharat Renewable Energy Summit 2026 showed India's green hydrogen sector moving from announcements of capacity to contracted demand. As Knowledge Partner to MNRE, GH2 India reflects on what the Summit settled, what it left open, and how the India Green Hydrogen Assembly x Hyvolution India will take the conversation forward on 17 and 18 November.

A summit that marked a shift

The Bharat Renewable Energy Summit & Expo (BRES) 2026, held from 2 to 5 November at Bharat Mandapam, New Delhi, brought together the 9th Assembly of the International Solar Alliance and the 4th International Conference on Green Hydrogen (ICGH).

MNRE reported more than 75,000 visitors from 135 countries, over 400 exhibitors and more than 627 speakers across 113 sessions.

Opening the Summit, Prime Minister Narendra Modi set out the aim of adding another 500 GW of non-fossil fuel capacity over the next 10 to 11 years, reinforcing India's long-term commitment to energy security and sustainable growth.

For green hydrogen, the defining message was a change of emphasis: from announcing production capacity to securing demand, executing contracts and building commercially viable projects.

GH2 India participated as Knowledge Partner to the Ministry of New and Renewable Energy (MNRE), moderating two green hydrogen plenaries and the domestic offtake roundtable, and supporting technical sessions on green steel and hydrogen mobility.

"Three years into the National Green Hydrogen Mission, India has contracted close to 11% of its 2030 target, against around 4% globally," said Nishaanth Balashanmugam, Director and CEO of GH2 India, opening the offtake roundtable. "That is a moment for the whole community to recognise, and especially MNRE, which has spearheaded the Mission and coordinated across ministries to make it happen."

Turning demand into bankable projects

India's early market for green hydrogen derivatives is now anchored in contracts. Through its green ammonia auctions, the Solar Energy Corporation of India (SECI) has contracted around 7.24 lakh tonnes a year of green ammonia for fertiliser plants, across 13 supply lots, under ten-year purchase and supply agreements. SECI indicated at the Summit that it is working on a further green ammonia tender of around one million tonnes.

Nishaanth Balashanmugam
Director & CEO, GH2 India



The Green Hydrogen Domestic Offtake Roundtable, moderated by GH2 India, examined how to extend that progress beyond fertilisers. Around the table were MNRE and SECI, leading developers, and prospective buyers from refining, fertilisers, city gas distribution, steel and shipping.

"For the third-largest hydrogen market in the world, with around 70% of contracted volumes committed to export, the domestic market is where the next opportunity lies," Balashanmugam said. Developers emphasised long-term contracts, payment security and clear procurement schedules.

Industrial consumers emphasised competitive prices, dependable supply and manageable transition costs. Several participants proposed phased consumption requirements, beginning in refineries at low single-digit percentages. Policymakers stressed that requirements for competing green fuels should be designed together, so that end consumers do not carry overlapping obligations.

"The clearest message from the table was to phase it: start small, give developers and their suppliers a visible pathway to 2028 and 2029, and scale from there," Balashanmugam said. "Even a 2% requirement is a substantial project to build and deliver."

Finance featured strongly. Participants called for a green finance taxonomy, longer contract tenures and mechanisms that lower the cost of capital. "Around 70% of the cost of green hydrogen is renewable power, yet a small change in interest rates can move the price of the end product more than almost any other lever," Balashanmugam noted.

He also set out where GH2 India sees public support delivering most. "On the supply side, India is ready. The technology is there, the projects are there and the intent is there. Capital will follow demand, which is why support should increasingly go to the demand side."



A milestone for international green hydrogen trade

During the green hydrogen plenary, SECI and eFuels Rotterdam B.V. (Power2X) exchanged a Memorandum of Understanding to advance the supply and offtake of RFNBO-compliant green molecules from India to Europe. Power2X will aggregate demand in Europe while SECI aggregates supply in India. The first tranche indicates a potential 3 lakh tonnes a year of green methanol, and SECI has spoken of an ambition to aggregate demand of around one million tonnes.

"This is a landmark agreement because SECI is now venturing beyond domestic markets into international ones," Balashanmugam said. "It marks a transformational change for the institution."

The second plenary, on creating global demand, examined how buyers in Europe and Japan are structuring their purchases: Japan's contracts-for-difference support and hub programme, Germany's H2Global double-sided auctions through Hintco, and European mandates in transport, shipping and aviation. Indian developers have already secured long-term contracts with buyers in both regions. "Europe, with its target of importing 10 million tonnes a year by 2030, has secured some of those volumes from India," Balashanmugam observed. "What followed were several more contracts with East Asia, and Japan in particular."

A clear conclusion emerged: buyers and financiers look well beyond production cost. They need credible certification, policy certainty, dependable logistics and long-term contracts. India's opportunity is to be known as a reliable, long-term supplier of certified green fuels, competitive on cost and trusted on delivery.

Green steel: from demonstration to commercial scale

The technical session on hydrogen in steel examined the move from demonstration projects to commercial hydrogen-based direct reduced iron (H2-DRI) production. Research presented at the session indicated that hydrogen-based steel could become cheaper than new conventional blast furnace capacity in India around 2030, provided key assumptions on hydrogen costs, round-the-clock renewable power and iron ore quality hold.

Steelmakers set out the practical requirements: suitable or beneficiated iron ore, affordable round-the-clock renewable electricity, plant integration, grid stability, early safety standards and long-term financing. Participants also called for credible demand for low-emission steel, through public procurement and corporate purchasing commitments, and for close coordination between MNRE and the Ministry of Steel.

Steel decarbonisation will depend on hydrogen producers, steelmakers, technology providers, power suppliers and government institutions moving in step.

Hydrogen mobility: building the pathway to scale

The mobility session focused on the move from pilots to commercially sustainable deployment. Under the National Green Hydrogen Mission, 12 pilot projects have been awarded for 70 hydrogen-powered vehicles (27 buses and 43 trucks), supported by 16 refuelling stations across 21 routes. In his inaugural address, the Prime Minister also noted that India launched its first green hydrogen train a few months ago.

The Ministry of Road Transport and Highways reaffirmed a technology-agnostic approach, supporting both fuel cell and hydrogen internal combustion engine vehicles. Commercial deployment will depend on a lower total cost of ownership, domestic manufacturing of fuel cells and high-pressure cylinders, reliable refuelling networks and robust safety and technical standards.

Fleet aggregation, defined freight corridors and coordinated infrastructure investment can close the present gap between vehicle availability and refuelling demand. The priority is to concentrate on applications where hydrogen's advantages in utilisation, payload, range and refuelling time are most compelling.

Next: the India Green Hydrogen Assembly

GH2 India will carry these conversations forward at the India Green Hydrogen Assembly (IGHA) x Hyvolution India 2026, on 17 and 18 November at India Expo Mart, Greater Noida. Co-organised by GH2 India and GL events, with the support of the National Green Hydrogen Mission, the Assembly is built around the theme of celebrating India's green hydrogen foundations.

The first day takes stock of those foundations. The second, Building on the Foundations, turns to the demand side: offtake, consumption requirements and hard-to-abate sectors. The programme opens with GH2 India's verified offtake tracker, which counts binding agreements only.

Alongside the plenaries, closed-door roundtables will take forward the threads that ran through BRES, covering cross-ministry coordination, the path to final investment decision (FID), electrolyser and component manufacturing, fertilisers, hydrogen mobility and maritime. A Technology Showcase will feature Indian and international innovators, and the inaugural India Green Hydrogen Foundations Honours on the evening of 17 November will recognise milestones in the sector's progress.

"BRES showed how far India's green hydrogen sector has come in three years," Balashanmugam said. "The Assembly is where we take stock of those foundations and work as one industry on what comes next: standards, certification, market access and, above all, demand."

Strengthening the wider clean energy ecosystem

The Summit week also brought significant developments for the wider renewable energy sector. On 4 November, the Union Cabinet approved a ₹14,500 crore viability gap funding scheme for 92 GWh of grid-scale energy storage, comprising 60 GWh of pumped storage, 30 GWh of battery storage and 2 GWh of emerging technologies.

The Summit saw 10 MoUs and framework agreements signed and 37 reports, assessments and digital platforms released, among them MNRE's National Hydrogen Survey and the International Solar Alliance's World Green Hydrogen Outlook.

These developments matter directly for green hydrogen, where access to round-the-clock renewable power, adequate transmission and affordable finance will determine long-term competitiveness.

The road ahead: from commitments to delivery BRES 2026 showed meaningful progress in a short period. Procurement contracts are in place, developers are advancing projects, domestic industrial applications are being tested and international buyers are contracting with Indian suppliers. The next phase is about converting these commitments into operational capacity and delivered volumes.

From the week's discussions, GH2 India sees five priorities for that phase:

1. Visibility on upcoming tranches. A clear pathway of procurement rounds for green ammonia, green methanol and refinery hydrogen through 2028 and 2029, so that developers and their suppliers can plan teams, manufacturing and supply chains.
2. Phased consumption requirements. Beginning with refineries at modest levels and rising over time, designed alongside requirements for other green fuels so that end consumers face one coherent framework.
3. A lower cost of capital. A green finance taxonomy, longer contract tenures and risk-sharing instruments, given how strongly financing costs shape the delivered price.
4. Certified, trusted supply. Continued alignment of India's certification framework with European and Japanese requirements, so that molecules certified in India are accepted at the point of delivery.
5. New demand centres. Shipping, which participants suggested could in time rival refineries and fertilisers combined, along with steel and heavy freight corridors.

INSOLARE
INNOVATING NET ZERO SOLUTIONS

CLEANER ENERGY.
BRIGHTER TOMORROWS.

THREE GROWTH PLATFORMS.
ONE NET ZERO VISION.

GREEN ELECTRON
- RENEWABLE ENERGY
- RE RTC
- BESS

GREEN MOLECULE
- H_2 GREEN HYDROGEN
- GREEN AMMONIA
- ELECTROLYZER TECHNOLOGIES

GREEN COMPUTE
- DATA CENTRES
- DIGITAL INFRASTRUCTURE
- FUTURE ENERGY SOLUTIONS



For Electrolyzers
Dr. Nisarg Shah
nisarg.shah@insolare.com

www.insolare.com

For Green Molecules
Mr. Robin Arora
robin.arora@insolare.com

"This is no longer only about decarbonisation," Balashanmugam said. "It is about energy security, and increasingly about the influence India can have on the global energy landscape."

GH2 India will take the roundtable's recommendations forward with government and industry, and continue to support evidence-based policy dialogue, domestic demand creation and practical industry coordination.

Closing the opening plenary, Balashanmugam reflected on the year: "We have seen shifts in timelines, and some plans have changed, but the sector is moving forward with resilience and a very strong community.

These are still early days, and India will be at the forefront of this new race for clean fuels."

India has laid the foundations of a green hydrogen economy. Its next measure of success will be commissioned projects, reliable supply, competitive green molecules and customers ready to contract for them at scale.

Review notes for Nish (remove before submission)

Nine quotes are drawn from your BRES transcripts and tidied for print; one (IGHA) is drafted and needs your approval or replacement. Article body runs to roughly 1,900 words, up from about 1,250; I can cut to a word limit if the magazine sets one.

Quotes to approve

Quote (opening words)	Where you said it	What changed
"Three years into the National Green Hydrogen Mission…"	Offtake roundtable opening; repeated at Plenary 1	Tidied; 11% vs 4% needs a citable source (offtake tracker plus the global comparator)
"For the third-largest hydrogen market…"	Offtake roundtable	"70% of our projects are exporting" recast as contracted volumes; confirm against the tracker
"The clearest message from the table was to phase it…"	Offtake roundtable, after the refinery discussion	Two remarks combined
"Around 70% of the cost of green hydrogen is renewable power…"	Offtake roundtable, after SECI's finance remarks	Tidied
"On the supply side, India is ready…"	Offtake roundtable, recounting your point to the Government of Gujarat	Softened from "we don't need any subsidies"; check comfort with developer members
"This is a landmark agreement…"	Plenary 1, after the SECI and Power2X MoU	Tidied
"Europe, with its target of importing 10 million tonnes…"	Plenary 2, after the Hydrogen Europe keynote	Tidied
"This is no longer only about decarbonisation…"	Offtake roundtable, building on a participant's remark	Tidied
"We have seen shifts in timelines…"	Plenary 1 closing remarks	Tidied
"BRES showed how far…"	Not said at BRES; drafted for the IGHA section	Approve, edit or replace



ENERSIDER

INFRA NEWS

India's infrastructure sector continues to evolve, creating new opportunities for growth, investment and connectivity. This section takes a closer look at the developments shaping the country's infrastructure landscape, covering ports, railways, aviation, roads, construction, mining, urban mobility, tunnels and bridges, and water and waste management. From major projects and policy changes to new technologies and business opportunities, it brings together the stories, progress and challenges driving these sectors forward.



INFRA NEWS



AVIATION

01

IndiGo signs $328 million financing deal for eight Airbus aircraft

13 OCTOBER 2026 I PTI

IndiGo has signed a USD 328 million financing agreement with Citi to acquire eight Airbus narrow-body aircrafts: six A321s and two A320s. The transaction marks the world's first aviation financing deal insured by Belgian export credit agency Credendo and the first export-credit-agency-backed aircraft financing deal structured through GIFT IFSC, strengthening India's position in the global aviation finance ecosystem.

02

Akasa Air to shift Mumbai–Jeddah operations to Navi Mumbai Airport

27 OCTOBER 2026 I PTI

Akasa Air will begin a phased shift of its Mumbai–Jeddah flight operations from Chhatrapati Shivaji Maharaj International Airport to Navi Mumbai International Airport from December 2026. The move is part of the planned redistribution of air traffic across the Mumbai Metropolitan Region, with IndiGo and the Air India Group also set to progressively shift some operations to the new airport from December. The transition is expected to ease congestion at the existing airport and create capacity for the redevelopment of Terminal 1.

03

Embraer looks to Mahindra and Adani for deeper India presence

27 OCTOBER 2026 I ANI

Brazilian aircraft manufacturer Embraer is expanding its India presence through partnerships with Mahindra Group and Adani Group. The Mahindra partnership is linked to India's proposed 60-aircraft Multi-Role Transport Aircraft programme. Embraer is also exploring opportunities in the civil aviation segment, while looking to strengthen its local supply chain, manufacturing and maintenance, repair and overhaul (MRO) capabilities.

04

DGCA introduces formal training framework for gyroplane pilots

29 SEPTEMBER 2026 I PTI

The Directorate General of Civil Aviation (DGCA) has introduced new training requirements for candidates seeking pilot licences in the gyroplane category. The Civil Aviation Requirement outlines the prescribed ground and flying training, marking a step towards the introduction and operationalisation of gyroplanes in India. The move is expected to support the development of training facilities and the wider gyroplane ecosystem.



RAILWAYS

01

Two new railway sections covering 118 km inaugurated in Madhya Pradesh

24 OCTOBER 2026 I PIB

Indian Railways inaugurated two new sections in Madhya Pradesh, adding 118 km to the Vindhya region's rail network. The 53-km Satna–Devendra Nagar and 65-km Rewa–Churhat sections provide Sidhi district its first-ever rail connectivity since Independence, boosting regional connectivity, trade, tourism and economic activity.

02

Wabtec secures ₹839-crore order for Vande Bharat Sleeper systems

27 OCTOBER 2026 I PTI

Indian Railways has awarded a ₹839-crore contract to US-based Wabtec for braking systems, doors and gangway solutions for its upcoming 24-coach Vande Bharat Sleeper trains. The equipment will support passenger safety and operational reliability. ICF Chennai targets design finalisation by November 2026, with the prototype expected by May–June 2027.

03

India moves closer to indigenous bullet train manufacturing

01 NOVEMBER 2026 I PIB

India has unveiled its first made-in-India bullet train, manufactured at BEML's Bengaluru facility for the Mumbai–Ahmedabad High-Speed Rail Project. Designed for Indian conditions, the eight-car train has a maximum test speed of 280 kmph and a proposed operational speed of 249 kmph, marking progress in domestic high-speed rail manufacturing.

04

Jupiter Wagons bags ₹1,140-crore order for 2,583 wagons

29 OCTOBER 2026 I PTI

Jupiter Wagons secured a ₹1,140-crore Ministry of Railways order to manufacture 2,583 BOXNHL and BOXNS wagons. The company expects further order inflows of around ₹2,000 crore in Q4 FY2026–27, supported by strong private-sector demand. It is also expanding backward integration across key wagon components, including bogies, couplers and wheelsets.

ENERSIDER

INFRA NEWS



PORTS & SHIPPING

01

India moves towards unified port processes and port-linked industrial clusters

13 OCTOBER 2026 I PIB

The 21st Maritime State Development Council meeting outlined reforms to modernise India's maritime sector, setting a March 2027 deadline for implementing ONOP, integrating ports with Sagar Setu and publishing tariffs electronically. It also introduced credit-risk insurance for shipbuilding and urged coastal states to develop port-linked industrial clusters.

02

Centre approves ₹10,000-crore container manufacturing scheme

28 OCTOBER 2026 I PIB

The Union Cabinet has approved the ₹10,000-crore Container Manufacturing Promotion Scheme to establish a domestic container manufacturing ecosystem and reduce India's dependence on imports. The scheme aims to increase the country's annual container manufacturing capacity nearly ten-fold, from around 70,000 TEUs to 7.5 lakh TEUs. The initiative is expected to create around 3,000 direct and over 50,000 indirect jobs, while strengthening India's maritime supply chain and supporting the growth of containerised trade.

03

Jindal Steel commissions 12.5 MTPA cargo terminal at Paradip

16 OCTOBER 2026 I PTI

Jindal Steel has commissioned the first phase of its cargo terminal at Paradip Port in Odisha, with a handling capacity of 12.5 million tonnes per annum (MTPA). Developed through its subsidiary, Jindal Paradip Port Ltd, the facility is part of a ₹3,393-crore project to develop a 25 MTPA dry bulk cargo terminal at the port's Western Dock. Commercial operations commenced on 15 October, ahead of schedule.

04

Essar Ports secures ₹2,276-crore Kandla terminal project

21 OCTOBER 2026 I PTI

Essar Ports has secured a Letter of Award from Deendayal Port Authority to develop an 18.33 MTPA multipurpose cargo terminal at Tuna Tekra in Kandla, Gujarat. The project, estimated at ₹2,276.06 crore, will be developed under a 30-year Build-Operate-Transfer concession through the public-private partnership route. Essar Ports will invest approximately ₹1,552.57 crore, with the remaining investment coming from the port authority.

INFRA NEWS



ROADS & HIGHWAYS

01

National Highway project awards rise 62.9% to 2,236.3 km in April–September

16 OCTOBER 2026 I PTI

India awarded 2,236.3 km of National Highway projects during April–September FY 2026–27, marking a 62.9% increase over the corresponding period last year. The figures, released by the Ministry of Statistics and Programme Implementation in its quarterly Performance Monitoring Dashboard, indicate an acceleration in highway project awards and continued investment in the country's road infrastructure.

02

MoRTH and Bihar sign MoU to use excavated river silt in National Highway construction

03 OCTOBER 2026 I PIB

The Ministry of Road Transport and Highways (MoRTH) and the Bihar Government signed an MoU to use silt removed from rivers and water bodies in National Highway construction under the 'Nadi Sanjivani' initiative. Around 243 lakh cubic metres of silt will be used in 16 ongoing highway projects, while another 835 lakh cubic metres has been identified for use in 27 future projects, subject to technical approvals. The initiative aims to improve river flow, reduce flood risks and limit the use of fresh soil in road construction.



TUNNELS & BRIDGES

01

NH-22 four-laning project in Bihar to include seven major bridges

13 OCTOBER 2026 I PIB

The government outlined the development of the 82.57-km Muzaffarpur–Sitamarhi–Sonbarsa section of NH-22 in Bihar, which is being upgraded to four lanes at an estimated cost of ₹3,590.73 crore under the Hybrid Annuity Model (HAM). The project includes seven major bridges, including a 340-metre bridge over the Bagmati River, three railway overbridges and two flyovers. The upgraded corridor is expected to improve connectivity with the India–Nepal border, ease traffic movement and strengthen freight transportation.

02

Afcons emerges as lowest bidder for Lucknow Metro's underground corridor

13 OCTOBER 2026 I PTI

Afcons Infrastructure emerged as the lowest bidder for a ₹1,632-crore contract to design and construct a 6.52-km underground stretch of the Lucknow Metro's East-West Corridor (Phase 1B). Awarded by the Uttar Pradesh Metro Rail Corporation, the project involves constructing seven underground stations between Charbagh and Chowk. The work, scheduled for completion within three years, will include tunnelling and associated civil construction in densely populated areas of the city.

INFRA NEWS



WATER AND WASTE MANAGEMENT

01

₹8,941 crore worth of projects launched for Yamuna rejuvenation

22 OCTOBER 2026 I PTI

Union Home Minister Amit Shah launched 43 projects worth ₹8,941 crore to improve the condition of the Yamuna in Delhi. The projects include a 124 MGD sewage treatment plant at Okhla, 29 decentralised sewage treatment plants, sewage pumping stations and expansion of the sewer network. The initiative also includes laying 1,034 km of new sewer lines. The decentralised facilities will cover 358 unauthorised colonies and 113 villages, benefiting approximately 36.29 lakh residents.

02

Amazon India and FluxGen – Water conservation project in Pune

07 NOVEMBER 2026 I FINANCIAL

Amazon India and FluxGen are collaborating on an integrated water-management project at the National Chemical Laboratory (NCL) campus in Pune, Maharashtra. The initiative aims to restore approximately 178 million litres of water annually through wastewater recycling, rainwater harvesting, groundwater recharge and smart water-management systems equipped with sensors. The project seeks to improve water conservation and resource efficiency across the campus.



CONSTRUCTION MACHINERY AND EQUIPMENT

01

China announces export controls on tunnel boring machines

19 OCTOBER 2026 I REUTERS

China announced export controls on tunnel boring machines (TBMs), requiring exporters to obtain licences under its export-control regulations. TBMs are critical for metro rail, highway tunnels and other underground infrastructure projects. The development has implications for India, which relies significantly on imported tunnelling equipment, including machinery supplied by Chinese manufacturers. It also strengthens the case for developing domestic capabilities in advanced tunnelling machinery.

02

India and Japan discuss advanced road construction and tunnelling technologies

15 OCTOBER 2026 I PIB

The Ministry of Mines launched the ninth tranche of critical and strategic mineral block auctions, offering 20 blocks, alongside 11 blocks under the third Exploration Licence tranche across six states. The initiative seeks to boost private-sector participation in exploring 29 critical and deep-seated minerals, including copper, vanadium and rare earth elements.



METALS AND MINING

01

Critical mineral processing gets ₹2,814 crore government support

04 NOVEMBER 2026 I PIB

The Union Cabinet approved a ₹2,814 crore Capital Expenditure Support Scheme to promote domestic processing of critical minerals, particularly lithium and nickel. The scheme will provide a 30% capital subsidy for setting up two lithium and two nickel processing plants during FY 2026–27 to FY 2030–31. The four plants will have minimum capacities of 30,000 tonnes each for lithium and 50,000 tonnes each for nickel. The initiative is expected to attract around ₹10,000 crore in investment.

02

Government launches ninth tranche of critical mineral block auctions

05 NOVEMBER 2026 I PIB

The Ministry of Mines launched the ninth tranche of critical and strategic mineral block auctions, offering 20 blocks, alongside the third tranche of Exploration Licence auctions. The latter includes 11 blocks across Madhya Pradesh, Maharashtra, West Bengal, Rajasthan, Telangana and Gujarat, covering minerals such as copper, vanadium, potash and rare earth elements. The exploration licence auction is aimed at encouraging private-sector participation in the exploration of 29 critical and deep-seated minerals.

03

PTC India approves ₹65 crore investment to establish mineral exchange

26 OCTOBER 2026 I PTI

PTC India approved an investment of up to ₹65 crore to establish a wholly owned subsidiary for setting up and operating a mineral exchange. The platform will enable delivery-based electronic trading in permitted minerals and related products, subject to regulatory approvals, including registration with the Indian Bureau of Mines.

04

India's steel sector records production growth; green steel initiatives gain momentum

23 OCTOBER 2026 I PIB

India's crude steel production rose 2.9% to 85.1 million tonnes during April–September FY 2026–27, while finished steel consumption increased 7.6% to 85 million tonnes. Meanwhile, 104 steel producers received Green Steel Certificates. MECON partnered with Russia's Zyfra LLC for digitalisation and automation solutions, while NMDC tied up with GAIL Gas to replace furnace oil with LNG at its Nagarnar pellet plant.

ENERSIDER

INFRA NEWS



URBAN TRANSPORT

01

Chennai Metro inaugurates 3.7-km double-decker viaduct section

11 OCTOBER 2026 I PIB

The Poonamallee–Vadapalani stretch of Chennai Metro Phase II, featuring a 3.7-km double-decker viaduct, was inaugurated at an estimated project cost of ₹4,900 crore. The elevated structure integrates two levels of metro infrastructure, optimising land use in a densely populated urban corridor. The development is expected to strengthen connectivity, improve passenger movement and support Chennai's expanding urban transport network.

02

Hyderabad explores Personal Rapid Transit system for metro last-mile connectivity

27 OCTOBER 2026 I PTI

Hyderabad Metro Rail Limited (HMRL) is exploring a Personal Rapid Transit System (PRTS) to improve last-mile metro connectivity and ease road congestion. A techno-economic feasibility study is underway to assess implementation under the PPP model. The proposed system aims to link metro stations with nearby destinations and high-density activity centres.

03

Delhi flags off 150 electric buses and inaugurates five EV charging stations

13 OCTOBER 2026 I PIB

The Delhi Government flagged off 150 new electric buses at Anand Vihar as part of its efforts to expand clean public transport. Five public EV charging stations were also inaugurated at ISBT Anand Vihar and four bus depots. The initiative is expected to strengthen Delhi's electric mobility infrastructure and support the transition towards cleaner urban transportation. The event also included the inauguration of an AI-enabled Integrated Command and Control Centre at Shastri Park.

04

Work underway on 998 km of additional metro rail lines across India

23 OCTOBER 2026 I PTI

India has around 998 km of metro rail lines under construction, Union Minister Tokhan Sahu announced at the 19th Urban Mobility India Conference in Bhubaneswar. The operational metro network has expanded to over 1,185 km across 26 cities, up from 248 km in 2014, strengthening urban connectivity and mass transit infrastructure.



01

Multi-Modal Logistics Park planned at Sindi Railway, Maharashtra

1 NOVEMBER 2026 I PIB

Union Minister Nitin Gadkari performed the bhoomipujan for a Multi-Modal Logistics Park at Sindi Railway in Wardha district, Maharashtra. The 150-acre project is being developed by National Highways Logistics Management Limited (NHLML), in association with Jawaharlal Nehru Port Authority (JNPA) and AMARA TRANZ Solution. The facility will include warehouses, cold storage, a customs office and exporter clusters. The project is also expected to reduce transportation costs per container from approximately ₹1.5 lakh to ₹1 lakh.

02

India records growth in air cargo and port cargo movement

16 OCTOBER 2026 I PIB

The Ministry of Statistics and Programme Implementation, in its latest quarterly Performance Monitoring Dashboard update, reported growth across India's logistics and infrastructure sectors. Air cargo traffic registered a 12% year-on-year increase, while cargo handling at major ports rose 7.2% to 390.4 million tonnes. In the road infrastructure segment, projects covering 2,236.3 km of national highways were awarded during the reporting period, marking a 62.9% increase over the previous year.

03

Freight loading reaches record 145 million tonnes in October

4 NOVEMBER 2026 I PIB

Indian Railways recorded its highest-ever monthly freight loading of 145.07 million tonnes in October 2026, registering an 8.32% year-on-year increase over the 133.93 million tonnes handled in October 2025. Among key commodities, foodgrain loading increased by 26.3%, domestic coal by 16%, container traffic by 6.3% and iron ore by 5%. Coal supplies to power houses also rose by 19.5%, with an average of 469.8 rakes dispatched daily. Cumulative freight loading during April–October 2026 reached 978.78 million tonnes, marking a 4.67% increase over the corresponding period last year.

The Role Of Local Knowledge In Forest Landscape Restoration

By Gojesh Konsam, Neha Sharma & Varun Grover

Under the Bonn Challenge, restoration should recover "ecological integrity while enhancing human well-being". India has pledged to bring 26 million hectares under restoration by 2030.

From 19 to 30 October 2026, the Convention on Biological Diversity conference in Yerevan, Armenia, took up both halves of this task: progress on restoring 30 per cent of degraded ecosystems by 2030, and Article 8(j), which asks countries to respect the knowledge of Indigenous Peoples and local communities and encourage fair sharing of its benefits. Restoration at this scale needs people who know a landscape, yet India's programmes pay them for labour, rarely for knowledge.

In the Biligiri Rangaswamy Temple (BRT) Tiger Reserve in Karnataka, Soligas were paid a daily wage under the rural employment guarantee scheme to cut back Lantana camara, an invasive shrub smothering the reserve's understorey. The wage paid for their labour, not for what they know about keeping the shrub in check.

Soligas describe taragu benki, low-intensity fires lit to control lantana, as a practice they followed until forest laws ended it. One field study found that lantana thickened more slowly under frequent fire. But fire worked, the Soligas say, only while the shrub was sparse; today it grows in dense thickets that sprout again after burning.







GOJESH KONSAM
Research Associate, Land Resources Division, TERI

VARUN GROVER
Fellow, Land Resources Division, TERI

NEHA SHARMA
Associate Fellow, Land Resources Division, TERI

Fire's effect depends on season, intensity and site. Living knowledge is not a rule handed down but a capacity to read a forest and adjust practice as it changes.

In 2011, the Soligas became the first community living inside a tiger reserve to win forest rights. Where they have cleared lantana, they report native trees and grasses returning.

A review of 120 studies found that restoration is more likely to succeed when local knowledge shapes a project from the design stage, helping choose native species, set targets and monitor recovery. Success also tracks direct benefits and long-term support for communities.

Clearing lantana helps only if native plants take its place. Planting trees rarely works here: in BRT, herbivores eat so many saplings that fewer than 5 per cent survive, according to the Lantana Collective. Grass is the more promising route, and researchers testing cool-season burns to restore it turn to Soliga elders.

The elders know the right season: their litter fires were lit mostly in January and February, while fallen leaves were still moist, so flames stayed low. This is skilled work, yet the wage for clearing lantana did not pay for it.

What is at stake

Ecological knowledge is a skill, kept alive only by being practised and passed on. When people are cut off from their land, it erodes one unpractised season at a time. A 2026 study of 30 Konda Reddi villages in Andhra Pradesh documents such erosion alongside restricted forest access and widening gaps between generations.

Answering likely objections

One objection is that traditional knowledge is hard to verify. Yet it can be judged by results. In northern Australia, Aboriginal ranger groups carry out cool early dry-season burns, much like taragu benki, creating firebreaks against hotter wildfires later in the year.

The emission cuts are measured from satellite fire maps and earn government-recognised carbon credits. The lesson is not that knowledge earns pay only by cutting carbon, but that community practice can be tied to public monitoring and funding.

Administrative load is another worry, yet the channels exist: gram sabhas can nominate knowledge holders, Biodiversity Management Committees keep biodiversity registers, and compensatory afforestation funds pay for restoration.

What the law already provides

Section 3(1)(k) of the Forest Rights Act, 2006 recognises a community right to "intellectual property and traditional knowledge related to biodiversity and cultural diversity", a domestic counterpart to Article 8(j).

The Rules set out no procedure for recording or using it. The task is to make an existing right workable, and different kinds of knowledge work need different payment.

First, pay for advice as specialist work. Judge a site as a recovering ecosystem. Counting planted trees is a poor test: in Himachal Pradesh, decades of planting did not, on average, raise canopy cover, and shifted forests slightly away from the broadleaf species local people value.

A better year-five test is whether native species, ground cover and soil life have returned. Knowledge holders who set the species mix and monitor recovery could be paid as specialists.

Second, fund teaching as a standing commitment. Under the Ministry of Culture's Guru Shishya Parampara scheme, a master of a rare art form receives ₹7,500 a month to train four pupils. A similar stipend could support forest elders, nominated by gram sabhas, to train apprentices as skilled staff, not day labour.

Third, give the knowledge right a procedure and a way to share benefits. People's Biodiversity Registers could be revived as living records that gram sabhas help control. Where that knowledge earns money, a community trust can receive a share, as the Kani tribe did when a medicine based on their knowledge was licensed in 1996.

A commons is not just a stock of timber or carbon to count; it is a relationship, and knowledge is what that relationship produces.

A plantation can be planted; a forest has to be known, season after season, by the people who live in it. As countries follow up on Yerevan, India can start funding that relationship. Knowledge that is respected and paid for can be passed on, not forgotten, so forests flourish in the care of those who know them.

The views expressed are personal.

teri

COP 31: Global Effort Under A Threatened Energy Security Scenario

By M. Jamshed

Countries are gathering yet again at COP 31, the Conference of the Parties to the UN Framework Convention on Climate Change (UNFCCC), to negotiate how to tackle a challenge that no nation can overcome alone.

The conference is being held under the joint presidency of Türkiye and Australia, both countries ironically with a record reliance on fossil fuel. COP 31 is taking place under the shadow of the ongoing West Asian and Russia–Ukraine wars, which have had a devastating impact on global energy supplies.

Countries dependent on West Asian oil and gas, their energy security threatened, have had to diversify their sources and push their own alternatives, including renewables. Yet the same crisis has undeniably compelled several nations that were heading towards renewables to revert to coal.

According to UN Climate Change, the COP 31 Presidency announced new targets at the launch of its global climate action agenda in June 2026. These include raising the share of final energy demand met by electricity from just over 20% today to 35% by 2035, halving the growth in global waste by 2035, and a resilient cities target of reducing the energy consumption intensity of the building sector by at least 25% by 2035.

The assessments of where the world stands are sobering. Climate Action Tracker (CAT), a climate watchdog, has in its recent report projected a stagnating warming outlook of 2.6°C to 2.7°C by 2100, pointing to a multi-year plateau caused by systemic national policy rollbacks.

The UN Emissions Gap Report 2026 ('The Point of Return') warned that global greenhouse gas emissions reached 58.4 billion tonnes of CO2e in 2025, and that a low-overshoot 1.5°C pathway requires emissions to drop by 18% by 2030, 45% by 2035 and 69% by 2040. Full implementation of current pledges would cut 2030 emissions by only 5% to 8%.

In its country-wise analysis, CAT found that the United States recorded the largest absolute increase in emissions i.e. 2.2%, driven by rollbacks of foundational climate policies. Russia and Saudi Arabia have pursued policies tethered heavily to fossil fuel expansion, while Indonesia continued on an upward trajectory driven by industrial power demand.

On re-evaluation, India has been rated 'highly insufficient 'with China, Canada and New Zealand: although non-fossil sources make up more than half of India's installed power capacity, rising electricity demand keeps its fossil fuel use climbing. China's emissions have also risen. The EU, Japan and the UAE are in 'insufficient'; and Chile, Costa Rica, Kenya, Nepal and Norway placed in 'almost sufficient'.



MOHD JAMSHED
Distinguished Fellow, CRF
Public Policy and Governance Expert

The Emissions Database for Global Atmospheric Research (EDGAR), in its 2025 report, noted that global Greenhouse Gas Emissions have risen since the turn of the century, driven mainly by major emerging economies, reaching 53.2 Gt CO2eq in 2024. China, the United States, India, the EU-27, Russia and Indonesia were the largest emitters; together they accounted for 51.4% of the global population, 62.5% of global GDP, 64.2% of fossil fuel consumption and 61.8% of Greenhouse Gas Emissions. Of these, China, India, Russia and Indonesia increased their emissions over 2023, with Indonesia recording the largest relative rise.

Yet the world's attention has shifted elsewhere. The World Economic Forum's Global Risks Report 2026 found that conflicts, including Russia–Ukraine and US–Israel–Iran, have thrown up new short-term risks, with geoeconomic confrontation now dominating global concerns while environmental and climate risks have been downgraded in ranking and severity.

'Extreme weather events' moved from second to fourth place and 'pollution' from sixth to ninth, while 'critical change to Earth systems' and 'biodiversity loss and ecosystem collapse' fell by seven and five places respectively, into the lower half of the list.

The most significant setback to global climate action, however, comes from the United States. In keeping with 'drill, baby, drill', the push for greater exploration and extraction of fossil fuels, the US administration has scaled back the 2023 rules requiring the oil and gas industry to cut methane emissions at drilling sites nationwide.

Methane is the second-largest contributor to climate change and is estimated to be over 75 times more potent a warming agent than carbon dioxide over a 20-year period. The reversal will do harm beyond the United States, as other economies hit hard by the West Asian crisis may follow suit.

Coal continues to dominate the energy mix of major economies: China (55%), India (70%), the US (20%), Indonesia (54%) and Australia (76%). India's major efforts have taken its non-fossil installed power capacity past 54%, but actual generation from renewables lags far behind.

Coal still accounts for about 70% of electricity generated, solar and wind for 14–15% and hydro for 6%. With large domestic reserves, India will continue to rely on coal for decades to secure its energy needs, which were severely affected by the recent crisis.

The issues likely to dominate the COP 31 deliberations are not new. Keeping warming as close to 1.5°C as possible, turning climate promises into action, delivering finance to the countries that need it most, helping communities adapt to a warmer world, speeding up the clean energy transition, cutting methane emissions, tackling waste and strengthening international cooperation may sound like repetitive rhetoric in the face of fast-changing climate challenges. But they remain as relevant today as ever.

India will pursue solution-oriented and equitable climate action at COP 31. Outlining its priorities, the Union Minister for Environment, Forest and Climate Change said India would bring practical solutions for the Global South, with capacity building, knowledge sharing and geography-specific solutions at the core.

He stressed that finance is an obligation of developed countries under Article 9.1 of the Paris Agreement, which must be predictable and must not add to the debt burden. India is also likely to press for mitigation and the Global Stocktake to remain party-driven, facilitative and non-punitive, respecting the nationally determined nature of NDCs and ruling out new top-down targets.

The world has undergone a sea change since the last UNFCCC conference in Belém a year ago. The United States has set about dismantling the principles on which decades of multilateral climate efforts were built.

At the same time, war in West Asia, the most important source of fossil fuels for economies of both the Global North and South, has set back efforts to raise the share of renewables. Countries with significant coal reserves have had to lean more heavily on coal, pushing back their renewable energy targets.

Whether COP 31 will produce new plans of action, and whether US policies will sway the deliberations, remains to be seen. What is beyond doubt is that, in these uncertain times, multilateral climate action must remain in focus for the earth's sustainability.

The views expressed are personal.

Chintan Research Foundation



IRENA's 2026 Outlook: Energy Transition Shifts Focus To Security, Economics, And Rapid Implementation

The global energy transition has entered a new phase. According to the International Renewable Energy Agency's (IRENA) World Energy Transition Outlook 2026, the focus has broadened from purely climate goals to include energy security, industrial competitiveness, and socio-economic development. Geopolitical tensions have highlighted the vulnerabilities of fossil fuel dependence, driving a need for diversified, domestic energy systems.

The analysis models three pathways. The Planned Energy Scenario, based on current policies, results in over 2°C warming. The Decarbonising Energy Scenario aims for below 2°C. The revised 1.5°C Scenario requires a temporary overshoot followed by rapid decarbonisation. This limits cumulative carbon dioxide emissions to roughly 400 gigatonnes between 2026 and 2050. This is less than half of what current plans allow.

To meet this target, renewable-based electrification must become the backbone of the energy system. Electricity's share of total final energy consumption needs to rise from around 23% today to over 50% by 2050. This requires expanding global renewable capacity from 5.2 terawatts in 2025 to 38.2 terawatts by 2050. Concurrently, the annual improvement rate for energy efficiency must double to roughly 4%. IRENA stresses that grids, storage, and flexibility are no longer marginal additions but the core infrastructure necessary to support this growth. End-use sectors such as transport, buildings, and industry will see widespread electrification, complemented by sustainable fuels for hard-to-abate areas.

However, regional pathways will differ. For example, Africa will approach 50% electrification by focusing on expanding energy access and replacing traditional biomass, while the European Union will reach around 64% through widespread electrification across all sectors.

The economic case for acceleration is strong. Under the 1.5°C pathway, global GDP is projected to be 1.1% higher by 2050 compared to current policies, generating a cumulative gain of 47 trillion USD. The renewable sector could support 84 million jobs by 2050, up from 53 million under current plans.

However, these gains come with short-term challenges. Households may experience temporary cost-of-living pressures due to front-loaded investments and carbon pricing. Targeted affordability measures and social protection are essential to maintain public acceptance. Financing remains a major hurdle. The 1.5°C goal demands cumulative investments of 256 trillion USD by 2050, or 10.3 trillion USD annually. Currently, investment is heavily concentrated in China and advanced economies.

Developing regions, particularly Africa, need massive financial support to scale their renewable capacity nearly thirty-fold by 2050. The report concludes that the defining challenge is accelerating implementation. Governments must prioritise integrated planning, infrastructure investment, stable policy frameworks, and international cooperation to ensure a just and rapid transition.

ENERSIDER

ABC The Energy Dialogues

Annual Business Conclave 2027

2ND EDITION

MARCH 2027

Where India's Energy Future Moves From Ambition To Action.

2-DAY CONFERENCE • MASTERCLASS • AWARDS NIGHT • GALA DINNER

POLICY | CAPITAL | TECHNOLOGY | BUSINESS | LEADERSHIP

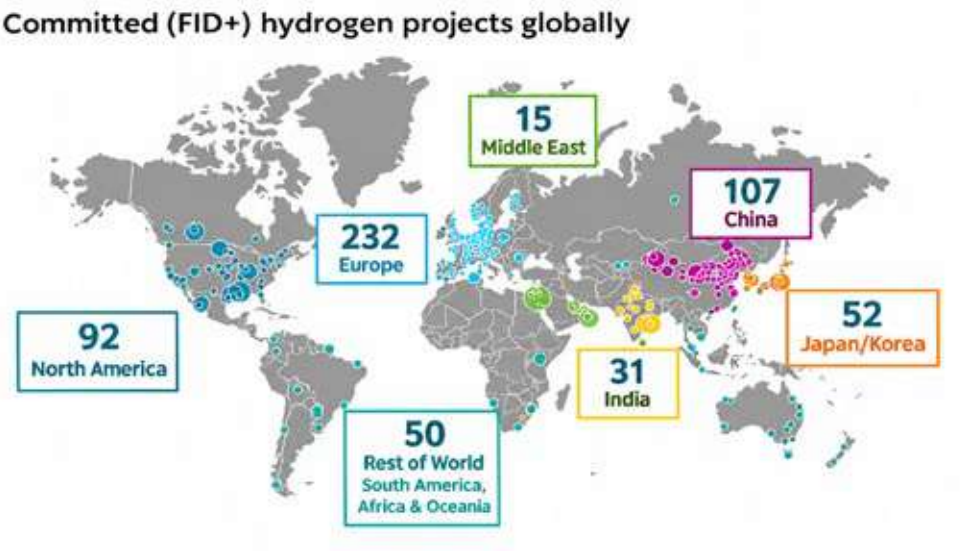
A high-level platform bringing together the people building, financing, regulating and transforming India's energy economy.

FOR MORE DETAILS, CONATCT: PARTNERSHIPS@ENERSIDER.COM

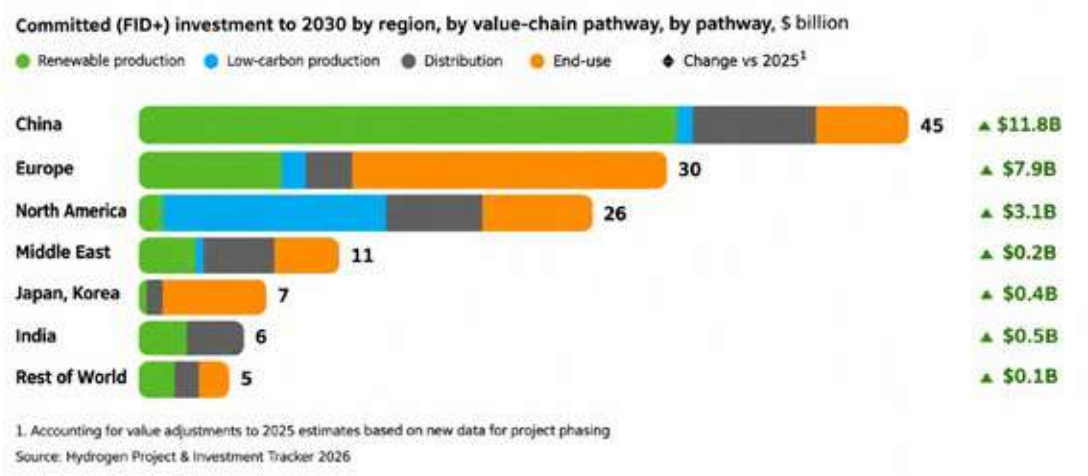
INDUSTRY GRAPHICS

Global Hydrogen Compass 2026

The global hydrogen market presents a mixed picture: project commitments and investments are growing, but the gap between planned capacity and actual demand remains significant. Drawing on the Hydrogen Council's Global Hydrogen Compass 2026, this Industry Graphics uses data and visual representations to examine the sector's progress across regions, track investments and project development, and assess how much of the 2030 ambition is backed by firm demand and policy support.



The hydrogen sector is moving beyond project announcements, with more projects now reaching the final investment decision (FID). Of a ~1,950-project pipeline, 579 are committed, compared to 510 last year. Of these, 525 are already under construction or operational. Europe has the highest number of projects, with 232, adding 34 new projects over the past year. However, North America and China account for more than 70% of global capacity.

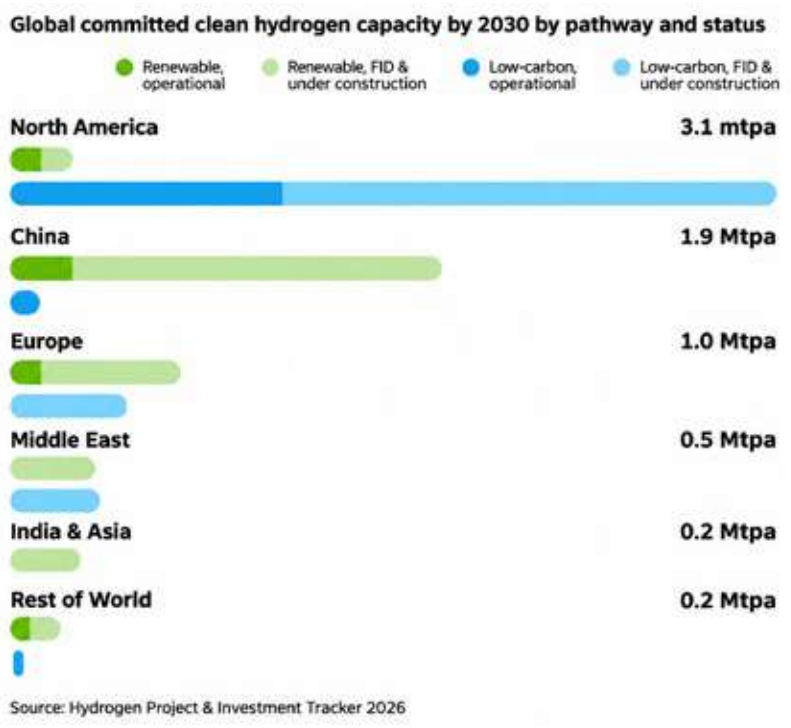


$130 billion committed

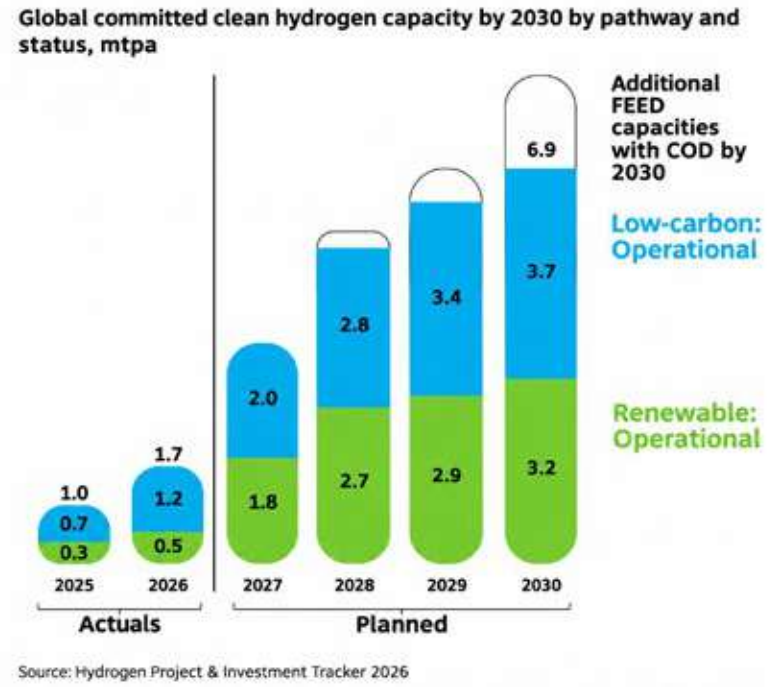
China leads the global hydrogen landscape with 45 GW of announced capacity, followed by Europe at 30 GW and North America at 26 GW. While China's pipeline is dominated by renewable hydrogen production, North America has a stronger low-carbon production component. India stands at 6 GW, with capacity concentrated in renewable production and distribution. Compared with 2025, China records the largest investment increase at $11.8 billion, while India's investment rises by $0.5 billion, signalling growing momentum.

6.9 mtpa committed Clean hydrogen capacity

The graph shows global committed clean hydrogen capacity by 2030 across different regions. North America leads with 3.1 Mtpa, mostly from low-carbon projects. China is second with 1.9 Mtpa, largely from renewable sources. Europe follows at 1.0 Mtpa, while the Middle East (0.5 Mtpa), India & Asia (0.2 Mtpa), and the Rest of the World (0.2 Mtpa) have much smaller capacities. Most global capacity is still in development rather than operational.



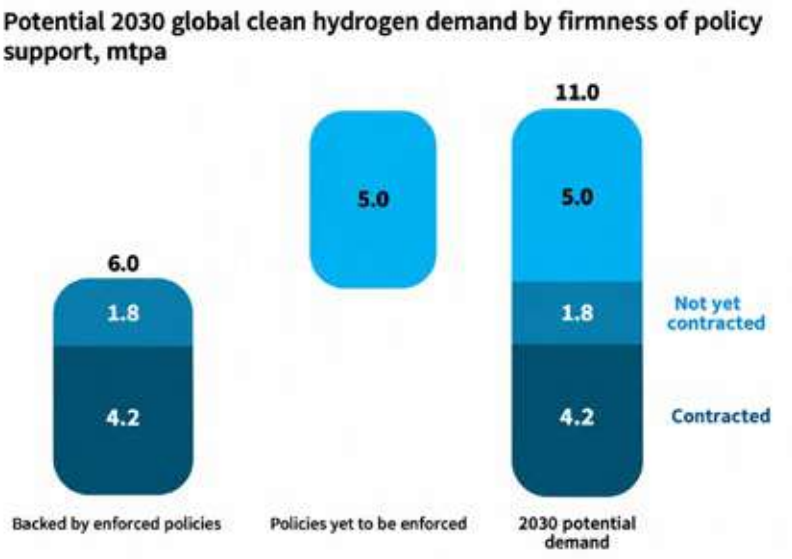
1.7 mtpa operational Capacity online today

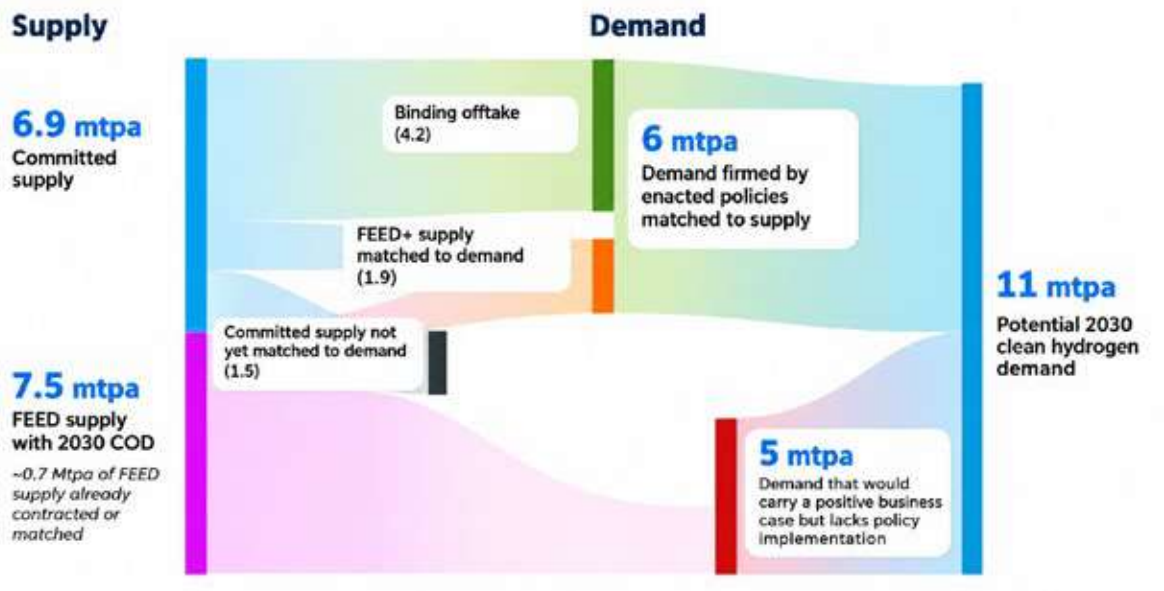


This chart compares expected 2030 clean hydrogen supply with potential demand of 11 mtpa. About 6 mtpa of firm demand—backed by active government policies—is already matched to supply, mostly through binding contracts (4.2 mtpa). However, 1.5 mtpa of committed supply and 7.5 mtpa of early-stage supply remain unmatched. Simultaneously, 5 mtpa of viable demand is stalled because governments haven't finalized supporting policies yet. Enforcing these policies is essential to connect waiting supply with demand.

11mtpa demand Achievable by 2030 – of which, 6 mtpa firmed by enacted policy

Global demand for clean hydrogen is expected to reach 11.0 mtpa by 2030, representing about 10% of total hydrogen demand, if all planned government policies are enforced. Currently, only 6.0 mtpa is firmly backed by active policies—consisting of 4.2 mtpa already contracted by buyers and 1.8 mtpa not yet contracted. The remaining 5.0 mtpa is uncertain and depends on future policies and infrastructure being finalised.

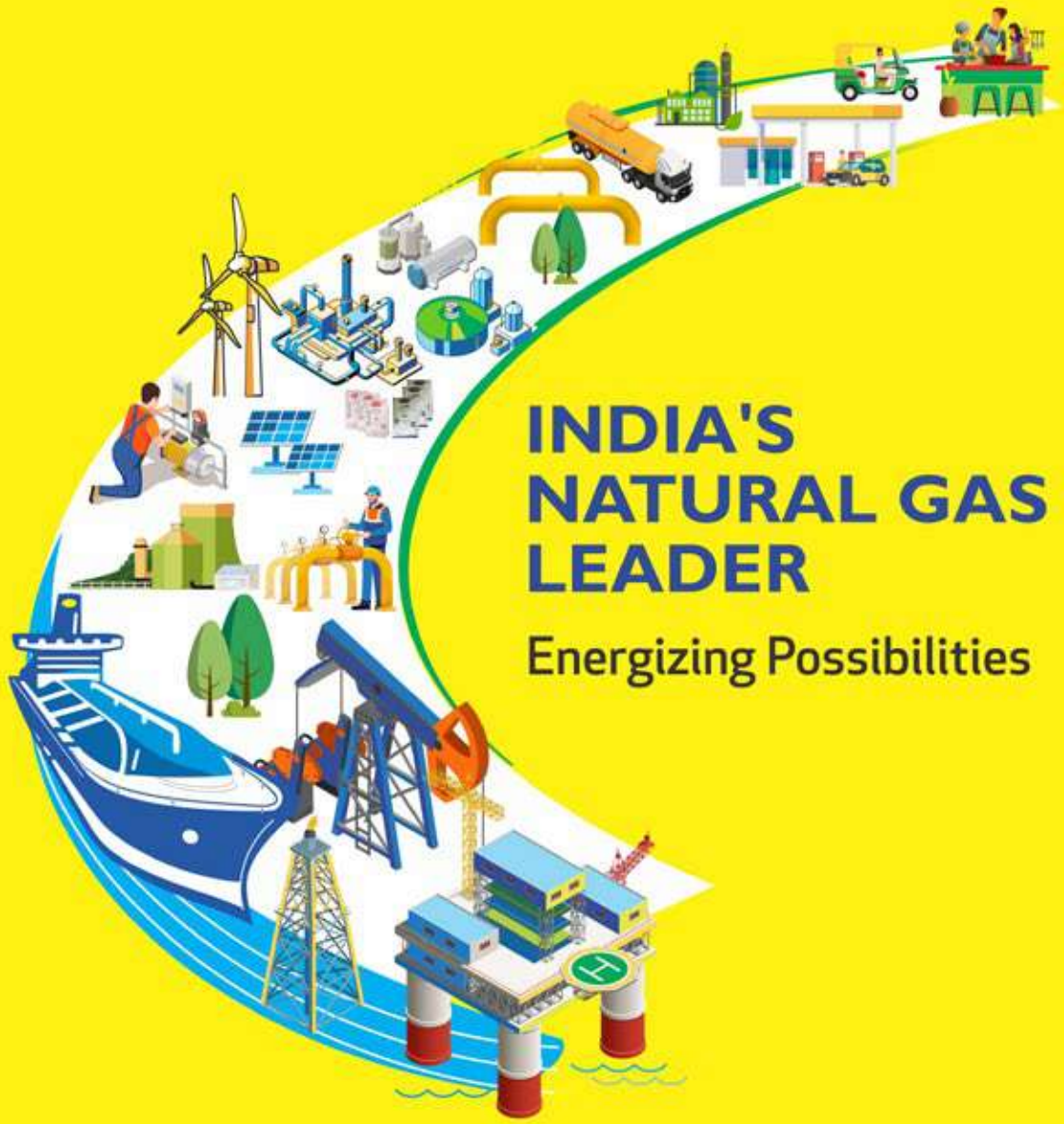




6 mtpa of 2030 demand already matched to supply

Global demand for clean hydrogen is expected to reach 11.0 mtpa by 2030, representing about 10% of total hydrogen demand, if all planned government policies are enforced. Currently, only 6.0 mtpa is firmly backed by active policies—consisting of 4.2 mtpa already contracted by buyers and 1.8 mtpa not yet contracted. The remaining 5.0 mtpa is uncertain and depends on future policies and infrastructure being finalised.

GAIL (India) Limited



INDIA'S NATURAL GAS LEADER

Energizing Possibilities

Contributing 53% of the Natural Gas sold in India.

Around 68% market share in Natural Gas Transmission in India.

www.gailonline.com

Follow us on

BIO-ENERGY

STRATEGIC PARTNER

iba | Indian Biogas Association

THE CHEAPEST CLIMATE JUSTICE IS ROTTING IN PLAIN SIGHT

As COP31 argues over who owes what, the Global South's organic waste offers something rare: fast methane cuts, cleaner kitchens and rural income, if finance follows.

Two billion people still cook on open fires or rudimentary stoves. Often, not far from those kitchens, lies the fuel that could replace the smoke: manure, crop residue and food waste, rotting slowly and leaking methane into the sky.

That image belongs in the plenary at Antalya, where COP31 opens on 9 November. The talks will turn on an old question: who owes what to whom? It is the right question, but an incomplete one.

We must also ask what the money should buy. Bioenergy is among the best answers available, and it is underrated because it smells of the farmyard rather than the future.

THE LEDGER

The arithmetic of responsibility is stark. Since 1850 the world has emitted about 2,651 billion tonnes of CO2. The United States accounts for more than a fifth of that, with about 4% of the world's people. Per person, its cumulative emissions are 25 times India's.

A 2023 study in Nature Sustainability found the Global North responsible for 89% of emissions beyond a fair share, and estimated it could owe about $170 trillion in compensation by 2050.

The sums on the table look small against that. At Baku, countries agreed a goal of $300 billion a year by 2035, inside a wider $1.3 trillion ambition. India and others called it an "optical illusion".

UNEP's latest Adaptation Gap Report says developing countries will need about $305 billion a year for adaptation alone by 2035. International public flows were about $30 billion in 2024.

Even the tripling called for at Belém would cover at most 29% of that need. Meanwhile, the largest historical emitter announced in January that it would leave the UN climate convention, and is not expected at Antalya.

So the blocs arrive speaking past each other. Developing countries want a climate finance work programme, and some propose formal burden sharing. Developed countries prefer better access to existing money and a wider donor base. The EU presses for national plans aligned with 1.5°C. The North asks how fast; the South asks who pays.

The South is no monolith, and its largest economies cannot hide behind history. China now holds second place in cumulative emissions, at about 13%. Language on moving away from fossil fuels remains contentious for big developing economies and fossil exporters. India, too, must show that its development path can be cleaner than the one the North took.



GAURAV KEDIA
Chairman, Indian Biogas Association

A RESOURCE THE SOUTH ALREADY OWNS

Bioenergy matters because it speaks to both questions at once. Methane drives nearly a third of current warming, and waste produces about a fifth of it. UNEP finds that national plans would cut methane just 8% by 2030, against the 30% pledged. Few levers slow warming faster.

The IEA puts sustainable biogas and biomethane potential at nearly 1,000 billion cubic metres of natural gas equivalent, a quarter of global gas demand. About 80% of it lies in emerging and developing economies, led by Brazil, China and India. Only about 5% is used today. This is the rare clean resource whose map favours the South.
Few technologies settle so many debts together.

In Africa, where a billion people lack clean cooking, the IEA links 815,000 premature deaths a year to poor indoor air. Digestate returns nutrients to tired soil: biogas and digestate together could meet about 10% of India's projected fertiliser needs by 2050. Farmers earn from what they once burned.

INDIA'S TEST

India shows both the promise and the problem. In August, Cabinet approved GOBARdhan, a ₹23,731 crore ten-year scheme aiming for a nearly tenfold rise in compressed biogas output.

Government expects over 1.5 lakh jobs and more than ₹40,000 crore in foreign exchange savings. Yet of 1,908 registered plants, only 217 were commissioned as of August, producing 0.4 million standard cubic metres a day. India uses under 5% of its potential; the EU uses about 40%. With new scheme in place, it is expected to gain the momentum though.

The distance between registered and running is also a story of finance, feedstock and offtake. It is also exactly the distance climate finance exists to close. And we must hold ourselves to account. Bioenergy's climate value disappears if plants leak methane or food crops displace waste. Measurement must be rigorous, or the claim is worthless.

WHAT ANTALYA SHOULD DO

The COP31 Presidency has made zero waste the first of ten action themes, proposing to halve the projected growth in municipal waste by 2035. The Belém 4X pledge, led by Brazil, Italy, Japan and India and backed by 23 other countries, seeks to quadruple sustainable fuels by 2035. Neither, alone, builds a digester. Three steps would help.

1. Count it. Put organic-waste methane into national climate plans, with measured targets for capture and use.

2. Fund it as resilience. Biogas cuts emissions while protecting soils and diversifying farm income. Concessional and first-loss capital should reach small and mid-sized plants, and such projects should be eligible for adaptation as well as mitigation finance.

3. Trust it. Give Belém 4X common sustainability standards and cross-border certificates, so that a verified methane cut in Bihar or Bahia can earn its value anywhere.

As an official UN observer, the Indian Biogas Association does not negotiate. Our task is to bring evidence from plants and farms into a process that too often runs on abstractions. That evidence says the South need not wait for the North to invent its transition. It needs capital on fair terms to build one from what it already has.

History's debt cannot be repaid in full. But climate justice can start paying in the currency that matters most in a village: clean air, a better harvest and a wage.



BEYOND BORDERS

ASEAN

ASEAN

In this segment, we traverse the ASEAN energy corridor — a space where innovation meets intent. From renewable breakthroughs to policy pivots and power partnerships, this segment uncovers how Southeast Asia is redefining its energy narrative, one megawatt and one milestone at a time.



01

Philippines' Alternergy energises 64MW Alabat Wind Farm in Quezon

QUEZON: Alternergy has energised its 64-MW Alabat Wind Farm, with the first three turbines now supplying the Luzon grid. The project includes a 37-km, 69-kV transmission line and a 1.4-km sea-crossing link. Using 8-MW turbines, the largest in Southeast Asia outside China, it will generate 202 GWh annually, powering 218,500 households and avoiding 150,541 tonnes of CO2. **(ASIAN POWER)**



02

Gentari Solar Project To Cut Petronas Complex Emissions By 2,500 Tonnes

KERTEH: Gentari has completed a 2.79-MW solar carpark system at the PETRONAS East Coast Complex in Terengganu, expected to cut about 2,500 tonnes of carbon emissions annually. The system will generate roughly 3.5 million kWh yearly, with surplus fed to the national grid under Malaysia's Net Energy Metering scheme. It was delivered under a Solar Power Purchase Agreement with Rantau Properties. **(BUSINESS TODAY MALAYSIA)**



03

Concord New Energy's October output rises 5.05% on wind power gains

SINGAPORE: Concord New Energy's October power output rose 5.05% year-on-year to 665.92 GWh, driven by wind generation, which climbed 6.71% to 578.13 GWh. Solar output fell 4.68% to 87.79 GWh. For the first ten months of 2026, total generation declined 3.43% to 6,855.27 GWh, with wind down 2.82% and solar down 6.93%. **(ASIAN POWER)**

MENA

MENA

Enersider Desk brings you the latest developments shaping the energy landscape across the Middle East and North Africa — from ambitious renewable transitions to strategic oil and gas investments. This segment captures the region's evolving energy narrative, spotlighting innovation, policy shifts, and partnerships driving sustainable growth in one of the world's most dynamic energy frontiers.



01

IEA Identifies Morocco Among Africa's Most Import-Dependent Gas Markets

RABAT: The IEA has identified Morocco among Africa's most import-dependent natural gas markets, exposing it to global prices and infrastructure constraints. Morocco plans its first LNG terminal at Nador with 5 bcm annual capacity and is pursuing the $25–26 billion Nigeria-Morocco Gas Pipeline. Global LNG supply is set to fall about 3% in 2026. (MOROCCO WORLD NEWS)



02

Abu Dhabi moves to ease peak power demand after electricity-saving trial

ABU DHABI: The Department of Energy has introduced new licensing rules for energy aggregator companies to manage peak electricity demand, following a 2025 pilot that cut demand by up to 401 MW. The trial achieved an average reduction of 251 MW, saved about 27 GWh and avoided roughly 4,000 tonnes of CO2. More than 30 entities participated, receiving bill credits. (GULF NEWS)



03

Alcazar Energy secures $436 million financing for Egyptian wind farms

CAIRO: Alcazar Energy has secured $436 million in financing for two 250-MW wind farms at Ras Ghareb on Egypt's Red Sea coast, costing $626 million combined. The Niat and Rasgha projects are due online by end-2028 under 25-year power purchase agreements at 3 cents per kWh. They will generate over 2.3 TWh annually, supporting Egypt's target of 45% renewable power by 2028. (REUTERS)

From Pledges To Plants

COP31 sets the destination. The time taken for the net-zero journey will be decided by how quickly we take proven technologies from pilot to scale. The Global South has started showing how.

By Dr. Rahul Walawalkar

Add up every national climate plan now on the table and, by UNEP's latest count, global emissions fall 11 to 15% by 2035 from 2025 levels. The path that brings warming back to 1.5°C by the end of this century needs about 45%.

That gap is the reason some people have stopped taking the COP process seriously. I think that is a mistake. COP is still the only table where a small island state and a G20 economy sit with the same voice, and it has moved the world further than its critics admit. When the Paris Agreement was signed, the world was heading for close to 4°C of warming. On today's policies it is about 2.8°C. That is not safe. It is progress, and it came from the direction COP set and from the cheap solar, wind and batteries that direction helped bring to market.

So we should defend the process and be honest about its record. Developed countries promised USD 100 billion a year in climate finance in 2009, to be delivered by 2020. It arrived in 2022. The 2024 figure, by the OECD's count, was about USD 137 billion, against a new goal of USD 300 billion a year by 2035. At COP28 the world agreed to triple renewable capacity by 2030, which means about 11,200 GW. Last year was a record. The world added 692 GW and reached about 5,150 GW. IRENA's arithmetic for the next 5 years is about 1,200 GW a year, close to 1.7 times that record, every year.

The Global South's argument on historical responsibility is correct, and I would not soften it. Countries that did the least to cause the problem are being asked to build the cleanest systems at the highest cost of capital. African negotiators opened in Antalya this week by saying, in effect, that you cannot implement without the means to implement.

But the options in front of the Global South are far better than they were at Paris. Solar module and battery pack costs have each fallen by roughly 90% since 2010, and wind has followed. A country building its power system today can meet most of its growing demand reliably with solar, wind and storage, at a cost nobody had access to ten years ago.

It does not have to repeat the fossil-heavy path that developed economies took and are now paying to unwind. That advantage will not be captured by waiting for the next technology to mature.

Solar did not scale on technology alone. It scaled on reverse auctions, 25-year power purchase agreements with payment security, solar parks that took land and evacuation risk off the developer, and pay-as-you-go models that put systems into homes with no access to credit. The business models and the financing travelled as far as the hardware did, and they are the part most worth learning from.

What people don't realize is that the North-South argument stays stuck partly because of how we frame it. "Finance" and "technology transfer" are negotiated as lump sums and principles. Very few of these discussions get down to saying, for a given technology in a given country, what exactly is missing. Is it the technology itself? The ability to manufacture it? Or a commercial structure that a lender will finance? Those are three different problems needing three different cheques, and we keep writing one.



Dr. Rahul Walawalkar
Founder & President,
NETRA (NetZero Energy Transition)

Last week in Delhi offered a useful contrast in method. The Ninth ISA Assembly met from 2 to 5 November at Bharat Mandapam, alongside the Bharat Renewable Energy Summit & Expo. India was elected ISA President for a third term, with France as Co-President.

A USD 200 million Africa Solar Facility was proposed. Across the week, ten MoUs and framework agreements were signed and 37 reports and tools were released. Minister Pralhad Joshi's summary was to move from commitments to investments and from partnerships to projects. In the same week the Union Cabinet approved ₹14,500 crore of viability gap funding for 92 GWh of storage, and the Power Secretary said storage purchase obligations for distribution companies would be finalised by March.

India can speak on delivery with some credibility. Non-fossil capacity is above 300 GW, more than half of the installed base, a mark the country's Paris commitment had set for 2030. Battery storage went from under 1 GWh at the end of 2025 to roughly 9 GWh by the middle of this year. There is also a long list of tendered projects still waiting to be commissioned, and that is the work in front of us.

On 3 November, at the Assembly plenary, ISA released its report, India's Energy Storage: From Strategy to Action. Our team at NETRA worked on it with ISA Director General Ashish Khanna's team through most of this year, alongside former colleagues at IESA.

NETRA is a global nonprofit industry association, incorporated on 22 April 2025, to accelerate the identification and scale-up of net-zero energy transition technologies by 2035, and this report is the clearest example so far of what we set out to do. It puts India's storage need at 888 GWh by 2035-36 and 2,380 GWh by 2047. More usefully, it says the policy framework is largely in place and the next phase is about converting tenders into commissioned, commercially sustainable projects.

The part I would ask readers to look at closely is the Integrated Readiness Level (IRL) framework, developed by NETRA and adopted by ISA in the report. It is our attempt to write down what the past decade taught us. Solar, wind and lithium-ion batteries scaled when technology, manufacturing and commercial readiness moved together, and stalled wherever one of the three was left behind.

NETRA developed the framework over 18 months and several hundred conversations with developers, manufacturers, lenders and officials, so that advanced energy storage and other net-zero technologies still at an early stage of manufacturing scale-up do not need another 20 years to get there. It reads three established scales together.

Technology Readiness Level, from NASA, asks whether the thing works reliably. Manufacturing Readiness Level, from the US Department of Defense, asks whether it can be made at scale with a supply chain you can reach. Commercial readiness, from the Australian Renewable Energy Agency's index, asks whether it can be financed and sold without special support. The three scales are borrowed, and we say so. What NETRA has developed is the framework that applies all three together, country by country, and reports a profile and a tier instead of one blended score.

A technology can be fully proven globally and still sit at an early manufacturing stage in India, Kenya or Indonesia, with no bankable revenue model. Each gap needs a different instrument. Research grants fix the first. Capacity support, testing centres and certification fix the second. Offtake structures, guarantees and long-tenor credit fix the third. In my experience financing is the constraint that binds most often, and it is the one a single "readiness" label hides.

The good part is that this gives North and South something specific to negotiate. Technology transfer becomes a list that names the technology, the country, the gap, the instrument and the amount. Climate finance can be pointed at the constraint that actually binds. Countries can stop repeating the same 2 MW pilot and compare results against common criteria.

A framework does not replace finance. It does make clear what the finance is for. ISA has 130 member and signatory countries, and I would like to see the India roadmap adapted for as many of them as want it. None of this replaces COP. It gives COP a way to keep score.

It is high time every pledge made in Antalya carried a delivery line next to it, saying who builds, who finances, and where the technology stands on all three counts in the countries expected to deploy it. For India, the next 6 months are about the storage obligation rules and the first tenders under the new funding.

The next 18 are about commissioning what has been tendered and building testing capacity at home. For the COP process, the test is simpler. When we meet next year, we should be able to count gigawatts commissioned and dollars disbursed against what was promised this month. That is a scoreboard all of us, North and South, can be measured against.

The views expressed are personal.

NETRA
Net-zero Energy Transition Association

ENERSIDER

WHAT MADE NEWS

01

MNRE reviews cleanliness and file disposal progress under Special Campaign 6.0

नवीन एवं नवीकरणीय ऊर्जा मंत्रालय
MINISTRY OF NEW AND RENEWABLE ENERGY
सत्यमेव जयते

NEW DELHI: MNRE reviewed cleanliness and file disposal progress under Special Campaign 6.0 at Atal Akshaya Urja Bhawan, with Director Aditya Pratap Singh inspecting sections. The campaign, implemented by DARPG from October 2 to 31, focuses on reducing pendency and institutionalising Swachhata. MNRE and its renewable energy CPSUs and institutes are participating, supporting efficient administration of India's clean energy mission. **(ENERSIDER DESK)**

02

भारत सरकार
GOVERNMENT OF INDIA
सत्यमेव जयते

Grid storage, critical mineral push to strengthen India's energy self-reliance: Report

NEW DELHI: India's energy self-reliance push gains momentum with a Rs 14,500 crore VGF scheme for 92 GWh grid-scale storage (60 GWh pumped hydro, 30 GWh BESS) by FY31, requiring Rs 97,600 crore investment, and a Rs 2,800 crore capex scheme for domestic lithium and nickel processing. A 40% domestic content mandate for batteries aims to boost manufacturing, ICICI Securities said. **(ANI)**

03

नवीन एवं नवीकरणीय ऊर्जा मंत्रालय
MINISTRY OF NEW AND RENEWABLE ENERGY
सत्यमेव जयते

India's renewable energy capacity to reach 530 GW by 2030, solar to drive over 80% of growth: IEA

NEW DELHI: India's renewable capacity is projected to reach around 530 GW by 2030, with solar driving over 80% of growth, the IEA said. Solar may exceed 350 GW, wind approaches 90 GW and hydro reaches 75 GW. Annual additions will stay above 50 GW, lifting renewable generation to about 950 TWh, or 35% of electricity. **(ANI)**

04

Odisha cabinet approves proposal for ₹4,708-crore pumped storage power project

BHUBANESWAR: The Odisha cabinet approved a ₹4,708.64 crore, 600 MW Upper Indravati Pumped Storage Project at Ranibahal, Kalahandi district, the state's first such facility. Targeted for commissioning by 2030-31 with MEIL as developer, it will generate about 1,040 MU annually and serve as grid-scale storage, absorbing surplus power and meeting peak demand. **(PTI)**

05

AGRIVOLTAICS WORLD CONFERENCE

India hosts Agrivoltaics World Conference 2026 for first time in Global South

NEW DELHI: India hosted the first Agrivoltaics World Conference 2026 in the Global South, inaugurated by Ministers Shivraj Singh Chouhan and Pralhad Joshi. India's non-fossil capacity reached 308.03 GW, over 55% of total. A TERI study finds 47.5 million hectares technically suitable for agrivoltaics. PM-KUSUM solarised 25 lakh pumps, and a major agrivoltaic programme is planned in its next phases. **(Enersider Desk)**

06

Haryana govt raises solar subsidy limit for shrimp farmers to 30 KW

CHANDIGARH: Haryana has raised the subsidised solar system capacity limit for shrimp farmers from 10 KW to 30 KW. Project cost is fixed at ₹50,000 per KW, capped at ₹15 lakh, with a 60 per cent subsidy. The move aims to cut electricity and diesel expenses, lower production costs and improve shrimp farming profitability across the state. **(PTI)**

07

IB Solar Signs MoU with German Technology Leaders to Establish India's First Centre of Excellence for Solar Technology in Uttar Pradesh

NEW DELHI: IB Solar has signed an MoU with German technology leaders RENA Technologies, Centrotherm and ISC Konstanz to establish India's first Centre of Excellence for Solar Technology at YEIDA in Uttar Pradesh. Signed at BRES 2026, the collaboration aims to build domestic R&D, next-generation solar technology and a stronger manufacturing ecosystem. **(ANI)**

08

Renewable Energy Procurement Strategies for Data Center Operators in India

NEW DELHI: India's data centre capacity neared 2 GW in H1 2026, consuming about 0.5% of national electricity. Operators can procure renewables via open access, group captive, round-the-clock contracts and onsite solar. A SECI 1 GW RTC tender discovered ₹5.25 per unit. India's non-fossil capacity reached 308 GW, or 55% of total installed power. **(ANI)**

09

India's net-zero transition aim by 2070 offers $22.7 tn investment opportunity for global capital

NEW DELHI: India's net-zero transition by 2070 offers a USD 22.7 trillion investment opportunity across renewables, grids, storage and clean tech, with a USD 6.5 trillion funding gap for international capital, according to a report by economist Nicki Hutley. Non-fossil sources account for 54.2 per cent of installed capacity but only about a quarter of generation. **(PTI)**

10

Electric vehicle sales jump 45% to 3,54,625 units in October, led by e-two wheelers and burgeoning demand

MUMBAI: Electric vehicle sales in India jumped 45 per cent year-on-year to 3,54,625 units in October, led by e-two-wheelers at 2,24,064 units, FADA data showed. E-passenger vehicle sales rose 76.47 per cent to 37,049 units, capturing 7.3 per cent retail share. Overall EV penetration reached 11.5 per cent from 6 per cent a year ago. **(PTI)**

WHAT MADE NEWS

11

India leads globally with green hydrogen offtake commitments exceeding 5.5 lakh MTPA till October 2026

नवीन एवं नवीकरणीय ऊर्जा मंत्रालय
MINISTRY OF NEW AND RENEWABLE ENERGY
सत्यमेव जयते

NEW DELHI: India has signed green hydrogen offtake commitments exceeding 5.5 lakh MTPA till October 2026, with 23 contracts since the National Green Hydrogen Mission launched in 2023. Over 70% are earmarked for exports, and projects are expected to attract about ₹90,000 crore in investment. Contracts include ACME's green ammonia deal with Japan's IHI, Reliance-Samsung C&T, and AM Green's H2Global win. **(ENERSIDER DESK)**

12

TATA POWER

Tata Power installs 60 MWh energy storage projects in Mumbai

MUMBAI: Tata Power has installed 60 MWh of battery energy storage systems at Mahalaxmi, Saki and Mankhurd, part of a planned 200 MWh BESS across 10 locations. The systems store low-cost solar power and discharge during evening peaks, improving network flexibility and cutting peak-hour costs for over 8 lakh consumers. **(PTI)**

13

नवीन एवं नवीकरणीय ऊर्जा मंत्रालय
MINISTRY OF NEW AND RENEWABLE ENERGY
सत्यमेव जयते

Renewable energy could save India USD 240 billion in coal, gas imports by 2030: IEA

NEW DELHI: India could save nearly USD 240 billion in cumulative coal and gas import spending by 2030 through renewable expansion, the IEA said, with annual savings reaching about USD 35 billion. Solar contributes roughly 60% and wind 30%. Without renewables added since 2010, coal imports would be 110 million tonnes higher. **(ANI)**

14

indus TOWERS

Telecom infra company Indus Towers steps up solar adoption amid energy costs and sustainability pressures

NEW DELHI: Indus Towers deployed 50,000 solar-powered telecom sites across India with about 300 MW capacity, becoming the first passive telecom infrastructure company to reach this milestone. It targets 100,000 sites. The solar network cuts roughly 420,000 tonnes of CO_2 annually, reduces diesel dependence and enhances energy security. **(ANI)**

15

Bharat RE Summit & Expo 2026

Pralhad Joshi reaffirms commitment towards global solar cooperation during BRE Summit & Expo 2026

NEW DELHI: Pralhad Joshi reaffirmed India's commitment to global solar cooperation at the BRE Summit 2026, noting India's election as ISA President for a third consecutive term. The ISA now has 130 member countries. He cited the USD 200 million Africa Solar Facility, India's USD 25 million contribution, the Nigeria fund, and efforts to empower 3 million farmers through solar and Agri-PV. **(ENERSIDER DESK)**

16

PM Surya Ghar has transformed into a mass movement: Pralhad Joshi

भारत सरकार
GOVERNMENT OF INDIA
सत्यमेव जयते

NEW DELHI: Pralhad Joshi said PM Surya Ghar has become a mass movement, with about one lakh rooftop solar installations completed every six days. India's solar capacity rose from 3 GW in 2014 to 172 GW, module manufacturing crossed 200 GW and cell capacity reached 45 GW. **(ENERSIDER DESK)**

17

KPI Green Energy Limited

KPI Green Energy energises 49.7 MW solar capacity in Gujarat

NEW DELHI: KPI Green Energy has energised 49.7 MW of solar and 121.8 MWp of hybrid capacity at Bharuch, Gujarat. The additions fall under its 250 MW/350 MWp solar IPP and 370 MW/677 MWp hybrid IPP projects. Energisation approval allows the projects to connect to the main grid and begin supplying renewable power. **(PTI)**

18

SAEL
SUSTAINABLE & AFFORDABLE ENERGY FOR LIFE

SAEL Industries to procure 20 lakh tonnes of paddy straw for its waste-to-energy plants

NEW DELHI: SAEL Industries has begun procuring 20 lakh tonnes of paddy straw in phases for its 11 agri-waste-to-energy plants, offering an alternative to stubble burning ahead of winter. The crop residue will be converted into renewable energy, reducing pollution while creating additional income and rural employment opportunities for farmers. **(PTI)**

19

एनटीपीसी
NTPC

NTPC plans to expand installed capacity to 149 GW by 2032, add 58 GW

NEW DELHI: NTPC plans to expand its installed capacity to 149 GW by 2032 from 91 GW, adding about 58 GW. It targets roughly 30 GW of nuclear capacity by 2037 as part of a 250 GW roadmap, with feasibility studies completed in Madhya Pradesh, Bihar and Odisha. October power demand rose 21 per cent. **(ANI)**

20

Bharat RE Summit & Expo 2026

BRE Summit & Expo 2026 reinforces India's position as a major global force in renewable energy: Pralhad Joshi

NEW DELHI: The BRE Summit & Expo 2026 concluded with over 75,000 visitors, 400 exhibitors and delegates from 135 countries. Pralhad Joshi said India has emerged as a major global renewable energy force and needs USD 220 billion for 500 GW non-fossil capacity. A SECI-Power2X MoU targets 3 lakh tonnes per annum of green methanol. **(ENERSIDER DESK)**

INDUSTRY EVENTS

INDIA

India Green Hydrogen Assembly (IGHA) 2026

Date: 17-18 November 2026
Venue: India Expo Centre & Mart (IEML), Greater Noida (Delhi NCR)
Organised By: GH2 India

Website: www.gh2.org.in

IGHA 2026 unites government, industry, and civil society to advance India's green hydrogen economy through focused sessions, CEO roundtables, workshops, exhibitions, and site visits. Participants forge partnerships, share technological insights, address challenges, and mobilize investment to accelerate a fair, inclusive low-carbon transition.

INDIA

27th International Conference INDIAN Petrochem - 2026

Date: 19-20 November 2026
Venue: The Lalit, Mumbai, INDIA
Organised By: Elite Conferences Pvt. Ltd.

Website: www.eliteconferences.com

The Indian Petrochem conference brings together global petrochemical professionals, experts, and stakeholders to discuss the latest developments, challenges, and opportunities in the sector. Through dialogue and knowledge exchange, participants explore industry trends, emerging technologies, and strategic solutions shaping the future of petrochemicals.

VIETNAM

10th Biomass & BioEnergy Asia

Date: 17-19 November 2026
Venue: Le Méridien Saigon in Ho Chi Minh City, Vietnam
Organised By: Centre for Management Technology (CMT)

Website: www.wasteculture.com

Biomass & BioEnergy Asia convenes producers, buyers, lenders, and developers for price intelligence, contract insights, project case studies, and direct buyer-seller dialogue. Sessions examine domestic biomass use, SAF, biomethane, biocarbon, biochar economics, and bankability, helping Southeast Asia's biomass market meet quality standards and close real deals.

UAE

RAK Energy Event 2026

Date: 25-27 November 2026
Venue: Ras Al Khaimah, UAE
Organised By: Collab Ventures Events Organizing & Managing LLC

Website: www.dii-desertenergy.org

The RAK Energy Summit convenes policymakers, industry pioneers, and innovators from public and private sectors through curated sessions, panel discussions, networking forums, and live demonstrations. Participants address energy efficiency, renewables, future grids, AI, carbon markets, and industrial decarbonization, advancing sustainable energy and climate action across the UAE and wider GCC.

For media partnership, contact: editor@enersider.com

ENERSIDER

presents

THE 100

VANGUARDS OF INDIA'S ENERGY FUTURE

2026 - 2027

www.enersider.com

INDIA GREEN HYDROGEN ASSEMBLY | Hyvolution INDIA

17–18 NOVEMBER, 2026 | INDIA EXPO MART, GREATER NOIDA (DELHI NCR)

Celebrating India's Green Hydrogen Foundations

Exhibition | Plenary Conference | Technical Conference | Leadership Roundtables

Supported By

NGHM | रसायन एवं पेट्रो-रसायन विभाग DEPARTMENT OF CHEMICALS & PETRO-CHEMICALS | सेकी SECI | ISA International Solar Alliance | INVEST INDIA

Platinum Port Partner

दीनदयाल पत्तन प्राधिकरण, कंडला DEENDAYAL PORT AUTHORITY, KANDLA

Gold Partners

am green | INOXCVA HISTORICALLY FUTURISTIC | gentari

Industry Partners

HERO FUTURE ENERGIES | AVL | Green Hydrogen Organisation

Associate Partners

ZIRFON | INSOLARE | TrueRE ORIANA POWER LIMITED | AVAADA

International Pavilion by

AHK

Supporting Partners

THERMAX | SOPAN | Kirloskar Pneumatic | SUNGROW Hydrogen

Startup Pavilion Partner

Energy Leap WITH xynteo

Strategic Knowledge Partner

AMITY UNIVERSITY

Carbon Partner

PROCLIME

Knowledge Partners

CertifHy | LBST | ITA | CEEW | H2Global | Smart Freight Centre | SYSTEMIQ

Key Exhibitors

newtrace | 40 years of Trusted Engineering Excellence | BVK HYDROTECH | Malvern Panalytical | Barot Renewables | STATCON ENERGIAA | SEETRU | SepraTECH | MOLSIEVE DESIGNS LIMITED | COVESS

Chola MS | KLINGER India | PHOENIX CONTACT | NASADYA | Hylan | HYDROVERT | SGT HydroEdge | Athena | BaoShilai

HyChaser Gas Equipments | h2e POWER | AIP | DILICO | HyCentA | PUNE HYDROGEN VALLEY | BRIGHT | TIME TIME TECHNOPLAST LTD.

Industry Network Partner

Green Ports and Shipping Network (GPSN)

Media Partners

ICN INDIAN CHEMICAL NEWS | Hydrogeninsight

Official Magazine Partner

ENERSIDER

Association Partners

NSEFI | Hydrogen Europe | THICP | ifs | FAI | DSCI A nasscom Initiative | IESA India Energy Storage Alliance | NETRA | SPDA

Organised by

GH2 India | GL events

Event Host

AEPL Connecting Businesses, Accelerating Growth.