

Accelerating Green Hydrogen for Sustainable Growth



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About Task force on Green Hydrogen Mission, Jharkhand

The Task force on Green Hydrogen Mission in Jharkhand was formed by the Government of Jharkhand in March 2023 as a part and response to the National Green Hydrogen Mission launched by the Government of India in January 2022. The State Task Force's objective is to assess the current scenario of hydrogen energy, study best practices from around the globe, evaluate the applicability and suitability of green hydrogen for the state, and create a roadmap for implementing the mission in Jharkhand.

About CEED

Centre for Environment and Energy Development (CEED), an environment and energy expert group, is involved in creating sustainable solutions to maintain a healthy, rich and diverse environment. CEED primarily works towards energy transition, ambient air quality, clean water for all and zero waste solutions by creating an enabling ecosystem to scale up investments in low carbon development pathways, climate mitigation and adaptation. CEED engages with industries, think tanks, stakeholders and the public to create environmentally responsible and socially just solutions.

For further details, please contact :

Task force on Green Hydrogen Mission, E-mail : sjtjharkhand.office@gmail.com

Centre for Environment & Energy Development (Technical Partner to the Task Force), Email : info@ceedindia.org

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Acknowledgements

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The consultation was jointly organised by the Task Force on Green Hydrogen Mission, Government of Jharkhand and Centre for Environment and Energy Development (CEED) in association with Central Coalfields Limited (CCL), National Thermal Power Corporation (NTPC) and Tata Steel.

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Foreword



Hydrogen is the energy of the future. Green hydrogen is considered the next big thing in moving towards a climate-resilient and sustainable development future.

The Government of Jharkhand is also prioritising green hydrogen as a potential solution and a state-level Task Force on Green Hydrogen Mission has been constituted in March 2023 to align with the national goal. The state government is committed to ensuring energy security in the state and accordingly, cleaner sources of energy have been prioritised.

The State Solar Policy 2022 has been mandated to scale up solar solutions.

Jharkhand is keen to capitalise on the solar potential in all socio-economic activities for energy security purposes. Similarly, the Task Force on Green Hydrogen Mission will open up new opportunities to harness another form of cleaner energy – hydrogen energy to fulfil the net-zero ambitions and climate-related goals in the state.

This also creates a massive opportunity for Jharkhand. Renewables have been torchbearers of the green initiative since the beginning of the 21st century. Hydrogen can play a similar role as the goalpost of going green shifts from merely reducing GHG emissions to achieving net-zero emissions.

This workshop was organised at the right time to bring forth key ideas and concerns in creating an ecosystem for harnessing hydrogen energy. We are looking forward to creating a blueprint for a cleaner energy based greener future to benefit all.

Mr. Avinash Kumar, IAS

Additional Chief Secretary, Department of Energy
Government of Jharkhand

Message



Hydrogen is seen as a sunrise energy for achieving net-zero emission. Various studies show that a green future can be built on hydrogen. Jharkhand state has a strong presence in heavy industries of iron & steel, transport vehicles, cement and others. The decarbonisation process through cleaner energy sources, particularly hydrogen, can lead towards a low-carbon scenario in the state.

Carbon-free hydrogen will play a critical role in decarbonizing certain end-use sectors such as iron ore and steel, fertilizers, chemicals, and transport, which emit major amounts of CO₂. These sectors

are considered as hard to abate in decarbonization by adopting low- or zero-carbon technologies.

In the run-up to the net-zero goal set by the Government of India, Jharkhand is also moving strategically in this direction. A dedicated Task Force on Green Hydrogen Mission has been constituted to assess the present scenario, learn from the best practices around the globe and create a roadmap to harness the potential of green hydrogen in Jharkhand.

Harnessing hydrogen requires a holistic approach in presenting technical know-how, incentives, infra support and ecosystem change. A detailed techno-economic assessment is needed to know the current status, future demands and road ahead to capitalise on the opportunities. This would also contribute to India's commitment to reduce carbon emissions and enhance the competitiveness of Jharkhand's industries in the global market.

This workshop was one of the initial steps in bringing all concerned stakeholders on board and deliberating on path-breaking ideas and solutions to shape the creation of a roadmap. We are happy to share the report of the workshop and sure that it will further lead to a formative discussion on various facets of green hydrogen to meet net-zero ambitions and sustainable development goals in Jharkhand.

Mr. Ajay Kumar Rastogi (IFS, Rtd.)

Chairman, Task Force on Green Hydrogen Mission and Sustainable Just Transition
Government of Jharkhand

Message



Considering the deepening climate impacts and its associated risks to our economy and society, it is imperative that we transition towards cleaner energy and more sustainable alternatives. Green hydrogen, produced using renewable sources such as wind and solar power, has emerged as a promising solution to decarbonise the economy.

By leveraging the state's existing infrastructure and abundant renewable energy resources, Jharkhand can become a leader in the production and distribution of green hydrogen, while simultaneously reducing its carbon footprint and

contributing to global efforts to combat climate change.

We need to take action towards this goal and support the transition towards a green economy. Let us work together to accelerate the adoption of green hydrogen in the coal-mining industry and create a more sustainable future.

This workshop has been really a commendable effort in bringing out exciting ideas and recommendations to create a low-carbon economy and green hydrogen mission in the state.

The Task Force on Green Hydrogen Mission and Centre for Environment and Energy Development (CEED) must be congratulated for organising such a fulfilling discussion on a pressing issue of our time. This workshop has outlined a pathway for the state to adopt sustainability-based steps for the betterment of society.

Mr. Aboobacker Siddique P., IAS

Secretary, Department of Mines and Geology
Government of Jharkhand

Message



Jharkhand is primarily an industrial state with a very strong presence of heavy industries, MSME and other enterprises. There are many districts where the industrial clusters cater to economic demand and societal needs. Hydrogen has the potential to decarbonise industrial and economic activities by reducing CO₂ emissions from the environment.

As the Govt of Jharkhand has formed a Task Force on Green Hydrogen Mission, we look forward to a pathway and action plan for the future to make Jharkhand the hub of hydrogen in Eastern India.

This has been really a praiseworthy initiative by the Task Force on Green Hydrogen Mission and Centre for Environment and Energy Development (CEED) for bringing out the best of minds to showcase and discuss the best practices happening in industrial decarbonisation areas to move towards the net-zero goal set by Government of India.

This will definitely set a new trajectory of industrial development with sustainability principles at the core of every step. We pledge support for putting cleaner and green technologies in the industrial segments for a better socio-economic future.

Mr. Jitendra Kumar Singh, IAS

Secretary, Department of Industries
Government of Jharkhand



Message



Jharkhand is at a crucial juncture in terms of changing its energy landscape, where green hydrogen has a critical role to play to make it a self-reliant and energy-independent state.

Guided by the mandates of the National Green Hydrogen Mission, Jharkhand Government (through the Department of Energy) has constituted a Task Force on Green Hydrogen Mission in March 2023. It will assess the scope and potential of green hydrogen in the state and prepare a roadmap to make the state a green hydrogen hub in India. This is really a farsighted step to chart visionary low-

carbon pathways. The task force is expected to prepare a blueprint for the future.

This is indeed a massive task for the Centre for Environment and Energy Development (CEED) as well since it is a technical partner to the Task Force. For the net-zero and carbon-neutral scenario, a cleaner energy-based development paradigm has to be strengthened.

Green hydrogen has been seen as a potential solution to decarbonise hard-to-abate sectors. It is high time that Jharkhand formulate programs and policies to harness sustainable energy options like green hydrogen so that they should not be in a disadvantaged position.

For this, a long-term roadmap is needed to create an enabling ecosystem to improve investors' confidence and will converge the entire value chain and the various government agencies towards a singular vision.

A synergetic approach composed of planning by government departments, knowledge sharing by academia and think-tank, best practices executed by industries and capacitation of key stakeholders is essential to create an ecosystem for hydrogen.

With proactive collaboration among innovators, entrepreneurs and key stakeholders, green hydrogen has the potential to drastically reduce CO₂ emissions, fight climate change, and put Jharkhand on a path towards a net-zero scenario.

Mr. Ramapati Kumar

Chief Executive Officer (CEO)

Centre for Environment and Energy Development (CEED)



Executive Summary

India has set ambitious climate goals and in the course of achieving them, it has put strong efforts into becoming the fastest growing renewable energy capacity country in the world. With a vision to become energy independent by 2047 and achieve net-zero emissions by 2070, India recognizes the critical role of Green Hydrogen. The National Green Hydrogen Mission was launched in 2022 to establish a green hydrogen ecosystem and catalyze a systemic response to the opportunities and challenges of this sunrise sector. Green Hydrogen produced using renewable energy has the potential to play a key role in a low-carbon and self-reliant economic future. It can enable the utilization of domestically available abundant renewable energy resources across regions, seasons, and sectors, feeding multiple usage streams either as fuel or as an industrial feedstock. The mission aims to accelerate the transition towards sustainable energy and establish its global presence in green hydrogen production.

The state of Jharkhand has taken the lead in creating the green hydrogen ecosystem by establishing a dedicated "Task Force on the Green Hydrogen Mission". By creating a comprehensive roadmap and action plan for implementing the mission in the state, Jharkhand aims to create a robust hydrogen ecosystem to strengthen its energy security.

The state of Jharkhand faces challenges with resource depletion and ensuring inclusive development despite having 40% of India's mineral reserves and 26% of its coal reserves. Furthermore, the state's installed power capacity is 94% coal-based, and due to its heavy reliance on thermal sources of energy and the moderate share of renewable sources in the power mix, the state is likely to experience challenges with energy security as it races to achieve net zero emissions and aspires to become carbon neutral in the coming years. Jharkhand is one of the climate-sensitive states in India, which has also seen the highest rate of land degradation with about 69% of the state's total geographical area being categorised as degraded.

To address these challenges, a stakeholder consultation titled 'Developing Green Hydrogen Ecosystem for Jharkhand' was organized jointly by the Task Force on Green Hydrogen Mission, Government of Jharkhand and Centre for Environment and Energy Development (CEED) in association with Central Coalfields Limited (CCL), National Thermal Power Corporation (NTPC), and Tata Steel. The consultation aimed to sensitize key stakeholders about the challenges and prospects of green hydrogen and solicit their solution-driven perspectives and support for Jharkhand's efforts in harnessing green hydrogen as a sustainable energy solution.

“ The adoption of green hydrogen in Jharkhand can create opportunities for economic growth, create jobs, reduce fossil fuel imports, and mitigate greenhouse gas emissions. The state has the potential to become a leading producer of green hydrogen by utilizing its abundant renewable energy resources. The consultation emphasized the importance of a collaborative approach involving government, industry, and academia to create a comprehensive roadmap and action plan for the adoption of green hydrogen in Jharkhand. The successful implementation of the mission can provide a pathway for other states in India to embrace the green hydrogen ecosystem and accelerate the country's transition towards sustainable energy. ”

Notable Speakers



Mr. Avinash Kumar, IAS
Additional Chief Secretary
Department of Energy, GoJ



Mr. A. K. Rastogi, IFS (Retd)
Chairman, Task Force, Sustainable Just
Transition & Green Hydrogen Mission, GoJ



Mr. Jitendra Kumar Singh, IAS
Secretary
Department of Industries, GoJ



Mr. Aboobacker Siddique P., IAS
Secretary
Department of Mines and Geology, GoJ



Mr. Ramapati Kumar
Chief Executive Officer (CEO)
Centre for Environment and Energy
Development (CEED)



Mr. Rajiv Mangal
Vice President, Safety, Health &
Sustainability
TATA Steel



Mr. B. Sairam
Director
Central Coalfields Limited (CCL)



Mr. Chandra Prakash Tiwari
Head-Technology & Process Engineering (G)
Tata Power



Mr. P.C. Jha,
Chief Manager, Environment
CMPDI



Mr. D.M.R Panda
GM, (Hydrogen/ RE)
NTPC Limited



Dr. Manish Ram
Advisor- Energy Transition
CEED



Ms. Kajol
Sr. Manager, Decarbonisation, Energy
WRI India



Mr. Jagabanta Ningjoutham
Principal
RMI India



Mr. Rishi Gupta
Head Engineering
Energy, Sustainability & New Initiatives,
Tata Steel



Mr. Jaideep Malik
Business Development, Hydrogen
John Cockerill



Dr. Mayilvelnathan
Vice President
Hild Electric Private Limited



Mr. Anand Kumar
Head, Policy Affairs and Project
Development, Hygenco

Organising Partners



Participating Institutions





Key Recommendations

- 1 A comprehensive roadmap is needed with the identification of goals, roles and milestones for establishing collaborative partnerships between the government, industries, research think tanks, and techno-solutions providers, which will ensure that all stakeholders work together towards the common goal of promoting green hydrogen in Jharkhand.
- 2 Decarbonisation process based on the principles of sustainability is essential for all industrial and business activities. In this regard, adherence to Environment, Social and Governance (ESG), Business Sustainability Reporting and adoption of clean and green technologies and energies in all sectors are key for low carbon and net-zero scenarios.
- 3 A comprehensive potential assessment of renewable energy in the state is key to knowing the possible scenario for green hydrogen. Accordingly, investment in renewable energy sources should be encouraged to ensure a steady supply of clean energy for the production of green hydrogen.
- 4 The use of carbon capture, storage and utilisation technology can be promoted to reduce CO₂ emissions and a suitable infrastructure base can be used for encouraging the hydrogen production process.
- 5 Renewable energy (RE) development and electrolyser industries need to flourish together to support the production of green hydrogen, boost employment generation, and ensure economic growth in the state.
- 6 Rerouting the steel industry through the green hydrogen path (hydrogen injection in the blast furnace) is essential to unlocking the future potential for the industry by reducing fossil-fuel imports.
- 7 Fixed incentives to off-takers for investment security, cost-sharing by consumers for green products produced through hydrogen, and compliance with appropriate regulatory measures can bolster the financing of hydrogen export.

- 8 Some key pilot projects for demonstrations and leanings should be set up. For instance, Jharkhand can opt for H₂-PNG blending pipelines with advanced metallurgy and the offtake of hydrogen in the transportation sector through the use of long-haul fuel cell vehicles or Heavy-Duty Vehicles (HDVs), hydrogen refuelling stations (*hydrogen highways*), and small solar-electrolyser combined units (*hydrogen dhabas*).
- 9 Undertake a workforce gap assessment and a future action plan of skilling is essential for employment generation and the growth of the green hydrogen industry locally. This can be achieved through training and capacitation programs through corporate collaborations that focus on the skills required for the production, usage, and maintenance of green hydrogen infrastructure.



Introduction

India's unwavering commitment towards a sustainable energy future shines through its ambitious efforts to promote green hydrogen as a key solution towards achieving its goal of net-zero carbon emissions by 2070. Green hydrogen, produced using renewable energy sources, has emerged as a beacon of hope in addressing pressing challenges such as energy security, climate impacts, emissions reduction targets, air quality improvement, and reducing the burden of high import costs of fossil fuels.

India's pursuit of a low-carbon hydrogen-based economy is not only aligned with its national objectives of reducing dependence on imported fossil fuels but also serves as a beacon of inspiration for the global Clean Energy Transition. With its resolute focus on leveraging abundant renewable energy resources, promoting self-reliance through clean energy solutions, and addressing pressing environmental concerns, India's green hydrogen push is poised to usher in a brighter and more sustainable future for generations to come.

The central government has initiated the "National Green Hydrogen Mission" to promote the adoption of green hydrogen and position India as a leading producer with a production capacity of at least 5 million metric tons per year. This will require adding about 125 GW of renewable energy capacity, creating over 600,000 jobs, reducing fossil fuel imports by over Rs. 100,000 crores, and mitigating approximately 50 million metric tons of greenhouse gas emissions annually. The mission aims to accelerate the country's transition towards sustainable energy and establish its global presence in green hydrogen production.

By establishing a dedicated "Task Force on Green Hydrogen Mission," Jharkhand has charted a path towards creating a comprehensive roadmap and action plan for implementing the mission in the state. This visionary approach exemplifies Jharkhand's determination and creates a robust hydrogen ecosystem to strengthen its energy security.

In pursuit of this goal, a stakeholder consultation titled 'Developing Green Hydrogen Ecosystem for Jharkhand' was jointly organized by the Task Force on Green Hydrogen Mission, Government of Jharkhand and Centre for Environment and Energy Development (CEED) in association with Central Coalfields Limited (CCL), National Thermal Power Corporation (NTPC), and Tata Steel. The consultation aimed to sensitize key stakeholders about the challenges and prospects of green hydrogen and solicit their solution-driven perspectives and support for Jharkhand's efforts in harnessing green hydrogen as a sustainable energy solution.

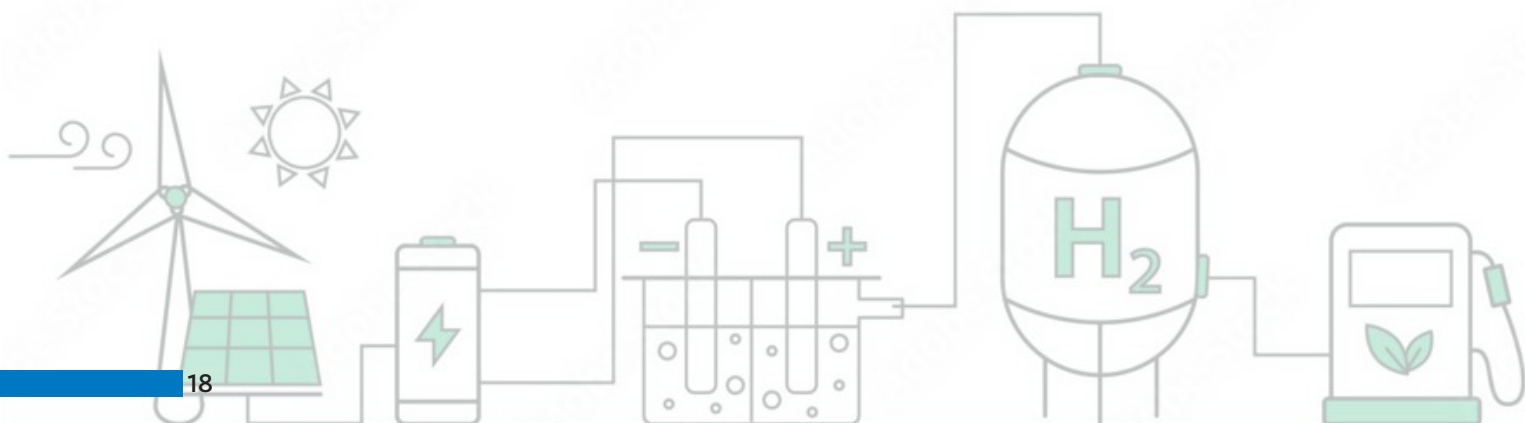
Motivation

The motivation behind organizing the stakeholder consultation on 'Developing Green Hydrogen Ecosystem for Jharkhand' is the state's aspiration to strengthen its energy security. By bringing together key stakeholders, the consultation sought to create awareness, gather perspectives and solicit support and solution-driven approaches towards realizing the goal of utilizing green hydrogen to meet Jharkhand's energy needs in an environmentally sustainable manner.

Goals and Objectives

The aim of the consultation was to promote the use of green hydrogen in Jharkhand and create a sustainable ecosystem for its production, usage, and export. By bringing together key stakeholders, the consultation sought to facilitate constructive dialogue and collaboration towards achieving the goals of the National Green Hydrogen Mission and ensuring a clean energy transition in Jharkhand. The consultation had the following Objectives:

1. To raise awareness among key stakeholders about the prospects of green hydrogen as an alternative source of energy.
2. To identify and bring solution-driven perspectives from stakeholders in Jharkhand for promoting green hydrogen in the state.
3. To discuss the potential of green hydrogen in strengthening energy security and promoting self-sufficiency in Jharkhand.
4. To deliberate on path-breaking ideas, solutions and challenges to harness green hydrogen in the state.
5. To envision a green hydrogen ecosystem in Jharkhand and identify potential areas of collaboration among various stakeholders.



Structure of the Consultation

The consultation consisted of two sessions that focused on the existing status of the energy sector in Jharkhand and aimed to foster a positive discussion and partnership to accomplish the objectives of the National Green Hydrogen Mission and facilitate a sustainable energy transition in the state.

Session 1:

Development of Hydrogen Ecosystem to Enable Sustainable Growth in Jharkhand

This session focused on discussing the need for a hydrogen ecosystem in Jharkhand to promote sustainable growth. Top officials from government departments and agencies, along with leaders from major industries, public sector undertakings, business associations, research think tanks and techno-solutions providers from global, national and subnational levels participated. The session aimed to identify the potential areas of collaboration and strategies to develop a robust hydrogen ecosystem in Jharkhand, aligning with the state's sustainable growth objectives.

Session 2:

Initiatives by Industry on Hydrogen – Challenges and Opportunities

This session highlighted the initiatives taken by the industry in the field of hydrogen, including the challenges and opportunities associated with its production, usage, and adoption. Leaders from major industries, public sector undertakings, and other stakeholders shared their experiences, insights, and perspectives on the current scenario and future prospects of hydrogen in Jharkhand. The session aimed to foster discussions on innovative solutions, technologies, and best practices that can drive the growth of the hydrogen industry in the state.





Inaugural Session

The consultation started with an inaugural session featuring several distinguished guests who delivered keynote addresses on the importance of developing a green hydrogen ecosystem in Jharkhand. The session witnessed the gracious presence of Mr. Avinash Kumar, IAS, Additional Chief Secretary of the Department of Energy, Govt. of Jharkhand; Mr. A.K. Rastogi, IFS (Retd.), Chairman, Task Force on Sustainable Just Transition & Green Hydrogen Mission, Mr. Jitendra Kumar Singh, IAS, Secretary of the Department of Industries, Govt. of Jharkhand; Mr. Aboobacker Siddique P, IAS, Secretary of the Department of Mines & Geology, Govt. of Jharkhand; Mr. Rajiv Mangal, Vice President of Safety, Health and Sustainability at TATA Steel and Mr. Ramapati Kumar, CEO of the Centre for Environment and Energy Development (CEED).

The session was intended to provide a platform for stakeholders to exchange ideas, share experiences, and identify challenges and opportunities in this field. Mr Ramapati Kumar welcomed the esteemed delegates and broadly elaborated on the need, objectives and goals of the consultation.

Mr. A.K. Rastogi set the context for the inaugural session and emphasized the importance of collaboration between different stakeholders, including industry, academia, and government, to develop a roadmap for the implementation of a green hydrogen ecosystem. Mr. Rastogi's message highlighted the need for a coordinated approach towards achieving a sustainable and clean energy future for Jharkhand.

Mr. Avinash Kumar, Additional Chief Secretary of the Department of Energy for the Government of Jharkhand in his keynote address emphasized the need for a holistic and sustainable approach in developing a green hydrogen ecosystem in Jharkhand. He used the development of palm-top and MRI technology as an analogy to illustrate how research and development can lead to significant progress in a short span of time. Mr. Kumar urged participants to work towards practical and sustainable solutions that benefit the community as a whole. His remarks set the tone for the workshop and emphasized the importance of a collaborative and sustainability-based approach in the development of a green hydrogen ecosystem in Jharkhand.



Key Highlights

Hydrogen is the energy of the future. It is a critical fuel for Jharkhand's growth engine, and one of the key resources to decarbonize the hard-to-abate sectors like the steel, heavy transport, cement, and fertilisers industries.

A strong base of renewable energy sources with round-the-clock supply is crucial to make Green Hydrogen economically viable for scaled-up manufacturing. Producing Green Hydrogen is currently expensive and production at scale is necessary for making it economically viable.

Jharkhand state has established a task force for sustainable Just transition, becoming the first state to do so.

There should be proper linkages between development needs, the decarbonisation process and low carbon opportunities of the state. In this case, more uptake of cleaner energy solutions will drive the state's ambition to achieve net-zero goals. For instance, 2.5 tonnes of CO₂ is emitted for every tonne of steel produced, and India produces an estimated 80 kg of steel per person annually. Decarbonising the steel industry and accelerating the production of green steel can be one of the approaches towards low-carbon industrialization.

A visionary plan of action is needed to promote various forms of hydrogen energies. This requires a framework which maps out the knowledge sharing of innovative technologies, building, infra support and creating conducive financial mechanisms to make it a win-win situation for all stakeholders.

A better start could be undertaking a comprehensive assessment of best practices and learning from around the world and contextualizing some of the best practices in Jharkhand to demonstrate promising pilots for scaling it further. This will contribute to building pathways and boost confidence among the key stakeholders involved in this process.

Key Speakers



"The State Government is committed to ensuring energy security in the state. As per the mandates of the National Green Hydrogen Mission and net-zero target, Jharkhand is also exploring the potential of hydrogen-based energy to bring its economic advantages and environmental co-benefits. As we plan for the implementation of the green hydrogen mission, it is imperative that we work towards making the transition process both economically viable, sustainable and inclusive."

Mr. Avinash Kumar, IAS

Additional Chief Secretary, Department of Energy, Govt. of Jharkhand



"With ambitious climate goals, industry and business sectors now have the greater onus to move towards the decarbonisation process and increasingly adopt sustainable forms of energies. It will be prudent to identify linkages between development needs, the decarbonisation process and low carbon opportunities of the state. Jharkhand has all natural and human resources to become a prominent hydrogen hub to enable the state to meet net zero targets through sustainable means."

Mr. A.K. Rastogi, IFS (Retd.),

Chairman, **Task Force, Green Hydrogen Mission and Sustainable Just Transition**, Govt. of Jharkhand



"Industries have traditionally been the driver of economic growth and social development. Decarbonisation of industries and business activities can be catalysed through developing long-term roadmaps and collaborative research & development-enabled options. Through a joint effort from the state, industry, think tanks and people, we can achieve our intended objectives of becoming a low-carbon economy aligned with national goals. "

Mr. Jitendra Kumar Singh, IAS

Secretary, Department of Industries, Govt. of Jharkhand



"The abundance of renewable energy sources, coupled with the existing infrastructure of coal-based industries, provides a unique opportunity for the state to become a leader in the production and distribution of green hydrogen. Creating a green hydrogen ecosystem requires significant investments in new technologies, infrastructure support, and innovative financial mechanisms from all stakeholders concerned to bring its enormous benefits to the state and people."

Mr. Aboobacker Siddique P., IAS

Secretary, Department of Mines & Geology, Govt. of Jharkhand



"The mandates of the task force are indeed futuristic steps in the policy planning process and rightly puts cleaner energy at the core of all socio-economic activities. Creating a forward-looking framework, sharing tech know-how, infra support and conducive financial mechanism, can help in reducing risk perceptions and unlock greater potential. Jharkhand must learn from the best practices from around the globe and promote the development of the green hydrogen ecosystem while also collaborating with other neighbouring states like Odisha and West Bengal to take a lead on this front."

Mr. Ramapati Kumar

Chief Executive Officer, Centre for Environment and Energy Development (CEED)



"The industrial segment is quite receptive to the increasing infusion of cleaner and greener energy options in its operational activities. Industries in Jharkhand must play a key role in contributing toward the net-zero target and in response to this, Tata Group has set its own target of 2045. Green hydrogen has the possibility to become the most sought-after enabler for the decarbonization of the steel sector, and Tata Steel is committed to assisting the state government in bringing know-how and support in this endeavour."

Mr. Rajiv Mangal

Vice President- Safety, Health and Sustainability, TATA Steel



H_2

Hydrogen

zero emission

Development of Hydrogen Ecosystem to Enable Sustainable Growth

Overview

Jharkhand is a significantly industrialized state in India with a presence of a diverse range of industries, including coal, steel, cement, fertilizers, and chemicals. This makes the development of a hydrogen ecosystem crucial for the state's sustainable growth. With its large fleet of heavy-duty vehicles/industries, extensive MSME sector, and iron & steel manufacturing capabilities, Jharkhand has the potential to become a significant consumer and supplier of hydrogen.

By reducing reliance on imported fossil fuels, promoting environmental sustainability, and supporting economic growth and employment opportunities, the session aimed to highlight the importance of hydrogen for Jharkhand and discuss strategies to establish a robust hydrogen ecosystem

The session consisted of six eminent panelists from diverse backgrounds who discussed the various pathways for the development of a green hydrogen ecosystem in Jharkhand. The emphasis was on comparing the state-level policies and analyzing the global trends in the hydrogen industry, taking into account the interests of policymakers, developers, suppliers, and vendors for local implementation. The deployment of solar technology, the need to increase electrolyzer capacity, possible scenarios to reduce the cost of electrolyzers, the uptake of hydrogen transportation, and the significance of developing a hydrogen export hub through manufacturing in the state were covered.

Objective

The objective of the session was to discuss the developments in the field of green hydrogen and how it can be utilized to decarbonize hard-to-abate industries such as steel, cement, and chemicals in Jharkhand. The panelists explored the possibilities of developing a hydrogen hub through manufacturing capabilities in the state and discussed the quantum requirement of hydrogen needed for the state's decarbonization. Additionally, the session aimed to identify opportunities for regional collaboration for the export of hydrogen and to provide insights on the progress made in the electrolyser industry.

The session was moderated by Mr. Ramapati Kumar, Chief Executive Officer, CEED who set the context of the session. Continuing the discussion, Mr. Jagabanta Ningthoujam (RMI India) highlighted on coupling hydrogen with the decarbonization of hard-to-abate sectors such as steel, ammonia, fertilizers, and refineries, Ms. Kajol (WRI) emphasized collaboration, Mr. Chandra Prakash Tiwari (Tata Power) stressed upon infrastructure and technology, Mr. Anand Kumar (Hygenco) focused on policy framework and supportive ecosystem, Dr. Mayilvelnathan (Hild Electric Private Limited) emphasized developing a hydrogen hub through manufacturing set up, and Mr. B. Sairam (Central Coalfields Limited) focused on linkage of hydrogen with the transport sector through heavy-duty fuel-cell vehicles, "solar highways", and "solar dhabas".

Key Highlights

India aims to produce green hydrogen at \$1 per kg by 2030; it currently costs \$4.5–5.5 per kg with \$33 electricity costs and \$1–1.7 per kg capex.

As a thumb rule, one tonne of green steel is required to produce one tonne of green hydrogen, and 50 to 55 kWh of renewable power is required to produce one kg of Hydrogen.

Jharkhand is a hub for large-scale hard-to-abate industries such as steel, cement, fertilizers and chemicals, and hydrogen can play a big role in decarbonising them.

Even though several measures can be taken up for increasing coal supply in the energy mix (such as installing more washeries to decrease ash content, improving production efficiency, improving geological exploration, repurposing coal mines, allocating more coking coal blocks, etc.), meeting the expectations of 2030 would be a challenging task for the state.

The abundance of solar energy and research potential to use appropriate electrolyser technology and reduce future electrolyser costs can bring hope to industrialists in Jharkhand.

Simultaneous accelerated green hydrogen production and fulfilment of round-the-clock renewable energy (RE) requirements in the state would require exploitation of the abundant solar potential and judicious use of bio-energy resources.

Dual modes of hydrogen production should be adopted – through localized RE consumption, as well as through Inter-State Transmission system (ISTS) waivers from nearby RE abundant states, however, production of hydrogen at the source of consumption shall be preferred.

Key Recommendations

- 1 Carbon capture technology should be effectively implemented in the coal industry to reduce CO₂ emissions.
- 2 The RE and electrolyser industries need to flourish together to boost employment generation and economic growth in the state.
- 3 Rerouting the steel industry through the green hydrogen path is essential to avoid future lock-ins of the industry, and reduce coal imports.
- 4 Jharkhand can think of making a hub-type project in collaboration with neighbouring coastal states (like Odisha and West Bengal) to export hydrogen (and may suitably cross-subsidize it) for the state's industry.
- 5 In order to achieve the dual objective of decarbonisation and ensuring energy security in the state, combined efforts from MSME, academia and industry, under the supervision of the state government are required.
- 6 The potential of using hydrogen as a fuel for the transportation sector must be explored. Some innovative ideas brought forth in this regard include heavy-duty fuel-cell vehicles, 'Hydrogen Highways' and 'Hydrogen Dhabas'.



Key Speakers

Mr. B. Sairam

Director, Central Coalfields Limited, CCL

"The solar industry is in a mature stage whereas the Green hydrogen industry is in its nascent stage, so these two industries should flourish together. The transport sector of the state is a good viable option, to begin with. The options available for Jharkhand are long-haul heavy-duty vehicles, hydrogen refueling stations (hydrogen highways), and small solar-electrolyser combined units (hydrogen dhabas)."



Ms. Kajol

Sr. Manager, Industrial Decarbonization, Energy, WRI

"Jharkhand is a hub of large-scale industries, especially steel, cement, and chemicals. Hydrogen can play a big role in decarbonizing the industry in Jharkhand. We need dedicated collaborations at the industry level, academia, and institutions for profit maximization".



Mr. Chandra Prakash Tiwari

Head-Technology & Process Engineering (G), Tata Power

"Jharkhand is a land-locked state, so we need to think of ways to transport hydrogen by developing infrastructure and technology for the electrolysis process and scaling it up at a rapid pace."



Mr. Anand Kumar

Head, Policy Affairs and Project Development, Hygenco

"We need to focus on developing a strong policy framework for the green hydrogen ecosystem in Jharkhand. We also need to create a supportive ecosystem for startups and MSMEs in the sector."



Mr. Jagabanta Ningthoujam

Principal, Rocky Mountain Institute (RMI), India

"Coupling hydrogen with larger scale decarbonisation is crucial for Jharkhand. We must focus on hard-to-abate sectors like steel, ammonia, fertilizers, and refineries."



Dr. Mayilvelnathan

Vice President, Hild Electric Private Limited

"For a state like Jharkhand with abundant solar energy potential, we need to develop a Hydrogen hub through manufacturing and focus on green hydrogen, green ammonia, and battery energy storage systems. Use of Alkaline electrolyzers can be a cost-effective solution for the state."



Mr. Ramapati Kumar

Chief Executive Officer, CEED

"The state government should provide support and handholding to small and medium enterprises to encourage their participation in the hydrogen ecosystem. Additionally, there should be measures in place to increase the demand for hydrogen, such as incentivising the use of hydrogen in transportation or supporting the establishment of hydrogen refueling infrastructure."





Initiatives by Industry on Hydrogen- Challenges and Opportunities

Overview

The demand for hydrogen in India could increase by more than four times by 2050, which would be almost 10% of the global hydrogen demand as per the NITI Aayog's studies. Initially, demand growth is anticipated in well-established markets such as refineries, ammonia, and methanol, which are already using hydrogen as an industrial feedstock and in chemical processes.



Based on the expanding need and the importance of the industry, the discussion focused on initiatives done by industries in India, particularly in Jharkhand, to explore the challenges and possibilities of developing a green hydrogen ecosystem.



Objective

The main aim of this session was to explore the areas of challenges and opportunities in developing the hydrogen ecosystem for Jharkhand. In this session, four eminent experts talked about and highlighted some of the pilot projects around Green Hydrogen. Further, the session also revolved around the best practices and possibilities for establishing a green hydrogen hub of the East, particularly in states like Jharkhand.

Dr. Manish Ram, Advisor- Energy Transition at CEED, moderated the discussion and set the tone by presenting a few recent industry initiatives for creating a green hydrogen ecosystem in India. Mr. P.C. Jha, Chief Manager, Environment, CMPDI; Mr. D.M.R. Panda, GM, (Hydrogen / RE); Mr. Rishi Gupta, Head Engineering – Energy, Sustainability & New Initiatives, Tata Steel; and Mr. Jaideep Malik, Business Development, Hydrogen, John Cockerill were the notable speakers at the discussion.



Key Highlights

Steel production contributes 0.07% to GDP but emits 78% of global CO₂ emissions.

A 5% vol./vol. blending of green hydrogen with PNG has been initiated in the piped natural gas (PNG) network of the NTPC Kawas township in Surat, and the degree of blending will be increased gradually until it reaches 20%. Green hydrogen reduces CO₂ emissions while maintaining the same net heating content when combined with natural gas. The project was undertaken in collaboration between Gujarat Gas Limited (GGL) and NTPC.

There are 340 square kilometres of abandoned mined-out land in the state that might be utilized to construct solar power facilities.

In terms of water consumption, considering an installed coal capacity of 300 GW, the amount of water required to run a 2 GW coal-based thermal power plant would be sufficient to produce 5 million metric tonnes of green hydrogen in India by 2030, as per MNRE. Hence the issue of water availability is not as critical in a water-stressed state like Jharkhand.

Tata Steel is conducting trials on hydrogen injection at its flagship facility in Jamshedpur in order to minimise metallurgical coke use and reduce carbon emissions. The trial, using 40% of Hydrogen in injection systems, may reduce coke consumption by about 10% and thus can reduce carbon emission considerably.

India currently lacks the infrastructure for compressing hydrogen beyond 200 bars, while the United States and Europe have the technology to compress hydrogen to 700 bars.

Out of the three electrolyzers considered for green hydrogen production in Jharkhand, Proton Exchange Membrane (PEM) electrolyzers are the recommended choice due to their ability to produce high-purity hydrogen at high pressures and better integration with renewable energy sources.

Alkaline electrolyzers are a mature and cheaper technology but have lower efficiency and flexibility. However, PEM electrolyzers are more expensive and less durable than alkaline electrolyzers, requiring further research and development. In general, Solid Oxide Electrolyzers (SOEs) require high temperatures and external heat sources.

The NTPC is conducting pilot projects to produce green methanol via CO₂ capture and green hydrogen in order to reduce reliance on imported petroleum products from Middle East countries and delay CO₂ emissions into the atmosphere.

NTPC Pilot Projects have claimed that blending hydrogen with PNG at a five percent rate is a viable option to reduce carbon emissions in household cooking, and this would only result in a marginal increase of Rs 5 to Rs 6 in the cost per cylinder. On average 6 cylinders per household are used annually at the National level, however, in Jharkhand this rate stands at around 3 cylinders per household p.a.

In trials conducted in Delhi (at an altitude close to Ranchi) and Leh (at an altitude of roughly 3500 feet), the use of hydrogen in transportation has shown promise in terms of stability, range, and reduced carbon emissions when compared to electric vehicles. Due to shipping delays, there are still issues with the availability of electrolyzers and compressors needed to produce hydrogen.



Key Recommendations

- 1 A comprehensive regulatory framework and standards for the transportation, storage, and use of hydrogen should be developed in Jharkhand to ensure safety and promote industry growth, while policies should be introduced by the state government to attract manufacturers and provide fixed incentives to off-takers for investment security.
- 2 Developing local green hydrogen production facilities in the state of Jharkhand is crucial given the challenges faced in sourcing hydrogen from other parts of India. This would be beneficial for Jharkhand to invest in local green hydrogen production facilities.
- 3 There is a need to start pilots in the state of Jharkhand by learning from the NTPC, which has begun green-hydrogen pilot projects. Some of these are focused on mixing green hydrogen with PNG in a pipeline and others on producing green methanol while interacting with green hydrogen to create methanol, which may be used as a fuel for green hydrogen buses.
- 4 Jharkhand should consider introducing green hydrogen buses in its public transportation system to reduce dependence on fossil fuels and promote clean mobility. This can be achieved by partnering with companies like NTPC and electrolyser manufacturers such as John Cockerill who can provide the necessary technology and expertise for setting up hydrogen fueling stations and manufacturing hydrogen buses. The adoption of green hydrogen buses can also help in reducing air pollution and improve the quality of life for citizens.
- 5 About 90% of the methanol used in India comes from imports from the Middle East, but because coal is necessary to meet our high energy demands, we can capture carbon dioxide and make green methanol using green hydrogen to postpone the release of CO₂ into the environment, it will reduce the dependencies on the imports of methanol from Middle east.
- 6 Considerations towards recovering any high-value components in e-waste for future usage and utilising them as important metallic components to develop the electrolyzers for Green Hydrogen Production may be required.

Key Speakers

Mr. P.C. Jha,

Chief Manager, Environment, CMPDI

"India is not particularly endowed in metallic elements, but given the volume of e-waste we produce as a nation, we can consider recovering any valuable metals for potential use in the future."



Mr. D.M.R. Panda

GM, (Hydrogen / RE), NTPC Limited

"The NTPC is launching green hydrogen pilot projects to reduce CO2 emissions and decrease household carbon emissions. The blending of hydrogen in the PNG pipeline can reduce CO2 emissions to an extensive extent."



Mr. Rishi Gupta

Head Engineering – Energy, Sustainability & New Initiatives
Tata Steel

"Green hydrogen can play a vital role in decarbonizing the steel industry, enabling us to meet our sustainability goals while maintaining competitiveness. Injecting Hydrogen in blast furnaces has the potential to reduce overall carbon consumption by up to 20%. We at Tata Steel are committed to exploring and investing in this promising technology."



Mr. Jaideep Malik

Business Development, Hydrogen, John Cockerill

"We are setting up a 2 GW plant, the largest in the world with lowest capex and operating cost, and maximum equipment lifetime – altogether it should bring down the cost of green hydrogen in India"



Dr. Manish Ram

Advisor- Energy Transition, CEED

"Once we are getting into the Green Energy transition narrative, we also have to think about circularity and how some of the critical materials can be recycled and be utilized. Jharkhand can take the lead in the process by bringing the best of minds, learnings and resources to accomplish this at the subnational level. "





Media Coverage

Govt is committed to ensure energy security in state: Avinash Kumar

MI News Service.

Ranchi: A stakeholder consultation titled 'Developing Green Hydrogen Ecosystem for Jharkhand' was jointly organised by the Task Force on Green Hydrogen Mission, Government of Jharkhand and Centre for Environment and Energy Development (CEED) in association with Central Coalfields Limited (CCL), National Thermal Power Corporation (NTPC) and Tata Steel on Tuesday.

The main objective of the consultation was to sensitise the key stakeholders about the challenges and prospects of green hydrogen and bring their solution-driven perspectives and support in Jharkhand. This consultation witnessed participation from top officials from the government department and agencies and leaders from major industries, public sector undertakings, business associations, research think tanks and techno-solutions providers from India and Jharkhand.

Addressing the conference, Avinash Kumar, IAS, Additional Chief Secretary, Department of Energy, Jharkhand said that, 'The state government is committed to ensure energy security in the state and accordingly cleaner sources of energy have been prioritised. As a form of clean energy, hydrogen has been categorised as the future.

Stakeholder Consultation Developing Green Hydrogen Ecosystem for Jharkhand



zero emissions and climate related goals in India and Jharkhand. As per the mandates of the National Green Hydrogen Mission and net-zero scenario, we are also exploring its huge potential in the state to bring its economic advantages and environmental co-benefits in the state.'

For achieving the net-zero scenario, the Government of India has launched a National Green Hydrogen Mission in 2022 and subsequently announced Green Hydrogen Policy. As a part of the mandates, the state government is committed to ensure energy security in the state and accordingly cleaner sources of energy have been prioritised. As a form of clean energy, hydrogen has been categorised as the future.

a roadmap for implementing the mission in Jharkhand. The task force is chaired by A.K. Rastogi (IFS Retd.), Chairman of Task Force on Green Hydrogen Mission said that 'Jharkhand is primarily an industrialised state with a strong presence of industries of iron-steel, transport vehicles, cement and others. Broadly these sectors are considered as hard to abate in terms of the decarbonisation process, where the role of low carbon energy and technologies is crucial. This requires a holistic approach in presenting technical know-how, infrastructure support and ecosystem change. As per the mandates set by Government of India, the task force has started conducting consultations and workshops with key stakeholders to prepare a repository of information in light of the best practices to create an action plan for tapping green hydrogen in the state.'

Lauding the state's effort for constituting a dedicated task force to harness green hydrogen, Rampraj Kumar, CEO of CEED said, 'Indeed this is a pathbreaking move and CEED feels immense participation from key government departments, agencies, prominent public sector units e.g. CCL, BCL, CMPDI, NTPC and Tata Steel on Tuesday.

Industries, Jharkhand who also addressed the gathering and emphasised the need to harness green hydrogen for a better future of the state.

Speaking on the occasion, A.K. Rastogi (IFS Retd.), Chairman of Task Force on Green Hydrogen Mission said that 'Jharkhand is primarily an industrialised state with a strong presence of industries of iron-steel, transport vehicles, cement and others. Broadly these sectors are considered as hard to abate in terms of the decarbonisation process, where the role of low carbon energy and technologies is crucial. This requires a holistic approach in presenting technical know-how, infrastructure support and ecosystem change. As per the mandates set by Government of India, the task force has started conducting consultations and workshops with key stakeholders to prepare a repository of information in light of the best practices to create an action plan for tapping green hydrogen in the state.'

tainable growth' and 'Initiatives by industry on hydrogen challenges and opportunities', which presented several key ideas and recommendations to create a green hydrogen ecosystem through production, storage, transportation through utilisation of cleaner sources of energy.

The workshop witnessed participation of top leaders of industries, public sector undertakings, business associations, sustainability think-tanks, MSME sectors and tech-no-solutions providers from India. The notable people include B. Sauran, Director, CCL, Mr. Rajiv Mangal, Vice President-Safety, Health and Sustainability, YATA Steel; Jagabaths, Nangthoum, Principal, Rocky Mountain Institute-India, DMH Panda, O&T, Mr. Jadhav Malik, Business Development, Hydrogen, Jipiel, Jharkhand, Manager, Industrial Decarbonization, Energy, WHR, Mr. P. C. Jha Chief Secretary, Department of Energy, Jharkhand, Mr. Anand Kumar, Head, Policy Affairs and Environment, Hydrogen, etc. and representatives from academia and research institutions. The conference also witnessed participation from key government departments, agencies, prominent public sector units e.g. CCL, BCL, CMPDI, NTPC and Tata Steel on Tuesday.

ग्रीन हाइड्रोजन के इस्तेमाल को लेकर राइडमैप बनायेगी झारखंड सरकार

विशेष संवाददाता, रांची

झारखंड ग्रीन हाइड्रोजन के इस्तेमाल के लिए एक रोडमैप बनायेगी. भारत सरकार ने नेट-जीरो उत्सर्जन टारगेट को प्राप्त करने के लिए वर्ष 2022 में राष्ट्रीय ग्रीन हाइड्रोजन मिशन शुरू किया है और ग्रीन हाइड्रोजन नीति की घोषणा की है. झारखंड सरकार ने ग्रीन हाइड्रोजन एनर्जी के वर्तमान टारगेट एवं संभावनाओं की पड़ताल करने और राज्य में संभावना का आकलन करने के लिए मार्च 2023 में एक टास्क फोर्स-ग्रीन हाइड्रोजन मिशन का गठन किया है, जो एक रोडमैप बनायेगी. सेवानिवृत्त आइएफएस एक रस्तीगी की अध्यक्षता में गठित इस टास्क फोर्स के मनोनीत सदस्यों में ऊर्जा और पर्यावरण विभागों के वरिष्ठ अधिकारियों समेत एनटीपीसी के क्षेत्रीय कार्यकारी निदेशक पाथ

डेलीपिंग ग्रीन हाइड्रोजन इकोसिस्टम फॉर झारखंड पर चर्चा



दीप जलकर उद्घाटन करते ऊर्जा विभाग के अपर मुख्य सचिव अविनाश कुमार पांडेय

टाटा स्टील के अजीत धनराज कोठारी शामिल हैं. टास्क फोर्स की तकनीकी सहायता के लिए सीड की टेक्निकल पार्टनर के रूप में नियुक्त किया गया है. मंगलवार को टास्क फोर्स-ग्रीन हाइड्रोजन मिशन और सेंटर फॉर एनवायरनमेंट एंड एनर्जी डेवलपमेंट (सीड) द्वारा पलाश सभागार में एक स्टेकहोल्डर्स कंसल्टेशन डेवलपिंग ग्रीन हाइड्रोजन इकोसिस्टम फॉर

झारखंड सरकार राज्य में ऊर्जा सुरक्षा सुनिश्चित करने के लिए प्रतिबद्ध है और इसके लिए ऊर्जा के स्वच्छ स्रोतों को प्राथमिकता दी गयी है. खान सचिव अरु बकर सिन्हा, उद्योग सचिव जीनंद कुमार सिंह व सीड के सीओ रमपति कुमार ने भी विचार रखे. कार्यशाला में देश व दुनिया के प्रमुख औद्योगिक

सचिव अविनाश कुमार ने कहा कि झारखंड सरकार राज्य में ऊर्जा सुरक्षा सुनिश्चित करने के लिए प्रतिबद्ध है और इसके लिए ऊर्जा के स्वच्छ स्रोतों को प्राथमिकता दी गयी है. खान सचिव अरु बकर सिन्हा, उद्योग सचिव जीनंद कुमार सिंह व सीड के सीओ रमपति कुमार ने भी विचार रखे. कार्यशाला में देश व दुनिया के प्रमुख औद्योगिक

Jharkhand task force on green hydrogen

ANIMESH BISOIE

Jamshedpur: Jharkhand aims to harness green hydrogen to strengthen energy security and it has constituted a task force to boost the 'Green Hydrogen Mission'.

This was stated by Jharkhand's additional chief secretary of Energy department, Avinash Kumar, during a stakeholders' meeting on 'Developing Green Hydrogen Ecosystem for Jharkhand', organised by the task force on Green Hydrogen Mission, Jharkhand government and Centre for Environment and Energy Development (CEED).

'The state government is committed to ensure energy security in the state and accordingly cleaner sources of energy have been prioritised. As a form of clean energy, hydrogen has been categorised as the future. Green hydrogen is considered the next big thing to fulfil the net-zero ambitions and climate-related goals in India and Jharkhand. According to the mandates of the National Green Hydrogen Mission and net-zero scenario, we are also



Stakeholders at a consultation 'Developing Green Hydrogen Ecosystem for Jharkhand' in Ranchi on Tuesday. Photo by Manish Choudhary

exploring its huge potential in the state to bring its economic advantages and environmental co-benefits in the state,' said Avinash Kumar.

'For achieving the net-zero scenario, the government of India has launched a National Green Hydrogen Mission in 2022 and subsequently announced Green Hydrogen Policy. As a part of the mandates, the government of Jharkhand has formed a task force on Green Hydrogen Mission in March 2023 to assess the current scenario of hydrogen energy, best practices from around the globe, its applica-

March 2023 to assess the current scenario of hydrogen energy, best practices from around the globe, its applicability and suitability for the state and accordingly create a roadmap for implementing the mission in Jharkhand,' added Kumar.

The task force is chaired by retired Indian forest service official A.K. Rastogi and its nominated members include senior officials from energy and forest departments along

with NTPC regional executive director Partha Majumdar, Central Coalfields Limited's project and planning director B. Sauran and Tata Steel sustainability and decarbonisation project chief Aji Dhruva Kumar.

Rastogi said 'Jharkhand is primarily an industrialised state with a strong presence of industries of iron-steel, transport vehicles, cement and others. Broadly these sectors are considered as hard to

abate in terms of the decarbonisation process, where the role of low-carbon energy and technologies is crucial. This requires a holistic approach to presenting technical know-how, infrastructure support and ecosystem change. According to the mandates set by the state government, the task force has started conducting consultations and workshops with key stakeholders to prepare a repository of information in light of the best practices to create an action plan for tapping green hydrogen in the state.'

'As a form of cleaner energy, hydrogen has been categorised as grey, black, blue and green based on its sources. At present, the majority of hydrogen consumed in India comes from fossil fuels. According to the mandates set by the state government, the task force has started conducting consultations and workshops with key stakeholders to prepare a repository of information in light of the best practices to create an action plan for tapping green hydrogen in the state.'

STATE ASPIRES TO CREATE HYDROGEN ECOSYSTEM TO BOOST ENERGY SECURITY

Strap: A consultation deliberated on path-breaking ideas and solutions to harness green hydrogen



Additional Chief Secretary, Department of Energy Avinash Kumar addresses a programme of Stakeholder Consultation 'Developing Green Hydrogen Ecosystem for Jharkhand' at Palash Hall, Doranda in Ranchi on Tuesday. Photo by Vinay Murmu

Department of Energy, Jharkhand said that, 'The state government is committed to ensure energy security in the state and accordingly cleaner sources of energy have been prioritised. As a form of clean energy, hydrogen has been categorised as the future. Green hydrogen is considered the next big thing to fulfil the net-zero ambitions and climate

related goals in India and Jharkhand. As per the mandates of the National Green Hydrogen Mission and net-zero scenario, we are also exploring its huge potential in the state to bring its economic advantages and environmental co-benefits in the state.'

For achieving the net-zero scenario, the Government of India has launched a National Green Hydrogen Mission in 2022 and subsequently announced Green Hydrogen Policy. The Jharkhand government has formed a Task Force on Green Hydrogen Mission in March 2023 to assess the current scenario of hydrogen energy, best practices from around the globe, its applicability and suitability for the state and

accordingly create a roadmap for implementing the mission in Jharkhand. The task force is chaired by A.K. Rastogi (IFS Retd.) and its nominated members include senior officials from Energy and Forest departments along with Partha Majumdar (Regional Executive Director, NTPC) and B. Sauran (Director, Project and Planning, CCL) and Aji Dhruva Kumar (Chief Sustainability and Decarbonisation project, Tata Steel). CEED has been roped in as a technical partner to provide handholding support to the task force.

Speaking on the occasion, Mr. A.K. Rastogi (IFS Retd.), Chairman of Task Force on Green Hydrogen Mission said that 'Jharkhand is primarily an industrialised state with a strong presence of industries of iron-steel, transport vehicles, cement and others. Broadly these sectors are considered as hard to abate in terms of the decarbonisation process, where the role of low carbon energy and technologies is crucial.'

CEED said, 'Indeed this is a pathbreaking move and CEED feels immense pride in working as its technical partner. Blessed with abundant natural resources and human capital, Jharkhand has a significant advantage in the production of hydrogen energy. However, an assessment of renewable energy sources in the state is prerequisite for tapping out the prospects of green hydrogen.'

The notable people include B. Sauran, Director, CCL, Rajiv Mangal, Vice President-Safety, Health and Sustainability, YATA Steel; Jagabaths, Nangthoum, Principal, Rocky Mountain Institute-India, DMH Panda, O&T, Mr. Jadhav Malik, Business Development, Hydrogen, Jipiel, Jharkhand, Manager, Industrial Decarbonization, Energy, WHR, Mr. P. C. Jha Chief Secretary, Department of Energy, Jharkhand, Mr. Anand Kumar, Head, Policy Affairs and Environment, Hydrogen, etc. and representatives from academia and research institutions.

‘झारखंड में ऊर्जा सुरक्षा के लिए ग्रीन हाइड्रोजन इको सिस्टम की भूमिका अहम’

स्टेक होल्डर्स कंसल्टेशन में ग्रीन हाइड्रोजन की संभावना एवं उपयोग के सततशील समाधानों पर दिया गया जोर

संवाददाता

रांची : टास्क फोर्स-ग्रीन हाइड्रोजन मिशन, झारखंड सरकार और सेंटर फॉर एनवायरनमेंट एंड एनर्जी डेवलपमेंट (सीड) के द्वारा सेंट्रल कोल फील्ड्स लिमिटेड (सीसीएल), नेशनल थर्मल पावर

विचार-विमर्श करना और इस दिशा में सभी स्टेक होल्डर्स का समर्थन हासिल करना था। कांफ्रेंस में झारखंड के प्रमुख सरकारी विभागों (ऊर्जा, उद्योग, खनन एवं भूतत्व आदि) के सचिव एवं उच्चअधिकारियों और प्रमुख उद्योगों, सार्वजनिक उपक्रमों, रिसर्चिथिंक-टैंक और ग्रीन हाइड्रोजन के तकनीकी-समाधानों से जुड़ी संस्थाओं के प्रतिनिधियों ने भाग लिया। कांफ्रेंस को संबोधित करते

उज्ज्वल है। ग्रीन हाइड्रोजन को भारत में नेट जीरो टारगेट और जलवायु समाधान संबंधी लक्ष्यों को पूरा करने के लिए निर्णायक माना जा रहा है। नेशनल ग्रीन हाइड्रोजन मिशन और नेट-जीरो परिदृश्य के अनुरूप राज्य सरकार इसकी अपार क्षमता का अन्वेषण करने और रोड मैप बनाने के लिए प्रयत्नशील है ताकि इसके आर्थिक और पर्यावरणीय लाभ झारखंड को मिल सके और सततशील विकास को प्राप्त

कर सकें। ग्रीन हाइड्रोजन को भारत में नेट जीरो टारगेट और जलवायु समाधान संबंधी लक्ष्यों को पूरा करने के लिए निर्णायक माना जा रहा है। नेशनल ग्रीन हाइड्रोजन मिशन और नेट-जीरो परिदृश्य के अनुरूप राज्य सरकार इसकी अपार क्षमता का अन्वेषण करने और रोड मैप बनाने के लिए प्रयत्नशील है ताकि इसके आर्थिक और पर्यावरणीय लाभ झारखंड को मिल सके और सततशील विकास को प्राप्त

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झारखंड में ऊर्जा सुरक्षा के लिए ग्रीन हाइड्रोजन इको सिस्टम की भूमिका अहम : अविनाश कुमार

स्टेकहोल्डर्स कंसल्टेशन में ग्रीन हाइड्रोजन की संभावना एवं उपयोग के सततशील समाधानों पर दिया गया जोर

खबर मन्त्र व्यूरे

रांची। टास्क फोर्स-ग्रीन हाइड्रोजन मिशन, झारखंड सरकार और सीड के द्वारा सीसीएल, एनटीपीसी और टाटा स्टील के सहयोग से मंगलवार को एक स्टेक होल्डर्स कंसल्टेशन 'डेलीपिंग ग्रीन हाइड्रोजन इको सिस्टम फॉर झारखंड' का आयोजन किया गया। कांफ्रेंस का मुख्य उद्देश्य ग्रीन हाइड्रोजन से जुड़ी संभावनाओं एवं चुनौतियों पर विचार-विमर्श करना और इस दिशा में सभी स्टेक होल्डर्स का समर्थन हासिल करना था। कांफ्रेंस में झारखंड के प्रमुख सरकारी विभागों (ऊर्जा, उद्योग, खनन एवं भूतत्व आदि) के सचिव एवं उच्च अधिकारियों और प्रमुख उद्योगों, सार्वजनिक उपक्रमों, रिसर्चिथिंक-टैंक और ग्रीन हाइड्रोजन के



तकनीकी-समाधानों से जुड़ी संस्थाओं के प्रतिनिधियों ने भाग लिया।

2022 में राष्ट्रीय ग्रीन हाइड्रोजन मिशन शुरू किया है और ग्रीन हाइड्रोजन नीति की घोषणा की है।

राज्य सरकार ऊर्जा सुरक्षा के लिए प्रतिबद्ध

जायें, रांची : टास्क फोर्स-ग्रीन हाइड्रोजन मिशन, झारखंड सरकार और सेंटर फॉर एनवायरनमेंट एंड एनर्जी डेवलपमेंट (सीड) के द्वारा मंगलवार को स्टेक होल्डर्स कंसल्टेशन डेवलपिंग ग्रीन हाइड्रोजन इकोसिस्टम फॉर झारखंड का आयोजन किया गया। कार्यशाला का उद्देश्य ग्रीन हाइड्रोजन की संभावनाओं एवं चुनौतियों पर विचार-विमर्श और इस दिशा में स्टेक होल्डर्स का समर्थन हासिल करना है। संबोधित करते हुए उर्जा विभाग के एडिशनल चीफ सेक्रेटरी अविनाश कुमार ने कहा कि झारखंड सरकार राज्य में ऊर्जा सुरक्षा सुनिश्चित करने के लिए प्रतिबद्ध है। स्वच्छ ऊर्जा के रूप में हाइड्रोजन का भविष्य उज्ज्वल है। मार्च में एक टास्क फोर्स-ग्रीन हाइड्रोजन मिशन का गठन किया है, जो एक रोडमैप



कार्यशाला में संबोधित करते सचिव, खनन एवं भूतत्व विभाग अरुबकर सिन्हा की अध्यक्षता में। सेवानिवृत्त आइएफएस एक रस्तीगी ने कहा कि झारखंड मुख्य रूप से लौह-इस्पात, परिवहन वाहनों, सीमेंट, केमिकल और अन्य उद्योगों को मजबूत उपरिष्ठित वाला एक औद्योगिक राज्य है। मोटे तौर पर इन क्षेत्रों को डीकार्बोनाइजेशन प्रक्रिया के लिए कठिन (हार्डटू) माना जाता है, जहां न्यूनतम कार्बन उत्सर्जन के लिए स्वच्छ

ऊर्जा एवं तकनीकी की भूमिका अहम है। नीति आयोग और अन्य संस्थानों के अनुमानों के अनुसार, भारत में 2050 तक लगभग 23 मिलियन टन हाइड्रोजन की मांग होगी, जबकि विभाग के सचिव अरुबकर सिन्हा ने कहा कि भविष्य में सभी आर्थिक-औद्योगिक गतिविधियों के लिए ग्रीन हाइड्रोजन एनर्जी जरूरी है।

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‘ऊर्जा सुरक्षा सुनिश्चित करने को सरकार प्रतिबद्ध’

स्टेक होल्डर्स कांफ्रेंस

रांची, संवाददाता। टास्क फोर्स-ग्रीन हाइड्रोजन मिशन झारखंड सरकार और सीड की ओर से मंगलवार को स्टेक होल्डर्स कांफ्रेंस हुआ। सीड ने सीसीएल, एनटीपीसी और टाटा स्टील के सहयोग से डेवलपिंग ग्रीन हाइड्रोजन इकोसिस्टम फॉर झारखंड की थीम पर इसका आयोजन किया। कांफ्रेंस का मुख्य उद्देश्य ग्रीन हाइड्रोजन से जुड़ी संभावनाओं एवं चुनौतियों पर विचार-विमर्श करना था। साथ ही इस दिशा में सभी स्टेक होल्डर्स का समर्थन हासिल करना था। ऊर्जा विभाग के एसीएस अविनाश कुमार ने कहा कि झारखंड सरकार राज्य में ऊर्जा सुरक्षा सुनिश्चित करने के लिए प्रतिबद्ध है और झारखंड के प्रमुख औद्योगिक

ऊर्जा सुरक्षा सुनिश्चित करने के लिए प्रतिबद्ध है और झारखंड के प्रमुख औद्योगिक

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Speakers' profile



Mr. Avinash Kumar, IAS

Additional Chief Secretary, Department of Energy
Government of Jharkhand

Mr. Avinash Kumar, an esteemed officer of the Indian Administrative Service (IAS) from the 1993 batch, currently serves as the Additional Chief Secretary at the Department of Energy in the Government of Jharkhand. He also holds the positions of Chairman-cum-Managing Director of Jharkhand Urja Vikas Nigam Limited (JUVNL) and Managing Director of Jharkhand Bijli Vitran Nigam Limited (JBVNL). Mr. Kumar's contributions to Jharkhand have been exemplary throughout his various responsibilities in the state. As a prolific administrator, he is widely recognized for his efforts towards the progress of Jharkhand in the areas of energy and environment. With his profound understanding of the challenges and opportunities in the energy sector, Mr. Kumar has been a driving force behind sustainable development in the state.



Mr. A. K. Rastogi, IFS (Retd)

Chairman, Task Force, Sustainable Just Transition & Green Hydrogen Mission
Government of Jharkhand

Mr. A. K. Rastogi, an esteemed officer of the Indian Forest Service (IFS), has been a driving force in the field of sustainable development and environmental conservation in Jharkhand. He currently serves as the Chairman of the Task Force for Sustainable Just Transition and also heads the sub-task force on Green Hydrogen Mission.. With a rich background in various policy issues, Mr. Rastogi has held key positions in the government, including Principal Chief Conservator of Forests (PCCF), Head of Forest Force (HoFF) and Chairman of the Jharkhand State Pollution Control Board (JSPCB). As the Chairman of the Task Force, Mr. Rastogi plays a pivotal role in shaping policies and strategies for promoting sustainable development practices in the state. His visionary leadership and extensive knowledge in environmental and climate issues make him a key proponent of responsible and inclusive development in Jharkhand.



Mr. Jitendra Kumar Singh, IAS

Secretary, Department of Industries
Government of Jharkhand

Mr. Jitendra Kumar Singh is an IAS Officer, currently serving as the Secretary at the Department of Industries, Government of Jharkhand. With a wealth of experience in driving economic growth and industrial development, Mr. Singh has played a pivotal role in shaping the future of sustainable industrial development in the state. His profound insights on the role of hydrogen in fostering sustainable industrial growth have made him a visionary leader and a key proponent of clean and sustainable development in Jharkhand. With an unwavering commitment to energy and environmental issues, Mr. Singh's leadership is driving positive change in the industrial landscape of the state.



Mr. Aboobacker Siddique P., IAS

Secretary, Department of Mines & Geology
Government of Jharkhand

Mr. Aboobacker Siddique P. is an Indian Administrative Service (IAS) officer of the 2003 batch, currently serving as the Secretary at the Department of Mines & Geology in the Government of Jharkhand. With extensive experience in public administration, he has played a pivotal role in shaping the state's sustainable development agenda. His expertise in facilitating dialogues among stakeholders and promoting greener economic growth has been instrumental in driving positive changes in Jharkhand. Mr. Aboobacker Siddique's commitment to sustainable development is evident in his tireless efforts in preparing the roadmap for a brighter and more responsible future for the state of Jharkhand.



Mr. Ramapati Kumar

Chief Executive Officer
Centre for Environment and Energy Development (CEED)

Mr. Ramapati Kumar is a seasoned professional with over 25 years of cross-cultural experience in policy development and sustainable development. He currently serves as the Chief Executive Officer (CEO) of Centre for Environment and Energy Development (CEED). Mr. Kumar has made significant contributions to various areas, including environment management, sustainability, climate change, renewable energy, waste management, education, and livelihood. He has actively participated in national and international conferences, advocating for climate change mitigation and energy issues. Mr. Kumar is highly regarded for his expertise in public policy making and serves on multiple committees related to sustainability and climate change.



Mr. Rajiv Mangal

Vice President, Safety, Health & Sustainability
TATA Steel

Mr. Rajiv Mangal is a seasoned professional with extensive experience in sustainability, safety, health, and corporate social responsibility (CSR). He currently serves as the Vice President – Safety, Health, and Sustainability at TATA Steel, where he has been a driving force behind sustainable practices. With diverse industry experience and expertise in sustainability, Mr. Mangal has been a valuable contributor to discussions and initiatives related to clean energy, green hydrogen, and sustainability. His influential role in shaping sustainable practices in the corporate sector has earned him recognition and respect in the industry.



Mr. B. Sairam

Director
Central Coalfields Limited (CCL)

Mr. B. Sairam is the Director Technical – P&P at Central Coalfields Ltd. He has over 30 years of experience in the coal sector and has worked in various roles related to mine operations, planning, logistics, and regulatory practice. He holds a graduate degree in mining engineering from NIT Raipur and has completed a PGDM in Energy Management from NTPC School of Business Delhi. He has also studied the Just Energy Transition efforts of Germany and Poland. Prior to joining CCL, he served as Executive Director at CIL.

**Mr. Chandra Prakash Tiwari**

Head-Technology & Process Engineering (G)
Tata Power

Mr. Chandra Prakash Tiwari, Head-Technology & Process Engineering (G) at Tata Power, is a seasoned mechanical engineer with over 25 years of experience. Passionate about Green Hydrogen, Energy Storage, and Energy Transition. With Expertise in evaluating next-gen technologies, developing sustainable business models, and driving emission abatement projects, he is a valuable asset in promoting green technologies for the country and the state.

**Mr. P.C. Jha**

Chief Manager, Environment
CMPDI

Mr. P.C. Jha is a seasoned environmental expert with extensive experience in air quality modelling, environmental monitoring, and clean energy promotion. As Chief Manager of Environment at CMPDI, his contributions are pivotal in enabling the development of the green hydrogen ecosystem in Jharkhand and leveraging its opportunities.

**Mr. D.M.R. Panda**

GM, (Hydrogen/ RE)
NTPC Limited

Mr. D.M.R. Panda is an experienced General Manager at NTPC Limited, with a strong background in the clean energy sector. With expertise in power plant operations, training, learning, and renewable energy/hydrogen, he will play a pivotal role in promoting clean energy and driving the green hydrogen ecosystem in Jharkhand.

**Ms. Kajol**

Sr. Manager, Decarbonisation, Energy
WRI India

Ms. Kajol is a Senior Manager in the Energy program at WRI India, where she leads the industrial decarbonisation work. Her main objective is to enhance energy efficiency and promote clean energy adoption in industries, contributing to the successful progress of energy transition in India. She focuses on integrating energy efficiency and clean energy initiatives in MSMEs, and supply chains, and tracking new low-carbon and energy technologies. Before joining WRI India, Kajol served as an Assistant Director at the National Productivity Council under the Ministry of Commerce and Industry. She holds a master's degree in technology from the Indian Institute of Technology, Delhi.

**Dr. Manish Ram**

Advisor- Energy Transition
CEED

Dr. Manish Ram is a renowned expert in renewable energy and sustainable development, with over a decade of experience. He holds a Ph.D. in Solar Economy and an MBA in Energy Management. He has conducted research, policy analysis, and advocacy for renewable energy, led innovative projects in India, and provided scientific consultancy on the energy transition. As an Advisor on Energy Transition, Dr. Ram is committed to driving positive change towards a clean and sustainable energy future, particularly in the global south.

**Mr. Rishi Gupta**

Head Engineering – Energy, Sustainability & New Initiatives
Tata Steel

Mr. Rishi Gupta, Head Engineering – Energy, Sustainability & New Initiatives, Tata Steel, is a clean energy expert with a focus on decarbonization, renewable energy, and green hydrogen, driving Tata Steel's commitment to sustainable solutions.

**Mr. Jaideep Malik**

Business Development, Hydrogen
John Cockerill

Mr. Jaideep Malik, Business Development, Hydrogen, John Cockerill, is an expert in green hydrogen, renewable energy, and project management with 17+ years of experience. He is instrumental in promoting a sustainable clean energy ecosystem through his expertise and experience.

**Dr. Mayilvelnathan**

Vice President
Hild Electric Private Limited

Dr. Mayilvelnathan is the Vice President of Hild Electric Private Limited is an Inventor and Innovation Coach in the Green Hydrogen industry with 20+ years of experience, driving the development of a new energy system.

**Mr. Anand Kumar**

Head, Policy Affairs and Project Development
Hygenco

Mr. Anand Kumar, Head at Hygenco- The Hydrogen Company, brings over a decade of experience in the Power Sector. With an MBA in Power Management, he is positioned to drive solutions for scaled-up Green Hydrogen and Green Ammonia industries.



H_2

GREEN

Agenda

RENEWABLE

ENERGY

Stakeholder Consultation

Developing Green Hydrogen Ecosystem for JHARKHAND

Palash Community Hall, Opposite MECON Office, Doranda, Ranchi – 834002

Agenda	
10:00 AM – 10:30 AM	Delegate Registration
Inaugural Session	
10:30 AM – 11:45 AM	<p>Welcome Note & Opening Remarks Sh. Ramapati Kumar Chief Executive Officer, Centre for Environment and Energy Development (CEED)</p> <p>Setting the Context: Sh. A.K. Rastogi, IFS (Retd.) Chairman, Sustainable Just Transition & Green Hydrogen Mission, Govt. of Jharkhand</p> <p>Special Address Sh. Rajiv Mangal Vice President- Safety, Health and Sustainability, TATA Steel</p> <p>Special Address Sh. Jitendra Kumar Singh, IAS Secretary, Department of Industries Govt. of Jharkhand</p> <p>Special Address Sh. Aboobacker Siddique P, IAS Secretary, Department of Mines & Geology Govt. of Jharkhand</p> <p>Key Note Address by Chief Guest Sh. Avinash Kumar, IAS Additional Chief Secretary Department of Energy Govt. of Jharkhand</p>
11:45 AM – 12:15 PM	Tea Break

12:15PM – 01:30 PM	<p>Development of Hydrogen Ecosystem to enable sustainable growth in Jharkhand</p> <p>Ms. Kajol, Sr. Manager, Industrial Decarbonization, Energy, WRI</p> <p>Sh. Chandra Prakash Tiwari, Head-Technology & Process Engineering (G), Tata Power</p> <p>Sh. Anand Kumar, Head, Policy Affairs and Project Development, Hygenco</p> <p>Sh. Jagabanta Ningthoujam, Principal, RMI India</p> <p>Dr. Mayilvelnathan, Vice President, Hild Electric Private Limited</p> <p>Moderator Sh. Ramapati Kumar Chief Executive Officer, CEED</p>
01:30 PM 02:30 -PM	Lunch Break
02:30 PM – 03:45 PM	<p>Initiatives by Industry on Hydrogen- Challenges and Opportunities</p> <p>Sh. B. Sairam, Director, Central Coalfields Limited, CCL</p> <p>Sh. P.C. Jha, Chief Manager, Environment, CMPDI</p> <p>Sh. D.M.R. Panda, GM, (Hydrogen / RE), NTPC Limited</p> <p>Sh. Rishi Gupta, Head Engineering – Energy, Sustainability & New Initiatives, Tata Steel</p> <p>Sh. Jaideep Malik, Business Development, Hydrogen, John Cockerill</p> <p>Moderator Dr. Manish Ram Director-Energy Transition, CEED</p>
03:45 PM – 04:15 PM	<p>Closing Remarks and Vote of Thanks</p> <p>Sh. A.K. Rastogi, IFS (Retd.) Chairman, Sustainable Just Transition & Green Hydrogen Mission, Govt. of Jharkhand</p> <p>Sh. Ramapati Kumar Chief Executive Officer, Centre for Environment and Energy Development (CEED)</p>

For further details, please contact:
E-mail : sjtjharkhand.office@gmail.com / info@ceedindia.org