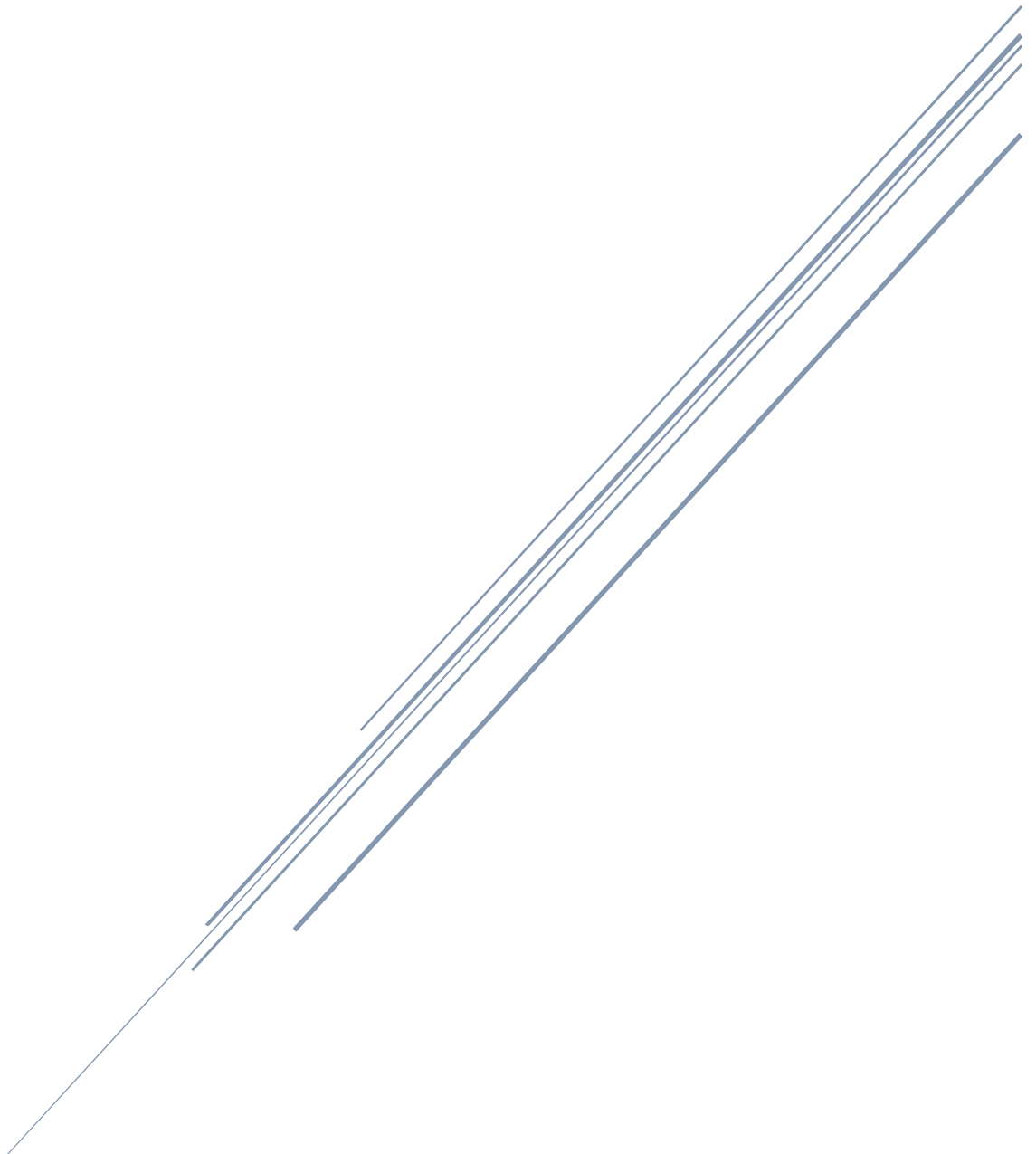


TERI-KAS National workshop on,
***“India’s energy scenario- 2040 and
beyond”***

Key Takeaways & Workshop Summary



TERI-KAS

National workshop on, “India’s energy scenario- 2040 and beyond”

6th September -8th September 2021

Leh, Ladakh

Key Takeaways

- There is a need to create an atmosphere to discuss energy security not just from a supply perspective but also embrace the new definitions and different conceptual approaches that are changing the way energy security is viewed and practiced.
- The role of Oil and gas needs to be reduced in the energy mix. However, critical and pointed strategies to enhance renewable energy manufacturing would be crucial to enable this transition.
- As the new ground for incubation of carbon-neutral strategies, the progress, challenges and the potential areas of energy development in Ladakh were discussed extensively. The need to accelerate these new low carbon strategies was considered vital as the region faces climate challenges that are changing its environment.
- The role of Alternative fuels such as biofuels has immense potential to change India’s energy choices, especially in the transportation sector. The alternative fuel sector could reduce the dependence on fossil fuels, if the policy environment becomes more conducive for its development.
- The development of other renewable sources such as wave energy and the solar module manufacturing sector were discussed as key areas for new development and innovation. Fostering different technologies and energy sources would help in expanding India’s energy choices.
- The need to enhance cross-border energy trade from a bilateral to a multilateral relation was also considered significant to harness and distribute clean energy sources in the future and to ensure continued supply of energy at a lower cost.
- The role of Multilateral and bilateral relations and multilateral institutions to foster renewable energy was considered crucial to enable faster adoption of clean energy options, technology transfers and to access financing.
- The need to foster a culture of innovation and to enable behaviour changes in consumers and end-users was considered essential to take further clean energy practices. The role of women was considered crucial to make informed energy choices.

- The need to engage with energy-reliant sectors such as Steel was considered crucial to achieve clean energy goals and to increase energy efficiency. The role of resource efficiency was considered vital to reduce waste and create a circular economy that reduces dependence on fossil fuel-based energy
- The need to understand and implement just transition and energy justice issues was considered significant in India's energy discourse. As ensuring livelihoods and quality of life for fossil fuel reliant communities is crucial, the focus was to develop strategies that enable smooth transitions and reduce the burden for developing economies.

Conference Glimpses



Day 1

The TERI-KAS National workshop held in Leh focused on the interlinkages and the impact of climate change on energy security. The concept of energy security is evolving and rapidly changing. From a time when the notion and definition of energy security were focused on conventional fuels, the central point of the discourse has shifted to creating access to sustainable and clean energy sources at affordable prices and contributing to climate mitigation goals. Geopolitics, governance, institutions, communities, practitioners, academicians, producers and consumers have to redirect their approach to energy security due to climate change.

Inaugural Session

During the inaugural session, the eminent speakers highlighted that the three key dimensions of energy future sustainability are energy security, renewable energy and socio-economic mechanisms. The climate change discourse has several linkages and 360-degree perspective is required with a focus on joint collective actions both at the national and international level. The recent G7 summit is an example of countries that previously didn't work collectively to solve the sustainability issues and are now coming together to tackle these critical global issues. Augmenting and improving our technological models and financing options are the need of the hour post-2040. The 2040 governance scenario will be based on cooperative frameworks and partnerships.

Each individual has a responsibility to adhere to sustainability measures and imbibe them in their day-to-day life. 1% increase in global temperature will negatively impact everything from floods to food security. The imminent crisis of climate change poses a radical threat to the world and the only way to avert it is through multilateral initiatives. Research and innovation, technological transfers and financing are essential to address climate change. The worldwide exchange of modern technologies is the imperative bridge that needs to be bypassed in order to identify a toolkit for a safe and green future.

Though countries are making efforts to tackle climate change, it was noted that the serious concern is the fact that the global peak of emission reduction hadn't occurred yet. With scientific estimates highlighting the need to take urgent actions and massive reductions in emissions, the road to achieving carbon neutrality is a tough road ahead. The pandemic has showcased to us the level of crises and disruption that the world can undergo, given its large-scale level of interconnectivity. The use of traditional and fossil fuels for energy hasn't reduced at a pace that is required with 1.8 billion people still relying on un-environmental forms of cooking practices. Multilateral relations need to be strengthened to take forward the clean energy and climate agenda and India-EU relations are significant in this direction.

New and reformed multilateral practices need to be forged between India and Europe. The global renewable energy targets are reliant on raw materials and this cannot be achieved without mineral extraction, thus there is an increased need to focus on global supply security measures. Raw materials and their extraction will be pivotal for energy transition in the coming years. Hence, we need to stress on the importance of supply security as well from a renewable and clean energy perspective.

Energy efficiency is essential to achieve energy security, as energy efficiency practices can help us reduce our emissions by 35%. The potential for India's power sector and distribution companies to become profitable if they gradually moved towards electrified cooking stoves is high. Energy appliances have the capability to spur an entirely new energy efficiency and distributed response. Moving forward the industrial efficiency segment will witness a silent revolution, as we begin to solve affordability and access issues.

Ladakh over the years has become a tourist spot, the possibilities of improving its energy demand is enormous. 90% of energy demand in Ladakh is used for heating and cooking purposes. Given that

buildings are one of the biggest carbon emitters, we need to look at design strategies to help reduce that aspect. Since Ladakh is a very unique region, all our innovation and research must be focused towards localized technological innovation which is suitable for the region. Ladakh is a significant example for establishing and developing carbon-neutral strategies. Much of these strategies begin from the transitions and transformations in the energy sector. Harnessing solar energy has been a focal point for the Union Territory (UT) of Ladakh with the government planning to turn the Union territory into a Carbon Neutral one. The UT has around 25GW of solar potential and many solar plants are already planned in the area. The 25000 acres near the Leh-Manali express will be home to a 5GW solar energy plant, 5GW plant in Neoma Axis and 2.5 GW plant in the Zaskar valley are some of the future projects that are envisaged in the UT. As a territory with livelihoods largely dependent on land grazing, the establishment of large-scale plants has to be undertaken while protecting these lands and the livelihoods. Harnessing energy from hot water springs is also being pursued by the administration.

Session 1 - Energy Security for a cleaner future

The first session focused on Energy security for a cleaner future and focused on the need to fulfil climate commitments and their impact on India's energy choices for the future. The session also focused on the major challenges faced in this perspective and how industries and energy reliant sectors can focus on transformations that boost clean energy developments.

The concept of energy security has evolved from supply risk to a multi-criteria approach that includes geopolitics, trade, technology, finance, gender and critical thinking on just transition, cross-border energy trade etc. Energy security has been a top-down approach from the perspective of supply technology, policy, and consumer behaviour as well, yet today the discussion is multi-layered with varied linkages. Energy security has localisation and customization aspects ranging from states as well as from different industrial and economic sectors which look at their sector commitments and have to align them to national security objectives. Apart from energy efficiency, energy security, resource efficiency needs to be focused upon and needs to be key agenda for policy making.

India used to face an enormous shortfall of power, but the average aggregate picture has improved significantly. The coal capacity has increased at the rate of 14.5%, but demand at only 6%. While, the variable renewable energy sources become the cheapest source, which needs to be harnessed at maximum possibility. Multiple steps need to be taken, with the integration of national mission aspects and bottom-up energy security approach. For the long-term strategies, no regret policies like improving reducing transmission losses, ultra-energy efficiency system, and including the co-benefits should be encouraged.

From a sectoral perspective, although India is the second largest producer of steel, per capita consumption is one of the lowest. Steel is identified as a hard to abate sector, developed countries are taking the circular economy route but India is currently not in that position as scrap generation is low. The sector holds the potential for decarbonisation, as low-efficiency levels and high emissions. Low carbon steel can be produced through maximising the use of scrap, carbon capture and storage technology, and the use of low carbon hydrogen.

Expectations of people have changed from 20 years back, now Ladakh is talking about 24/7 electricity. The government needs to look at affordability, assurance, supply and demand. The energy security and shift to cleaner sources from fossil fuels is about creation of demand. Additionally, Energy Security has taken the form of energy rights or access rights. Moving towards rooftop solar practices will help us save ground space and essentially move away from land displacement issues as well. This is significant in fossil fuel projects that lead to large scale displacement of population.

Session 2 - Future of fossil fuels and role of alternative fuels in India

The second session focused on the future of fossil fuels and Alternative fuels in India. The session discussed vital aspects of oil and gas and the expanding bio fuels sector. The session highlighted the need to strengthen Renewable energy manufacturing, energy storage and diversification of energy sources to reduce impacts of price volatility.

During the Covid-19 pandemic, both gas prices and its demand had fallen considerably. Since 52% of gas is imported, there is a high price volatility in the segment which affects the nation's fiscal balance. India needs an additional 300 GW of annual energy, thus we need to look at more alternative sources of energy, not just green ones. Given the large scale demand scarcity that exists in India, we need to implement more security measures. Further, storage measures and challenges need to be taken care of in order for India to have more efficient forms of energy consumption

80% of oil in India is being imported from international markets. Natural gas consumption isn't happening at the level like other resources. We need to be self-sufficient in our energy consumption and optimize the consumption of all our resources. India has been unable to establish significant manufacturing facilities within its renewable energy segment, an aspect which is hurting its growth prospects within the industry. India's high dependence on oil has made it extremely vulnerable to global shocks. Since India imports large barrels of oil from Iran, climate change based water scarcity crises from a few years ago impacted the nation's supply capabilities which led to freak oil price increase in India. The country now is steadily reducing its dependence on West Asia for oil supplies. Climate change-induced volatility on fossil fuel supplies must force India's hands to reinvigorate its energy security strategies, and ramp up its focus on renewables. It is important that we fill in the data gaps with respect to our fossil fuel consumption patterns, in order to forge appropriate strategies on energy security going forward. High level multilateral deliberations is pivotal for achieving this goal.

India right now is the largest source of global energy demand and is also the largest demander of oil based fuels. Affordability of natural gas is the key uncertainty, although a small subset of consumers benefit from access to lower cost of domestic gas. Due to the pandemic, spot prices of gas fell which made it affordable. However, when the demand began to increase, so did the price which created a significant level of market volatility. While gas has room to grow, the outcome for emissions can differ. India's clean energy market can grow a lot, led by Li-on batteries. The nation's photovoltaic (PV) solar market can account for 25% of the total global energy demand by 2040

Session 3- Renewable energy future- 2040 vision

The session focused on a Renewable energy future – a 2040 vision and highlighted the significance of alternative fuels. The case of Ladakh as the new incubation ground for carbon neutral strategies was discussed significantly including the potential areas and key challenges the UT faces on the road to low carbon choices. Increased R&D in alternative fuels will reduce India's dependence on the Middle-East for fuel and also ensure security. There needs to be decentralized energy systems in India to meet the energy demand of the remotest areas.

At the level of UT Ladakh as an example of deploying renewable energy projects, several projects have been undertaken in Ladakh on ground level like replacement of Diesel Generator sets with solar power plants in villages, connecting Ladakh to the main grid to utilise hydropower are some recent developments. Talking about steps in transportation from an energy perspective, introduction of Electric Vehicles and hydrogen buses are the latest developments. There are some challenges faced in the implementation of climate actions in Ladakh for instance the inaccessibility of the region, local people detesting solar power due to lack of awareness, low water availability in the region which makes cleaning

of solar power modules difficult. Ladakh is gearing up to address these challenges and adopt a cleaner future for itself.

Renewable Energy capacity has been doubled so far in India, with Ladakh receiving the world's largest solar power project in the world. But renewable Energy sources are limited to certain states only and there is a need to bring price parity of clean energy all over India. Also, PV systems are imported in high numbers in India, therefore there is a need to encourage domestic manufacturing of these modules by incentivising domestic producers. The high dependence on imported modules is a major concern for the country that is on the road to rapid solar energy deployment and is also the torch bearer for initiatives such as the International Solar Alliance.

India suffers significantly from climate change so there is a need to encourage green hydrogen in all sectors but specifically in steel and fertilizer production. There is a need to enforce reliable policies in renewable energy production. Policy making should focus on creating a global playfield which is based on energy sale and purchase between neighbours. Therefore, international and regional cooperation in energy is required. Various schemes have been started by the government for demand side management like UJALA to provide bulbs and fans in residential sector, installing LED street light, smart metering, Electric Vehicle (EV) in transportation, green coal and etc. There needs to be further boosts to such schemes and their wider dissemination.

Day 2

The second day of the conference was dedicated to the visit to Himalayan Institute of Alternative Learning (HAIL) wherein we were greeted by the founder of the institute Mr Sonam Wangchuk. There the HAIL team displayed some of its most innovative and climate resilient solutions which are capable of enabling the people living in the high terrain lands of Ladakh to sustainably consumer their energy needs. This includes innovating ways to insulate houses in the area to conserve heat, usage of sustainable construction material, managing water usage and etc.

Additionally, given its geographic location and close proximity to the border the team at HAIL also displayed some of the projects it is working on for the army, such as sustainably powered barracks and fire resilient building designs; aspects which are of critical importance for troops

Day 3

Session IV- Energy innovations and Technological transformations for enhancing energy security

The session on Energy innovations and Technological transformations for enhancing energy security focused on Biofuels, other renewable energy sources such as wave energy, solar manufacturing sector and the need to create a strong innovation focused environment.

Responsible energy production has to be the way forward. Utilizing agricultural residues is important because 20 million tonnes of it is burned every year in Punjab and Haryana. Between 2009 – 2015, only 250 million litres of ethanol was available and its price was very high too (INR 27/litre). Government policies have helped in the augmentation of the bioenergy industry, now 3000 million litres of ethanol is available annually. Government intervention has also helped in cross utilization of bioenergy, as it now comprises 10% of total transportation fuel. The government is further looking to establish 5000 compressed bio gas plants which will produce 50 million metric tonnes of gas.

In context to India's solar energy development, the development in PV cells and module development has been promising. At 22.8% PV cells have the highest learning rate of all technologies. Technological innovation has helped bring down the cost of solar cells by almost 4 times in the last decade. The industry is now focusing on high efficiency mono silicon cells and perovskite. Silicon tandem-based modules is the next technological revolution. They have a high one sun efficiency potential of almost 43%. For large grid connected loads, we need more baseline generation plants. Grid connected supply is not the only way to ensure uninterrupted energy access at affordable prices.

Market-based technological innovation needs regulatory support for largescale augmentation. Technological innovation is needed to break monopoly power and help citizens take control of their choices. The largescale interlinkages between global nations make it even more important to share knowledge and help countries achieve their goals. It is important that we fill the existing data gaps in order to make nuanced policy decisions. Sustainable solutions need to be powered by holistic knowledge sharing principles in order to spurt collective action

There are several other renewable technology solutions that India is also undertaking R & D initiatives in. Energy extraction in case of wave energy is only possible for 4-5 months. Tidal barrage and tidal stream turbines are some of the new technological ways to harness tidal energy. Point observer technology can prove to be useful for harnessing tidal energy in India. India currently has a 54GW wave energy potential and 12.45 GW tidal energy potential. Western parts of India currently have ideal conditions for tidal energy extraction. Climate change has transformed the landscape of ocean currents, rising sea levels have helped increase the height of tides, enhancing their extraction potential on both eastern and western parts of the country. Over the last 10 years, wind speeds have increased by 5 meters/second, high tide areas in Bay of Bengal are expanding significantly

The technology innovations that are being undertaken to transform Ladakh into a carbon Neutral UT are towards a low carbon pathway. Ladakh is currently carbon neutral, but may lose the status by 2030 or even earlier. The key energy intensive sectors are residential, transport, electricity, and defense. The use of diesel for electricity generation needed to be phased out through use of energy storage technologies. The usage of hydrogen, solar passive infrastructure, sustainable tourism practices, and harnessing the Renewable Energy potential is the key in the region for deep decarbonisation.

Session V- Energy Cooperation – Regional to Global Perspectives

The session focused on strategies, needs and new developments in enhancing bilateral and multilateral cooperation. The role of enhancing cross border energy trade, post pandemic regional level cooperation and impacts on energy choices, Indo-German cooperation in the wind energy sector and the role of EU green deal in India-EU energy cooperation and the impact of new institutions such as International Solar Alliance were discussed during the session.

SDG 7 aims to ensure accessibility, energy for all, and encourage cross border energy trade. Cross border energy trade has significant potential to increase energy interconnectedness and also harness renewable energy more effectively in a region. The current energy scenario of the BIMSTEC region is significantly fossil fuel based with a high share of biomass while coal and oil products continue to dominate. BIMSTEC relies on imports to meet the energy demand. Cross border energy trade is a crucial element for self-sufficiency. There is too much dependence on bilateral co-operation, more and more multi-lateral co-operation is required. There should be one supra-national body for harmonisation of cross border power sharing.

The pandemic has highlighted several weaknesses economies face during an unprecedented global crisis. The energy sector is also affected significantly. Hence, post-pandemic energy sector reforms and the Triple R approach for energy strategy- response, recovery, and redesign are crucial to take forward a reformed low carbon energy sector. The auction of coal mining was not a green choice but required for recovery of the energy sector. Solar power capacity addition fell by 36%, due to supply chain disruption during the pandemic. Need for climate resilient infrastructure after the Covid with new ideas of innovation like Carbon capture, utilisation and storage (CCUS), etc. More international energy cooperation like mission innovation, platform for redesign 2020, US India talks on alternate supply, BRICS energy cooperation, need to be encouraged. And the new technology needs to be taken to market from lab-course.

International Solar Alliance (ISA) has emerged as a new form of multilateral cooperation that is putting India at the forefront of global renewable energy transformations. ISA was formed by a developing and developed economy and has shown great potential for becoming a strong institution. Discussed the case study of ISA for solar energy co-operation. ISA has different dynamics for financing as well as nature of operations, unlike Renewable Energy and Energy Efficiency Partnership (REEEP) who used to market RE, and International Renewable Energy Agency (IRENA) looking at expansion of global RE. Concept of Renewable energy is very local, intervention required needs to be from region-specific learnings. Co-ordinated efforts are required for RE development from all countries including from countries with the technological might and countries such as India that have implemented at a rapid pace.

The Indo-German co-operation in the wind energy sector is a significant example of bilateral cooperation in the renewable energy space. India has significantly strived in RE and reached very competitive prices. There is a need for clean mobility and clean energy sources but international co-operation at first needs to be encouraged. India's significant wind energy potential is on cultivable lands, but if we increase the hub-height to 120 metres, maximum potential is on waste lands. Need to look at market size, profitability, and potential for domestic growth. The co-operation with Germany can co-shape the collaborative innovation, help in overcoming cost barrier, and frugal solutions can be applied.

The energy security framework needs to take new dimensions like digitalisation. The 7.6% annual emission reduction is required to reach the 1.5 degree Celsius temperature rise target. G20 countries are spending greater than 50% in covid recovery programme to fossil fuels rather than low-carbon energy. Energy investments need to show profitability over the next 20-30 years. Future bi-lateral co-operation on hydrogen projects, on battery chemistry development, recycling and reuse for circular economy, promoting CCUS, on digital innovation and artificial intelligence, enhancing energy conservation and efficiency, and strengthening resilience on energy systems.

Session VI - Energy transitions and Climate commitments –Interlinking approaches

The session focused on the crucial question of Just transition, energy justice and its definition, implementation and impacts in developed and developing economies. The focus was to understand the need for just transition for fossil fuel producing countries such as India that need to deliver on their climate commitments.

There is a difference in just transition in EU and India. In India, conventional activities in mining are happening in western part of the country and RE potential in eastern coast. There is need of data for effective policy making. The journey of energy transition in India would not require further investment on new fossil power plant, and by 2035 no passenger Internal Combustion Engine (ICE) cars are required for net zero. But this will require citizens' collaboration. Generating employment will be top concerns for policy makers, the experience of oil and gas workers could be used for off-shore wind, CCUS sectors as well. Improving quality of life with clean energy policies on clean cooking, power sector & transport is crucial going forward. Direct behaviour changes could reduce 5% of emissions. International Energy Agency's (IEA) gender diversity initiative shows 11% start up cofounders in energy sector are women compared to 20% in non-energy companies. There is a significant need for re-training, skill development, training & capacity in clean energy in RE and engaging youth.

There is a need to be cautious of justice while discussing technology. The concept of energy justice and just transitions is crucial to plan out India's fuel future and to ensure livelihood and a good quality of life for the population. The definitions of energy justice and just transitions do take different conceptual directions depending upon a country's economic development, energy choices, climate commitments and related transformations. The research and actual implementation for just transition are different, and the best justice for a coal miner can be to close the mine, allowing emotional as well as physical health prosperity.

Transport is an essential sector that could change the course of India's energy choices and import dependencies if a low carbon pathway is implemented at a faster pace within the sector. Electric mobility offers flexible use of multiple energy sources. There is a significant difference in the supply chains of EV compared to ICE. Many components in ICE are absent in EV. The involvement of jobs with EV is significantly lower as the components reduced from around 20,000 to 2,000. The End of Life management and recycling of Li-ion battery can enhance job creation in the EV shift. There are technological challenges associated which need to be addressed first.

A Just Transition describes both where we are going and how we get there, in an equitable and environmentally just manner. The Transition must include the entire socio-economic landscape, elements and people associated with it. Coal royalties are a major source of revenue for rentier economies like coal states in India (Non-tax revenue). Chhattisgarh, Madhya Pradesh, Odisha, and Telangana: 15%, Maharashtra – 8%, Uttar Pradesh- 3%. Population within India's coal mines live in the lowest two wealth quintiles. Chhattisgarh - 59%, West Bengal – 53%, Odisha – 63.8%, Jharkhand – 68% Madhya Pradesh – 54.7%. In a double doughnut framework all the elements must be treated as one and not as separate public policy problems. Moving forward there is a need to look at how we define growth, revisit the economic principles from over 50 years ago and how they can be changed with respect to the current times we are living in

Concluding Session

The world is constantly changing, and we need countries like India to take the lead. Technological partnerships between India and Germany will also help strengthen their links with the European Union. The possibilities of partnership with India may garner pace over the next few years. Technological revolutions must happen at the renewable energy side and the blockchain end for the creation of disruptive markets. Going forward, hydrogen energy needs to be central to our decarbonization goals.

Global energy trends need to be looked at from a market economy and volatility perspective. Developed nations need to make sure that they help mitigate the challenges faced by developing nations. The electricity sector will impact our green future. Thus, we need to look at technological innovations that

can mitigate its security risks, especially from an infrastructure perspective. Energy security must go hand in hand with digitalization

Energy Security should not only be seen from the supply side, but the demand side as well. Electrification of demand and hydrogen energy is imperative. Economies of scale is not the king anymore, more and more focus should be given to technology development and innovation.

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with Jai Prakash Singh and 5 others

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As Head of the Maritime Energy Security and Security-of-Energy (MESSE) cluster at the National Maritime Foundation, the TERI-KAS National Workshop on "India's energy scenario - 2040 and beyond," held in Leh, Ladakh, gave me a g ...see more



TERI Retweeted

EESL India @EESL_India · Sep 7

Our MD, @rajatksud addressed the session at the National workshop on "India's energy scenario 2040 and beyond" organised by @terilin & Konrad Adenauer Foundation. His session highlighted the roadmap of the energy sector & creating a sustainable pathway. @MinOfPower

Rajat Sud @rajatksud · Sep 7

Even amidst the pandemic, @EESL_India has seen sustained growth as we continue to provide affordable & accessible energy solutions. #Energyefficiency, #solar, green coal & #EVs will drive #climateaction & contribute towards NDC commitments under the Paris Agreement. @terilin

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DAY 1

6th September 2021

Arrival Hotel Abduz,

Leh, UT Ladakh

10.30 am – 12.30 pm

Inaugural session

- **Welcome Remarks – R R Rashmi**, Programme Director and Distinguished Fellow, The Energy and Resources Institute (TERI) (*Virtually*)
 - **Opening Remarks – Peter Rimmele**, Resident Representative, Konrad Adenauer Stiftung India office
 - **Special Address – Pawan Kotwal**, Principal Secretary (Health/Revenue/Planning, Dev & Monitoring/Forest), Administration of Union Territory of Ladakh **(TBC)**
 - **Special Remarks- Frank Umbach**, Research Director of the European Centre for Energy and Resource Security (EUCERS), King's College, London (*Virtually*)
 - **Theme Address: Rajat Sud**, Managing Director, Energy Efficiency Services Limited (EESL)
 - **Keynote Address: Sonam Wangchuk**, Founder and advisor of Students' Educational and Cultural Movement of Ladakh (SECMOL)
-

12.30 pm- 13.00 pm

Tea / Coffee Break

13.00 pm- 2.30 pm

Session I – Energy Security for a cleaner future

Session Chair – R R Rashmi, Programme Director and Distinguished Fellow, The Energy and Resources Institute (TERI) (*Virtually*)

Panelists:

- **Rahul Tongia**, Senior Fellow, Centre for Social and Economic Progress (*Virtually*)
- **Mukesh Kumar**, Director, Steel Research & Technology Mission of India (SRTMI) (*Virtually*)
- **Manu Maudgal**, Director, Clean Power Programme, Shakti Foundation (*Virtually*)

- **Abhishek Nath**, Sector Head, Energy and Power, Center for Study of Science, Technology and Policy (CSTEP)
- **Swati Ganeshan**, Independent Consultant & Honorary Adjunct Fellow, National Maritime Foundation

2.30 pm-3.30 pm

Lunch Break

3.30 pm – 5.00 pm

Session II – Future of fossil fuels and role of alternative fuels in India

Session Chair – R. K. Malhotra, Director General, Federation of Indian Petroleum Industry (FIPI)
(Virtually)

Panelists:

- **Shebonti Ray Dadwal**, Former Senior Fellow, MP-IDSA *(Virtually)*
- **Vatsala Sharma**, Research Scholar
- **Sanjay Kumar Pradhan**, Assistant Professor, Pandit Deendayal Energy University *(Virtually)*
- **Oliver Nelson Gonsalves**, Associate Fellow, National Maritime Foundation
- **Peter Zeniewski**, WEO Energy Analyst, International Energy Agency *(Virtually)*

5.00 pm- 5.30 pm

Tea / Coffee Break

5.30 pm- 7.00 pm

Session III – Renewable energy future- 2040 vision

Session Chair – Souvik Bhattacharjya, Associate Director, The Energy and Resources Institute (TERI)

Panelists:

- **Dipesh Pherwani**, Scientist-C, Ministry of New and Renewable Energy (MNRE) (*Virtually*)
- **Nissar Hussain**, Project Director, Ladakh Renewable Energy Development Agency (LREDA)
- **Tsewang Thinglas**, Executive Engineer, Public Work Department, Nobra, UT Ladakh
- **Winfried Damm**, Indo-German Energy Programme, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH (*Virtually*)
- **K Balaraman**, Director General, National Institute of Wind Energy (NIWE) (*Virtually*)
- **Ashish Jindal**, Clean Energy Expert (Technical), Energy Efficiency Services Ltd. (EESL)

DAY 2

7th September 2021

Visit to Himalayan Institute of Alternatives / SECMOL

DAY 3

8th September 2021

9.30 am – 11.00 am

Session IV – Energy innovations and Technological transformations for enhancing energy security

Session Chair – Mohit Bhargava, Executive Director, Renewable Energy, NTPC Limited (*Virtually*)

Panelists:

- **D K Tuli**, DBT-IOC Chair on Bioenergy (*Virtually*)
- **Nitin Bajpai**, Researcher, The Energy and Resources Institute (TERI)
- **Jai Prakash**, Director (Technical), National Institute for Solar Energy (NISE)
- **R B Grover**, Member of AEC and former Vice-Chancellor of Homi Bhabha National Institute (*Virtually*)
- **Prasad K. Bhaskaran**, Professor, Ocean Engineering and Naval Architecture, IIT Kharagpur

11.00 am – 11.30 am

Tea / Coffee Break

11.30 am – 1.00 pm

Session V – Energy Cooperation – Regional to Global Perspectives

Session Chair – P. C. Sharma, Joint Director, Renewable Energy, International Solar Alliance (ISA)
(*Virtually*)

Panelists:

- **Anasua Basu Ray Chaudhury**, Senior Fellow, Observer Research Foundation & **Roshan Saha**, Graduate Research Assistant, Auburn University (*Virtually*)
- **Nanda Kumar Janardhanan**, Assistant Professor, Energy Studies Programme, School of International Studies, Jawaharlal Nehru University (JNU) (*Virtually*), **Sruthi Kalyani A.**, Editor, Energy Review, Jawaharlal Nehru University & **Gargi Adhikari**, Research Associate, The Research Collective, Programme for Social Action (*Virtually*)
- **Swati Ganeshan**, Independent Consultant & Honorary Adjunct Fellow, National Maritime Foundation
- **Rajnish Tiwari**, Senior Research Fellow and Program Leader, Institute of Technology and Innovation Management (TIM) of Hamburg University of Technology (TUHH) (*Virtually*)
- **Frank Umbach**, Research Director of the European Centre for Energy and Resource Security (EUCERS), King's College, London (*Virtually*)
- **Joachim Pfeiffer**, MdB (Member of German Parliament) Christian Democratic Union (CDU)

1.00 pm – 2.00 pm

Lunch Break

2.00 pm – 3.30 pm

Session VI – Climate commitments and Just Transition –Interlinking approaches

Session chair - Chandra Bhushan, President & CEO, International Forum for Environment, Sustainability and Technology (iFOREST) *(Virtually)*

Panelists:

- **Astha Gupta**, Lead Country Analyst & Coordinator-India, International Energy Agency
 - **Ashwini Swain**, Fellow, Centre for Policy Research
 - **Pradip Swarnakar**, Associate Professor of Sociology, Department of Humanities and Social Sciences, IIT Kanpur
 - **Arghya Sardar**, Scientist-F, Technology Information, Forecasting And Assessment Council (TIFAC)
 - **Kartikey Sharma**, Research Associate, The Energy and Resources Institute
-

3.30 pm – 4.00 pm

Tea / Coffee Break

4.00 pm – 5.00 pm

Concluding Session – India’s Energy Security Scenario-Charting the Course Ahead

Conference Summary / Key Takeaways

- **Souvik Bhattacharjya**, Associate Director, The Energy and Resources Institute (TERI)
- **Swati Ganeshan**, Independent Consultant & Honorary Adjunct Fellow, National Maritime

Special Intervention

- **Frank Umbach**, Research Director of the European Centre for Energy and Resource Security (EUCERS), King’s College, London *(Virtually)*
- **Abhishek Nath**, Sector Head, Energy and Power, Center for Study of Science, Technology and Policy (CSTEP)
- **K Balaraman**, Director General, National Institute of Wind Energy (NIWE) *(Virtually)*

Concluding Remarks

- **Pankaj Madan**, Deputy Head, India Office, Konrad Adenauer Stiftung
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Departure on 9th September 2021

About Partners

The Energy and Resources Institute (TERI)

The Energy and Resources Institute (TERI) is an independent, multi-dimensional organization, with capabilities in research, policy, consultancy and implementation. We are innovators and agents of change in the energy, environment, climate change and sustainability space, having pioneered conversations and action in these areas for over four decades. With the belief that resource efficiency and waste management are the keys to smart, sustainable and inclusive development, TERI's work across sectors is focused on

- Promoting efficient use of resources
- Increasing access and uptake of sustainable inputs and practices
- Reducing the impact on environment and climate

TERI's research, and research based solutions have had a transformative impact on industry as well as communities. TERI has fostered international collaboration on sustainability action by creating a number of platforms and forums. Headquartered in New Delhi, TERI has regional centres and campuses in Gurugram, Bengaluru, Guwahati, Mumbai, Panaji, and Nainital. TERI's 1200-plus team of scientists, sociologists, economists and engineers delivers insightful, high quality action-oriented research and transformative solutions supported by state-of-the-art infrastructure.

Konrad-Adenauer-Stiftung (KAS)

The Konrad-Adenauer-Stiftung (KAS) is a political foundation. Established in 1955 as "Society for Christian-Democratic Civic Education", in 1964 the Foundation proudly took on the name of Konrad Adenauer, the first Chancellor of the Federal Republic of Germany. With 16 regional offices in Germany and over 120 offices abroad, the Konrad Adenauer Foundation is committed to achieving and maintaining peace, freedom and justice through political education. We promote and preserve free democracy, social market economy, and the development and consolidation of the value consensus. We focus on consolidating democracy, the unification of Europe and the strengthening of transatlantic relations, as well as on development cooperation. The leitmotif of the Konrad Adenauer Foundation "Germany. The next chapter" is supported by a thematic focus. With the three main topics Innovation, Security and Representation and Participation, it is quite clear which topics the Konrad Adenauer Foundation will focus on in the coming years. We cooperate with governmental institutions, political parties and civil society organizations, building strong partnerships along the way. In particular, we seek to intensify political cooperation in the area of development cooperation on the foundations of our objectives and values. Together with our partners, we make a significant contribution to the creation of a global order that empowers every country to determine its own developmental priorities and destiny in an internationally responsible manner.