

A close-up photograph of a person's hands cupped together, holding a small mound of dark brown soil. A vibrant green tree with a thick trunk and a full, rounded canopy of leaves is growing out of the soil. The background is a soft, out-of-focus gradient of green and white, suggesting a bright, natural setting.

Stimulating  
**SUSTAINABLE**  
Growth Through  
**THOUGHT LEADERSHIP**

\* Click on the page number to directly reach the Article

## Table Of Contents

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1 Message from CMD, ReNew Power	<b>04</b>
<hr/>	
2 Message from Founding Chair, ReNew Foundation	<b>05</b>
<hr/>	
3 ReNew Foundation: Adopting Thought-Leadership as a Tool for Advancing UNSDGs	<b>06</b>
<hr/>	
4 Scope of Report: A lookback at RF events	<b>07-44</b>
<hr/>	
a. Roundtables	
i. Gender and Sustainability	<b>09</b>
ii. Innovation and India's Energy Transition	<b>21</b>
<hr/>	
b. Knowledge-Sharing Sessions	
i. Energy Storage	<b>32</b>
ii. Geopolitics of Energy Transition	<b>37</b>

## Message from CMD, ReNew Power

Since its inception, ReNew Power has enjoyed exponential growth, and is today India's largest renewable energy company in terms of overall capacity. Over the years, while growing our business, we have also ensured that we play our role as a socially responsible corporate across India, and help transform lives of the most vulnerable. In this process, we have actively engaged with policy-makers, academia, civil society, other corporates and NGOs, to discuss and brainstorm on some of the most critical issues around sustainability and climate change. The idea was to mobilize various stakeholders, exchange insights and best practices and then curate a roadmap for coordinated action towards advancing the various UN SDGs.



ReNew Foundation, the philanthropic arm of ReNew Power, conducted a wide mix of thought-leadership events in the shape of expert lecture sessions and roundtables throughout the last financial year, to bring together stalwarts and champions of various spheres for not only discussing the various challenges and opportunities under the broad spectrum of sustainability, but also feeding those discussions into recommendations for various stakeholders, to provide an actionable high-level agenda for everyone to work towards.

These thought-leadership activities have not only been an essential cog in the wheel for partnerships and collaborations, but have also allowed us to learn from the best particularly on scaling up our work and its impact. Whether it be roundtables or knowledge-sharing sessions, ReNew Foundation aims to bring a deeper awareness and understanding of critical issues and provide strategic insights on how the spectrum of stakeholders, especially the government, can deal with various issues.

In the last year, these events have explored a diverse array of themes such as the deep interlinkages between gender and sustainability, the need for industry-academia partnerships to foster innovations in clean energy, how energy storage is a critical piece in the renewable energy puzzle, and the geopolitical implications of the transition to a clean energy future, among other topics. This report aims to revisit these discussions, capture the key takeaways and provide actionable recommendations for the path ahead.

We hope the report provides a deeper understanding of these critical issues and elevates not only the narrative and conversation on these topics, but provides actionable agenda items for all stakeholders to act upon.

**Sumant Sinha**

## Message from Founding Chair, ReNew Foundation

ReNew Foundation has had a busy first year in the domain of thought-leadership, among the other activities it is involved in, in the area of clean energy access, sustainability and social responsibility. The following report is a window into the various events organized under the ReNew Foundation banner, to facilitate a common understanding of relevant themes which have been touched upon in events staged throughout the year.



We set the ball rolling with a high powered roundtable on gender and sustainability chaired by Dr. Paula Johnson, President, Wellesley College, and with Amitabh Kant, CEO, Niti Aayog as a Chief Guest. Since then, we have hosted dialogues with international entities like the New Jersey Governor's office (with a gender and sustainability themed roundtable chaired by First Lady Tammy Murphy), eminent faculty from Stanford University engaged in pioneering clean energy research, Daniel Steingart, co-director of the Columbia Electrochemical Energy Center and David Livingston, the deputy director in the Atlantic Council's Global Energy Center. There has also been extensive participation from India, with prominent policymakers, academicians, corporate leaders, entrepreneurs, representatives of international development agencies and stalwarts from other spheres such as media, civil society and NGOs also being part of these dialogues.

The report provides clear context on the existing narrative and knowledge in the various topics it covers through these thought-leadership activities, brings out the key takeaways from all these discussions and delivers recommendations, supported with testimonials from each of these discussions.

As Covid -19 and the resulting lockdown unsettled the nation, we pitched in with our humble contributions towards relief and rehabilitation for those worst affected. We are certain that despite the bleak present, the future is riddled with opportunities. In these unprecedented times with the pandemic disrupting our way of living and how businesses operate, we are certain that sustainability will be at the center of the narrative going forward. To this effect, ReNew Power plans to commit itself towards efforts that can help in community welfare and nation building.

We would like to thank all the participants, chairs, moderators and attendees of the various events hosted by the ReNew Foundation for their contributions and insights that have helped in bringing this report to fruition. We hope it provides a more granular understanding of the various themes explored to all the readers and paves the way for a better, more equitable, and sustainable future ahead.

**Vaishali Nigam Sinha**

ReNew FOUNDATION

## Adopting Thought Leadership As A Tool For Advancing UNSDGs

For ReNew Foundation, thought-leadership becomes a critical tool to not only partner with leading stalwarts of the climate change and sustainability narratives, but also deliberate on sustainable solutions for some of the leading problems the world, including India faces today.

By organizing roundtables, conferences, information sessions and dialogues, ReNew Foundation has brought together a wide array of thought-leaders under its banner, and documented their views for presenting to the government and other stakeholders, who are also part of these events, for policy interventions and changes on a grass-root and systemic level.

ReNew Foundation works with leading national and multilateral international organizations in sectors like energy, sustainability, social responsibility and so on, to organize thought-leadership events, and also includes stakeholders from media, academia, civil society and so on, to provide a more holistic discussion agenda and diverse viewpoints.

The thought-leadership events of ReNew Foundation aim to enrich and enlighten all the stakeholders involved who can then utilize these learnings for actionable deliverables in their own organization or sector. They are designed to provide greater clarity on business proceedings, social responsibility agendas and even required policy changes for all the various participants involved, hence capturing these discussions becomes of utmost importance.

The ReNew Foundation Thought-Leadership Report can therefore become the backbone for impending improvements in the overall ecosystem, from the policy to the ground-level, through more awareness and knowledge-sharing, which are critical in the bigger battles which lie ahead, such as ensuring a sustainable and inclusive world order, which needs multi-stakeholder collaboration as a key prerequisite.



Prof. Daniel Steingart, Co-Director of Columbia Electrochemical Energy Centre, delivering a talk on “Energy Storage: Current Status, Gaps & Opportunities

SCOPE OF REPORT

## A lookback at RF events

This report covers four broad themes, which itself have been bifurcated into roundtables and knowledge-sharing sessions.

### Roundtables

- **Gender and Sustainability** is the first theme, which was explored through two roundtables namely *Gender & Sustainability: A Global & Cross Sectoral Perspective chaired by Dr. Paula Johnson on 11th February 2019* and *Women As Drivers Of The Sustainability Agenda chaired by Tammy Murphy, First Lady of New Jersey on 16th September 2019*.
- The second theme is *Innovation and India’s Energy Transition*, which was the theme for a *roundtable co-hosted by ReNew Foundation and Stanford Precourt Centre for Clean Energy on 7th February 2020*.

### Knowledge-Sharing Sessions

- The third theme is *Energy Storage*, for which a knowledge-sharing session was led by *Professor Daniel Steingart, leading expert and co-director of Columbia Electrochemical Energy Center* in May 2019.
- The fourth theme is the *Geopolitics of the Energy Transition* based on an address by *David Livingston, Deputy Director in the Atlantic Council’s Global Energy Center and a fellow of the Initiative for Sustainable Energy Policy* at John Hopkins University on 10th June 2019.



Delegates at the roundtable on Innovation and India’s Energy Future co - hosted by ReNew Foundation and the Stanford Precourt Institute for Energy

# 1. Gender and Sustainability

## Context

When it comes to the gender gap, India ranks 122nd out of 153 countries, as per a report by the World Economic Forum. Despite relative gains in various metrics with respect to gender over the past few decades, there is still a long way to go for India to achieve gender equity. With United Nation's Agenda 2030's deadline drawing closer, the achievement of the targets of SDG 5 on Gender Equality (among other SDGs) requires holistic changes in India, a country playing an integral role in the global endeavour towards advancing the 17 SDGs, remains critical. This is because of the huge interlinkages gender parity has with every aspect of sustainable development, whether it be poverty, health, education, energy, food, water, economic growth, innovation and even climate change among many others. Pushing forward the sustainability agenda, across environmental, social and economic factors, requires an overhaul of how efforts towards gender parity are perceived and acted upon, given the empirical evidence of the sustainability benefits of achieving gender parity across all parameters.

When it comes to climate change mitigation, focusing on gender issues becomes all the more important, given the disproportionate burden of climate risks faced by women. With 70% of the world's women living in poverty, women are disproportionately affected by extreme weather events, loss of agricultural productivity, destruction of life and property and so on, all of which stem from the climate change crisis. Therefore, the involvement of women through all-encompassing efforts and investments in gender empowerment, will greatly boost the sustainability agenda and even help provide sustainable solutions for climate change mitigation, given that women remain a largely untapped resource due to existing biases including restricted land rights, lack of access to training, technology and financial resources and limited access to political-decision making due to under representation.

A statistic which reinforces the important role women can play in the fight against climate change stems from fundamental economics- as per a McKinsey report, in a "full potential" scenario in which women play an identical role in labour markets to that of men, as much as \$28 trillion, or 26 percent, could be added to global annual GDP by 2025. This is more than enough to bridge the climate finance gap needed to fund the battle against climate change, which stands at €585 billion per year by 2020 and €894 billion by 2030. Just increasing the participation of women in the labour force will sufficiently increase the world GDP for financing sustainable development.

ReNew Foundation's thought-leadership activities included exploring these deep interlinkages between gender and sustainability, initiating dialogue aimed towards actionable agendas in terms of recommendations, through the participation of various stakeholders, opinion leaders and influencers across the spectrum. ReNew Foundation hosted two separate events - one in February 2019 chaired by Dr. Paula Johnson, President, Wellesley College and the other in September 2019, chaired by Tammy Murphy, First Lady, New Jersey respectively, under the theme of gender and sustainability.

## ROUNDTABLE

- Gender and Sustainability
- Innovation and India's Energy Transition

## ROUNDTABLE ON Gender & Sustainability: A Global & Cross Sectoral Perspective

On 11th February 2019, ReNew Foundation hosted a Roundtable on Gender & Sustainability: A Global & Cross Sectoral Perspective chaired by Dr. Paula Johnson, President, Wellesley College, with Amitabh Kant, CEO Niti Aayog as the Chief Guest, and moderated by Fatima Mahdi Karan, Consulting Editor, BTVI. The roundtable was hosted by Vaishali Nigam Sinha, Founding Chair, ReNew Foundation, in New Delhi.

### THE PARTICIPANTS

**Mr. Amod Kanth**

IPS (Retd.) and  
Founder- Prayas

**Ms. Antara Ganguly**

Gender & Development  
Specialist - UNICEF

**Ms. Shivani Kumar**

Gender & Strategic  
Consultant, CII Foundation

**Ms. Gauri Arora**

Private Sector Specialist, UN  
President Coordinator's Office

**Dr. Smriti Das**

HoD & Associate Professor, Teri  
Institute of Advanced Studies

**Ms. Laura Adamczyk**

Senior Development Officer,  
Wellesley College

**Ms. Manjari Jaruhar**

IPS (Retd.) &  
Advisor - TCS

**Dr. Shikha Nehru Sharma**

Founder & MD,  
Nutri Health Systems

**Ms. Shloka Nath**

Head, Sustainability & Special  
Projects, Tata Trust

**Mr. Balram Mehta**

President - Wind Business,  
ReNew Power

**Mr. Ajay Bhardwaj**

President - Transmission,  
ReNew Power

**Dr. Varun Sivaram**

Former Chief Technology Officer,  
ReNew Power

**Ms. Vaishali Nigam Sinha**

Chief Sustainability Officer, ReNew  
Power

**Mr. Sumant Sinha**

Chairman and MD,  
ReNew Power

A more than an hour long discussion entailed various dynamics of gender and sustainability being explored, such as the impact of climate change on women, the role clean energy can play in boosting gender parity and sustainability, the need for systemic shifts in outlook through education and awareness, efforts by the Indian government towards this end, and the structural changes required along with enhanced participation of women in decision-making in policy and the economy on every level, to “create a virtuous cycle”. There were also deliberations on gender as a social construct, trade-offs which occur in the pursuit of various SDGs, interventions to empower women and their holistic impacts and existing biases and gaps which need to be bridged. The role of men in bridging this gap, gender sensitization initiatives by multilateral agencies, the need for meaningful efforts especially towards gender parity among the underprivileged, cohesive and inclusive involvement of all stakeholders and higher enrolment of women in STEM fields and away from traditional roles were also brought up during the discussion.



Paula Johnson  
President, Wellesley College  
who chaired this roundtable



Sumant Sinha  
CMD,  
ReNew Power



Laura Adamczyk  
Sr. Development Officer,  
Wellesley College



Amitabh Kant  
CEO, NITI AAYOG  
and Chief Guest

## Key Comments



Sustainability and gender are profoundly interdisciplinary and we need an education system that will prepare today's youth to view these from diverse perspectives. Gender sensitivity must be a part and parcel of early school curriculum so that students are trained to look at issues through a gender lens. It is important to remove barriers and encourage more women to pursue STEM education.

Climate change is the biggest threat facing the current generation with women being most vulnerable to its impact due to their socio economic status. Clean energy is the key to safer, healthier women who will be more productive in what they do. Equally, participation of women in the business of sustainability is crucial and this must extend to the bottom of the pyramid with policy makers playing a big role.

**- Dr. Paula Johnson**  
President, Wellesley College



Innovative and sustainable urbanization is key to India's future growth. Low participation of women in workforce is a worry. The onus lies on men to help women advance to senior roles. Self Help Groups operating in rural India are a formidable force - with potential to transform lives of rural women through mentorship, skill training and access to finance.

Through the Jan Dhan Aadhar Mobile (JAM) trinity, the Govt. has ensured greater financial inclusion and bridged the digital divide for women in India, thus improving quality of lives. In rural India, women are regarded as natural resource managers and we have several success stories of green entrepreneurs acting as change agents - be it operating solar pumps & lanterns or maintaining solar micro grids.

The Government's focus is on ensuring women have equal access to land rights, credit, markets & technology & most importantly education where they have consistently outperformed their male counterparts. The Government is also encouraging more women entrepreneurs by creating an enabling ecosystem with access to industry linkages, finance, policy reforms and mentorship among others.

**- Amitabh Kant**  
CEO Niti Aayog



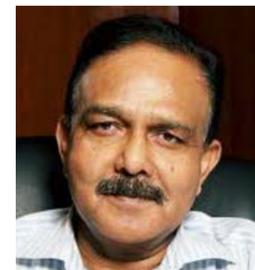
While females perform well in academics it does not always translate into a matching professional career due to barriers. While we have come a long way, a lot of ground still needs to be covered and men too must play their due role in ensuring advancement and mainstreaming of women.

**- Vaishali Nigam Sinha**  
Chair, ReNew Foundation



We must learn the importance of differentiating between gender and gender equality. Gender is a social construct - a socialized expectation from a person derived from his/her sex.

**- Antara Ganguly**  
Gender & Development Specialist - UNICEF



While we are the 7th largest economy, we must be equally cognizant of our low ranking on the UN Human Development Index, largely attributable to the conditions of women and the girl child. After working with the underprivileged sections, I can say that women empowerment must reach the lowest stratum of society, to be meaningful.

**- Amodh Kant**  
IPS (Retd.) and Founder- Prayas



There are many trade-offs that occur in our pursuit of various sustainable development goals. There is no critical pathway to achieve either sustainability or gender equality and the choice making process needs to be more cohesive and inclusive with participation of all sections.

**- Shloka Nath**  
Head, Sustainability & Special Projects, Tata Trust

## Key Comments



Women in tier 2 or 3 cities today are more aspirational and want to be in control of their lives. While access to digital tools has widened their horizons, power dynamics is still somewhat against them with little or no control over finances being key. India is fundamentally rooted in traditional gender role plays and Govt. policies need to address this.

**- Dr. Shikha Sharma**  
*Founder & MD, Nutri Health Systems*



Despite efforts, even in our own company, there remains a challenge in getting women in engineering roles and senior management positions. Creating a safe and sensitized environment at the workplace with initiatives to help women grow is integral to improving gender ratio in the energy sector.

**Sumant Sinha**  
*Chairman and MD, ReNew Power*

## ROUNDTABLE ON Women As Drivers Of The Sustainability Agenda

On 16th September 2019, ReNew Foundation hosted a roundtable on “Women As Drivers Of The Sustainability Agenda” chaired by Tammy Snyder Murphy, First Lady of New Jersey, and moderated by Vaishali Nigam Sinha, Founding Chair of ReNew Foundation.

A diverse mix of guests including policy makers, entrepreneurs, academia and opinion leaders from India as well as New Jersey joined the discussion, sharing their perspectives on gender equality and its linkages with sustainability.

### THE PARTICIPANTS

**Shweta Rajpal Kohli**  
 Director, Government Affairs &  
 Public Policy, Salesforce India and  
 South Asia

**Kathleen Frangione**  
 Chief Policy Advisor,  
 New Jersey Governor’s Office

**Balpreet Grewal-Virk**  
 Director, Community Engagement  
 & Population Health, Hackensack  
 Meridian

**Kaveree Bamzai**  
 Acclaimed Journalist

**Latika Nath**  
 Acclaimed Wildlife  
 Conservationist and Author

**Dr. Shikha Sharma**  
 Founder, Nutri Health

**Meenakshi Batra**  
 CEO, Charity Aids Foundation

**Amodh Kant**  
 Founder, Prayas

**Arunabha Ghosh**  
 CEO, Council on Energy,  
 Environment and Water

**Matthew Cherian**  
 Chief Executive, HelpAge India

**Stephanie Findlay**  
 South Asian Correspondent,  
 Financial Times

**Margie Piliere**  
 Chief Economic Development  
 Advisor, Choose New Jersey Inc.

**Coleen Burrus**  
 Office of Dean for Research,  
 Princeton University

**Kristen Ludecke**  
 VP, Federal Affairs, PSE&G

**Radhika Chopra**  
 Founder, No. 3 Clive Road

**Natasha Jog**  
 Election Integrity Lead, India and  
 South Asia, Facebook

The enriching session, analysed the linkages between women empowerment and sustainability, the need for viewing sustainability related issues through the gender lens, the gradual emergence of women at the forefront of the sustainability agenda - their journey from being a part of the agenda to shaping the agenda itself and the value they bring to the table in this leadership role. An actionable roadmap for catapulting women into leadership roles to drive the sustainability agenda was also deliberated upon during the discussion.



Kaveree Bamzai and Amod Kant at the Roundtable on Women As Drivers Of The Sustainability Agenda



Noted entrepreneur Ms. Radhika Chopra speaking at the roundtable



Vaishali Nigam Sinha, Tammy Snyder Murphy and members of the NJ State delegation with women entrepreneurs from Jath village, beneficiaries of the ReWIN programme



Panelists involved in candid conversations



Members of the NJ state delegation accompanying the First Lady at ReNew. Hub

## Key Comments



Sustainable energy is essential to supporting the environment. Women leaders are our greatest hope for meaningful change. Women have outplayed male colleagues in environmental protection. The New Jersey Governor office has pledged to make New Jersey a leader in climate change agenda, with respect to boosting renewables and increasing employment in the industry, increasing capacity of rooftop solar, ground mounted solar, conventional and off-shore winds, with various community programs to facilitate adoption of renewables. We are also integrating climate change deeply in higher school curriculum and pedagogy. All this will be done while prioritizing gender parity.

Silos need to be broken down for effective change. I have been working hard on maternal health. We were 45th of out 50 states in terms of maternal mortality and it disproportionately affected women of color. Black women were 5 times more likely to die. The Department of Health and the Department of Children and Families were working on this problem. Now 15 departments are working together towards this goal. We have been making a lot of progress and there is a lot of information sharing and data sharing. Collaboration thus becomes key when addressing issues of gender and sustainability, with everyone involved.

**- Tammy Murphy**  
First Lady of New Jersey



In the fight against climate change, women cannot be mere spectators, having the most exposure to the devastating effects of climate change. It is integral to recognize the important contributions of women as decision-makers, caregivers, stakeholders, experts and educators across all sectors for sustainable solutions to the environmental crisis before us.

There have to be investments in multi-stakeholder, multi-sectoral and participatory Climate Change Gender Action Plans, in order to develop comprehensive plans which integrates gender-related concerns and builds on the capabilities, unique knowledge and perspectives of women to not only build their climate resilience, but make them active agents of climate change mitigation. Climate finance should be made available to men and women for them both to share the mutual benefits, rather than exacerbating existing inequities.

**- Vaishali Nigam Sinha**  
Chair, ReNew Foundation

## Key Comments



Women are much more vulnerable to climate risks and therefore efforts towards building their resilience have to be made through capacity-building. Women also face the brunt of doing jobs like fishing as men migrate to urban areas for better opportunities, and even the share of unpaid labour participation in agriculture of women is alarmingly high. Women need to play an integral role in the renewables story of India. The next big surge in renewables is going to be in distributed solar and hybrid. Women can play a big part in this throughout the value chain.

**- Arunabha Ghosh**

*CEO, Council on Energy, Environment and Water*



We need more women leaders in every sphere and the media should showcase great women leaders as role models. The media also has to play an important role in making the invisible women in marginalized communities and rural areas, more visible, and highlight their importance in the sustainability journey or even economic growth.

**- Kaveree Bamzai**

*Acclaimed Journalist*



Gender related interventions need to impact businesses more. Gender diversity and sustainability need to be connected and a business case for the same has to be clearly put forward. Gender pay parity is the basic foundation for any of these changes, and will ultimately play a role in the company's improvement in the sustainability trajectory as well.

**- Shweta Rajpal Kohli**

*Director, Government Affairs & Public Policy, Salesforce India and South Asia*



## Key Takeaways from Gender and Sustainability Roundtables

- There is a clear linkage between sustainable development and gender equality; women empowerment is a key component for a sustainable future.
- The gender narrative has plenty of similarities across geography, sectors, societies and this means we can apply learnings and best practices from one area to others, while adapting it to local contexts.
- Multidisciplinary education is an important tool for inculcating gender sensitivity from an early age. Women must have the knowledge and understanding of what is needed to adapt to changing environmental circumstances in order to come up with practical solutions.
- The Govt. Of India has a major role to play in advancing gender equality through strategic policy interventions and ensuring equal opportunities commensurate with the potential women have. At the national and sub-national level, effective policies, projects and programmes for gender equality must be crafted in order to ensure equal space and resources for women and men to participate in climate change decision-making
- Gender sensitivity and equality has to be all pervasive, it needs to trickle down right to the bottom of the pyramid and benefit the underprivileged, going beyond the big cities and well off classes.
- Women at the helm of the sustainability agenda, just like their roles as managers are able to bring in more empathy and inclusiveness in their advocacy and problem-solving, which enhances their efficacy as sustainability leaders. The inherent qualities of a woman to be strong-willed and persevere while facing impediments and adversaries enriches their ability to be the voice of the sustainability agenda and frontline warriors of the battle against climate change.
- The amount of money added to the world GDP by full participation of women in the economy, to the level of men, can easily fund the path to sustainable development, and be a huge resource for climate financing.

## Recommendations for Boosting Gender Empowerment and Sustainability

- Allocation of resources for women empowerment by forming a broad-based committee with government and private stakeholders to evaluate the national and state budgets with a gender lens and pave the way for more inclusive fiscal outlays, can be a way to bridge gender gaps. This will pave the way for gender parity, which will naturally boost sustainability given the interlinkages.

- More emphasis on education of the girl child (like the Beti Bachai Beti Padhao program) all the way through higher education, with mandatory gender sensitivity programs, along with pedagogical interventions which clearly bring out the interlinkages between sustainability and gender, need to be institutionalized in the school and collegiate levels. There needs to be a more multidisciplinary-themed curriculum, and specific measures to boost women participation in the STEM field.
- Economic equality of women, and providing financial access to women in all levels of society remains integral in benefiting from their contributions towards sustainable development. Tax benefits, loans, financial prudence training, providing micro-finance opportunities to women (like the MUDRA scheme), and fostering a culture of Self Help Groups in rural areas, can help enable women to be more independent, and even foster entrepreneurship in areas of sustainability.
- Affirmative action for increasing women participation in policy, senior management positions at corporates, and even on a grass-root levels such as governance bodies in rural areas, can be made a legislative norm, given the empirical evidence of economic and social benefits linked to increasing participation of women.
- Government programs to boost renewables such solar rooftop adoption need to ingrain women deeply in the value chain of these interventions, through entrepreneurship and training programs, along with mandated educational programs for women in the clean energy journey.
- Recognition programs for women leaders in the sustainability realm need to be instituted by the government, to create a virtuous cycle of inspiration and create role models for others to emulate.



Vaishali Nigam Sinha, Dr. Paula Johnson, Mr. Amitabh Kant and moderator Fatima Mahdi Karan at the Roundtable on Gender and Sustainability

## 2. Innovation and India's Energy Transition

*India recently secured 74th rank on a World Economic Forum global 'Energy Transition Index' moving up 2 places since last year.*

### Context

With a burgeoning population of youth, steady on the path of development, India is being projected as the next big 'economic powerhouse' of the world. The tilt-shift of this power towards India will see the country transition from an agrarian economy to an economy dominated by the manufacturing and services sector, shouldered by a population that would be ever demanding and hungry for growth in all spheres of life.

One of the crucial ingredients for this transition to be smooth would be the availability of abundant 'energy'. According to the Central Electricity Authority, India's per capita electricity demand in 2018-19 was 1,181 kWh, a number fairly lower if compared to the more developed economies of the world. This figure is slated to see a rapid rise as India rides ahead on the path of development. According to the think tank Brookings, in India, the level of electricity consumption achieved by 2030 could be 35-43 TWh, growing at 5.0-6.3 percent CAGR from 17 TWh in 2015. To reach this level of consumption, the country would require a drastic boost to its energy generation capabilities.

Today, the primary source of fulfillment of India's electricity needs comes from nonrenewable resources. While we have an abundant supply of coal currently, this source of energy is being met with an increased amount of criticism worldwide, primarily due to the damage the burning of coal does to the environment. Over the years, India has faced increased criticism worldwide for its huge coal led carbon emissions. Not only this, but the use of coal is also limited only to a certain future after which the resource will get exhausted.

The question then arises, how do we fulfill the ever-increasing energy demands of the Indian population, and at the same avoid damage to the environment?

The answer lies in, 'renewables'. While India has a landscape that can provide abundant renewable energy led generation, this would not come at the cost of degradation of the environment. According to research firm JMK Research and Analytics, India's renewable capacity installations reached 86 gigawatt (GW) as of 31 December 2019. This represents about 23 percent of the total installed electricity generation capacity in the country, which is around 366 GW. Renewables capacity has registered an impressive CAGR of 17.5% from 2015-19. This has been possible largely due to the conducive policy environment fostered by the Central Govt. Technological breakthroughs have further pulled down prices making renewables commercially viable and the good news is India has still huge untapped potential for both wind and solar. Therefore, the challenge is to strengthen the grid to enable increased absorption of renewables and deal with challenges of variability and demand response. Another key issue is to check the high quantum of

AT&C losses, mainly due to operational and financial inefficiencies that plague state distribution companies. There is also a need to review the tariff structure where currently industrial and commercial customers heavily cross subsidize agricultural and residential customers. As transition to green energy picks up pace, two key issues need focus:

1. **Grid Flexibility for increased integration of renewables whose supply will vary and simultaneous curtailment of other power and**
2. **rapid deployment of battery storage systems.**

To sustain the renewables momentum and meet the new targets set by Government, it is estimated that an investment of USD 144 Bn is needed from 2017-22. The Central Govt. has taken several positive fiscal measures to attract higher flow of investment – both domestic and international. However, counterparty risk, grid risk, and currency risk still continue to dampen investor sentiments and need to be addressed. In addition, dearth of affordable long term debt, infrastructural bottlenecks and difficulties in acquisition of land are other factors slowing down the renewables expansion.

Moving onto mobility, India is distinct from the West in that cars actually constitute a meagre share of the vehicular mix, though it accounts for a bulk of the carbon emissions. The National Mission on Transformative Mobility & Battery Storage was set up in 2019 to drive the transition towards clean mobility. This is necessary to both reduce dependence on oil imports and reduce emission of carbon. While the Govt. has announced several incentives for EV manufacturers and customers and several states have declared aggressive targets, fact is there are still quite a few barriers. These include pre existing investments by auto companies in ICE, lack of expertise and spare parts, falling price of oil, slow progress on charging infrastructure and lack of clarity around battery swapping.

Innovation will also be a critical driver of energy transition in India. This is not just R&D but simultaneous technology push and market pull. The Government needs to incentivize innovation through funding and policy changes, there should be supporting infrastructure, innovative business models and new financial instruments. Compared to other Asian nations, research in India has a much lower share of GDP. Further, in India public sector sponsors more R&D than the private sector, as opposed to what happens in the West. Digital innovation is another emerging area which can contribute to deployment of renewables and boost energy efficiency in buildings and mobility – for e.g. advanced metering solutions or smart meters. India is slowly moving towards installing more smart meters. It is important to explore high impact digital interventions and see how digitization can help wind and solar power plants become more efficient. Digitization can also help fast track e-mobility.

By 2030, the government of India wants to achieve 450 GW of energy capacity, solely by renewables. To achieve this number, by any means, would require a huge impetus, both by the government and the private sector, especially the current big players in the renewable energy industry.

## ROUNDTABLE ON Innovation & India's Energy Future Co-Hosted By ReNew Power & Stanford Precourt Institute Of Energy

### THE PARTICIPANTS

**Sumant Sinha**  
CEO ReNew Power

**Sally Benson**  
Co-director, Stanford  
Precourt Institute for  
Energy Stanford University

**Dr. Varun Sivaram**  
Former CTO ReNew Power

**Vaishali Nigam Sinha**  
Founding Chair ReNew  
Foundation

**Yi Cui**  
Professor and Co-Director,  
Storage X Initiative  
Stanford University

**Liang Min**  
Managing Director, Bits &  
Watts Initiative Stanford  
University

**Thomas Heller**  
Professor and Director,  
Sustainable Finance  
Initiative Stanford  
University

**Vijay Menghani**  
Chief Engineer Central  
Electricity Authority

**Kanika Chawla**  
Director CEEW Centre for  
Energy Finance

**Aditya Ramji**  
Economist Mahindra &  
Mahindra

**Jagabanta  
Ningthoujam**  
Senior Associate Rocky  
Mountain Institute (RMI)

**Rashi Gupta**  
Managing Director Vision  
Mechatronics

**Sanjay Bajpai**  
Head, Technology Missions  
Division Department of  
Science and Technology  
(DST)

**Ambuj Sagar**  
Professor & Head, School of  
Public Policy IIT Delhi

**Arunabha Ghosh**  
CEO Council for Energy  
Environment and Water  
(CEEW)

**Vinay Rustagi**  
Managing Director Bridge  
to India

**Sneha Sachar**  
AEEE

**Satish Kumar**  
AEEE

**Rahul Walawalkar**  
President India Energy  
Storage Alliance (IESA)

**Satyajit Phadke**  
Industry-Academia lead  
IESA

**Rahul Tongia**  
Senior Fellow Brookings

**Arun R**  
Associate Vice President  
Infosys

**Amit Bhatt**  
WRI

**Jitendra Kulkarni**  
VP Innovation Softbank

**Vivek Sen**  
Associate Director - Power  
Shakti Sustainable Energy  
Foundation

India's energy transition is happening. And it is happening at a steady pace. However, where do we stand today, what are the challenges, and what does the future look like? These are the questions that confront policymakers, industrialists, researchers, and experts in the field. To answer some of these and to get different perspectives on the pace of energy transition in India, **ReNew Power and Stanford University's Precourt Institute for Energy** came together to host a day-long discussion on 'Innovation and India's Energy Transition'. The roundtable, held at ReNew.Hub on 7th February 2020, saw participation from government officials, sectoral experts, professors from the Stanford University and industry professionals.

The first half of the event saw members of the Stanford delegation present facts and learnings from key projects that they are leading. **Prof. Liang Min spoke about the Bits and Watts initiative** that he is leading and how it is fuelling innovations for a modern, automated grid. **Prof. Yi Cui shared latest trends in storage research** and predicted a robust growth in storage market in near future. He shared the biggest challenge in storage is to bring down cost and come up with an affordable yet safe and long lasting battery. For this, advanced research is being conducted using informatics and AI. **Prof. Thomas Heller spoke about the important role of funding and policy support in catalysing energy transition.** This was followed by introductory comments by **Sally Benson who was leading the Stanford delegation.** Sally stressed on the fact that India has to play a central role in adopting and mainstreaming of clean energy and to a large extent India will be showing the way and setting the stage for rest of the world. This is the reason why it was important to understand in depth the current state of the clean energy sector in India, its future, and identify specific opportunities for industry academia collaboration to drive growth of the renewables sector and the entire clean air ecosystem.

This led to the first of three scheduled panel discussions titled "**The Power Sector at the centre of India's energy transition**". Kicking off the discussions, **Sumant Sinha, CMD, ReNew Power** pointed out how the challenge for India in terms of the energy transition is different from the west. Sumant said, "In the western world, the challenge is substituting capacity. In India, it is to create new capacity." He said India's per capita consumption of electricity is only 1.4 trillion units which is a quarter of the rest of the world's consumption. Coal currently accounts for 2/3 rd of the energy generated. This consumption is expected to double by 2030- renewables alone cannot meet this incremental demand even if India managed to inch very close to target capacity. Nuclear and gas are not feasible options due to high cost, long gestation periods and import dependence. Hydro projects need



Arunabha Ghosh  
CEO, CEEW



Prof. Liang Min  
Stanford University

a bunch of environmental clearances making them unattractive. So coal will be a big source of meeting the incremental demand for energy. So if India emits more carbon, to balance out other countries, we will have to cut back ".

Sumant noted that renewables are now cheaper option than coal. According to a report by research and consultancy firm Wood Mackenzie, India has emerged as the market leader with the lowest renewable energy cost in the Asia Pacific. According to the report, India's levelised cost of electricity (LCOE) using solar photovoltaic has fallen to USD 38 per megawatt-hour (MWh) this year, 14 percent cheaper than coal-fired power. Further, price in renewables remain fixed for 20-25 years while that of coal see more frequent hikes.

However, even if the costs of renewable energy are declining in India, there still remain significant constraints to growth. Land acquisition is a complex process, Discoms are in poor financial health and not able to pay generators their dues and State Governments are not as focused on climate considerations as the Central Govt. This was corroborated by **Mr. Vijay Menghani** a senior engineer with CEA who said that power sector transformation was a collective responsibility and was being held back by lack of coordination between Centre, States and government agencies. He also sought international expertise in areas like data analysis, monitoring and technology as the Central Govt. worked to remove the bottlenecks.

India has recently been seeing a stagnation in investments in the renewable energy sector. **Kanika Chawla of Council Energy, Environment and Water**, put the above in order by mentioning investment in renewable energy in India has dropped to only about \$10 billion a year vis-a-vis the amount required for the transition, but this would still be second only to China. Kanika pointed out the absence of a deep bond market and the various risks that made investors shy away like policy instability, counterparty risk etc. Rising NPAs indicate that we may need to rethink our borrowing pattern. "Learning curve for capital is similar to the learning curve for the tech - but the capital curve is now expected to be very fast in renewable deployment", she added, pointing out how this number is slated to increase over the coming years. Kanika stressed on the need for mainstreaming green finance as we can't rely too much on public money which has competing uses.

**Sneha Sachar** raised an important point when she said we cannot look at supply side in isolation and that for renewables demand side load management will be key while **Rahul**



Prof. Sally Benson  
Co-Director, Stanford Precourt  
Institute for Energy



Prof. Thomas Heller  
Stanford University

**Walawalkar** cautioned against focusing too much on aspirational end goals without fixing initial gaps. **Vivek Sen** made an important point regarding Discoms, saying it is they who need to drive the transition on the ground but are in disarray; he called for training Discoms in technology and innovations. **Jitendra Kulkarni** spoke about merging Discoms to form a central entity and also suggested incentivizing high performing Discoms. **Arunabha Ghosh** talked about electricity transition, energy transition and economic transition being intimately connected and that we need to reimagine economic future and find space for energy solutions to drive it.

**Deepak Gupta from ReNew Power** spoke about developing a Total Cost framework instead of the Least Cost model that is currently in use. He acknowledged the Central Govt.'s support in speeding up energy transition but said we need to see the role of coal, push through broad sectoral reforms, focus on grid management and ensure financing at scale. He stressed on collaboration between academia, industry and civil society in solving the energy problem.

Next up was a session on **Transportation: Role Of Advanced Mobility Technologies**. **Aditya Ramji** mentioned that better urban planning and not necessarily electrification of mobility was key to emission reduction. He said that electric cars were mostly run by fleet owners who had figured out a way for charging via captive infrastructure. He drew attention to the facts that battery standards had not yet developed fully in India and state of R&D too was poor. **Jagabanta Ningthoujam** highlighted the disconnect between electricity planning and transport planning and suggested treating batteries like a fuel so that capex on cars would be reduced. **Arunabha Ghosh** shared that EV is driven by industrial policy and not emissions and suggested that India must carefully decide which part of the EV value chain it should tap. **Prof. Ambuj Sagar** disagreed with the focus on EVs stating that it was a very expensive route to decarbonisation.

Finally, it was time for the concluding session of the day, **Innovation and India's Energy Future**. **Sanjay Bajpai** from the Department of Science & Technology shared that the DST had shifted from subject specific focus to interdisciplinary focus and were concentrating on energy. He stressed on the importance of capacity building through public funded R&D to drive clean energy transition. He said the DST would be scouting for industry partners and wanted to replicate the success of the Stanford model.

India's energy transition wouldn't just need a financial and a policy push, however much thrust will also come from innovation. Several experts over the years have recommended India to take a path laden with innovation to smoothen India's energy transition.



Prof. Yi Cui  
Stanford University



Vijay Menghani  
Chief Engineer, CEA

**Ambuj Sagar, Head, School of Public Policy at IITD** during the discussion pointed out how 'India is a greenfield economy with brownfield thinking'. He also pointed out that India has a weak and fragmented innovation set up, spending only 0.7 percent of its GDP on R&D (private sector contributes 40%) and that this needs to increase to develop an innovation-led culture. He felt that research institutions can act as the bridge between advances in technology and social needs and complimented MIT and Stanford for addressing the biggest energy challenges of the world. **Dr. Rashi Gupta** advised India to play to her strengths and focus on areas like software, electronics, manufacturing among others. She advised against relying on a single technology and suggested tie ups and collaborations to push ahead in testing infrastructure, sustainable storage solutions and other areas. **Rahul Tongia** argued for a focus shift from supply side to demand side, while Vijay Menghani shared that little knowledge was available on which institution was researching what. He lamented the fact that researchers were working in silos and not connecting and collaborating for synergies in similar research work. He also said that industry was not exerting enough pressure on GOVT. to release all data. **Satish Kumar** shared some interesting insights around decarbonizing the building sector. He called for performance based and not prescriptive codes to make energy efficient building designs and policies for specification building materials. He felt Stanford could help develop a problem solution matrix for India - mapping solutions to specific problem areas.

## Summing Up

**Arunabha Ghosh** summarized the discussions identifying 2 major problem areas. Firstly, we lack the institutions to manage disruptions. Transitions are grey and the time horizon for different constituencies to move from one state to another is extremely hazy. Secondly, he noted that the economy had slowed down with high unemployment and subdued consumer spending. Climate action during economic recession is always going to be a hard sell. He identified the following areas where Stanford can help with their expertise:

1. Energy systems focus - Zero Emission Energy Systems and Storage X
2. Mobility - Urban Planning, Access, Externalities, Cross country rail
3. StorageX - Finding the spot in the value chain where India can best fit in
4. Circular Economy - Recycling of critical minerals

Arunabha also felt that India could do well to emulate Stanford in innovation strategies such as organizing faculty across programmes who are focusing on the same problem for more coherent research, performance driven innovations like for energy efficient buildings, areas where technology is ready for deployment but business model is yet to be figured out and in next generation technologies.

## Key Comments

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We need to radically accelerate Zero Emission Energy Solutions and for this we need to rely on technologies. Open source models and tools for system integration and supportive policy frameworks will also expedite this process.

**- Sally Benson**

*Co-director, Stanford Precourt Institute for Energy Stanford University*



While the transition to renewables has been happening steadily, there is still a lack of coordination between the central and the state governments. If this gets solved, better coordination would put India on track of becoming a renewable energy powerhouse.

**- Vijay Menghani**

*Chief Engineer Central Electricity Authority*



Public funded R&D with private sector help and industry partner association is needed to accelerate clean energy transition.

**- Sanjay Bajpai**

*Head, Technology Missions Division Department of Science and Technology*

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We know what the future of the energy systems looks like however what are the institutions that can get us there and where will the capacity lie?

**- Thomas Heller**

*Professor and Director, Sustainable Finance Initiative Stanford University*



India is transitioning however we still have power sector policy constraints which include:

- State Governments' policymaking very far from climate change considerations.
- Central govt. more forward thinking but can only set guidelines.
- Least cost power trumps any climate change consideration at state level.

**- Sumant Sinha**

*Chairman and MD, ReNew Power*



We have a target for electricity sector transition, but no narrative for energy transition, and no discourse for economic transition. However, it is obvious that they are all intimately connected. And talking about one without the other does not make sense.

**- Arunabha Ghosh**

*CEO Council for Energy Environment and Water*

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## Recommendations

- Today, as India stands on the brink of an energy revolution that will go on for decades, it is essential that the country's education systems and private industry come together and work towards building momentum for this transition. A lot of new opportunities for research and innovation are available today and private industry can provide a lot of support to education institutions primarily by providing essential resources and equipment, funds, practical and hands-on experience, students tours to manufacturing units, etc. An example of industry-academia partnership is the ReNew Power Centre of Excellence at IIT Delhi, the aim of which is to promote research in the field of renewable energy.
- The government must also start focusing on infrastructure upgradation. As the country upgrades itself, the country's infrastructure will have to keep up with this transition. The government should now focus on green buildings, electric transport such as EVs, pods, etc., cleaner waste management systems. India also needs a renewed push towards smart cities, a flagship project which went off track due to systemic issues.
- Lastly, and most importantly, all of this requires a heavy policy push from the government. This is not just limited to taking off import barriers and promoting exports in the sector, but also incentivizing financial deals, providing funds to India's Discoms (which badly need them to sustain their existence), and motivating states to adopt renewable energy projects in the longer run.



Participants at the roundtable on "Innovation and India's Energy Future"

## KNOWLEDGE SHARING

- Energy Storage
- Geopolitics of Energy Transition

## 3. Energy Storage

### Context

Today, India is leading the way globally in renewable energy production. With almost 87 GW of installed capacity, we are amongst the top five globally in terms of renewable energy capacity installed. Not only this, but we have also set highly ambitious targets in the future, targets if achieved would land us at the vanguard of the global clean energy revolution.

Renewable energy has been a boon for India. While it helps fulfill the electricity demands of millions of Indians, it does so by mitigating carbon emissions thereby keeping the environment clean.

However, one of the major challenges that the renewable energy industry faces today is the problem of intermittency. While renewable resources would never run out, those such as wind and solar have changing patterns. The sun wouldn't shine the entire day. Even with wind energy, one can see changing patterns of wind speed, wind direction, etc. This variability in renewable energy generation can lead to various problems including grid instability and shortage of supply when the demand is high, among others.

### Storage

Intermittency can be contained if power can be stored. Thus today, a lot of research is being put into the science of battery storage for renewable energy. According to International Renewable Energy Agency (IRENA), Utility-scale batteries can enable a greater feed-in of renewables into the grid by storing excess generation and by firming renewable energy output. Furthermore, particularly when paired with renewable generators, batteries help provide reliable and cheaper electricity in isolated grids and to off-grid communities, which otherwise rely on expensive imported diesel fuel for electricity generation.

India, with its high renewable energy production and complicated grid structures, needs advanced storage technology to deal with the problem of intermittency. We have vast and diverse geography with grids penetrating in deep corners of the country's landscape. As more and more Indian states adopt renewables led electricity generation, it will only but become necessary to deploy storage technologies to contain the power generated. As of now, we have just taken baby steps in the direction, however, an ISGF report titled **"Energy Storage System Roadmap for India: 2019 - 2032"** mentions that the cumulative demand of Energy Storage Systems estimated by 2032 will be more than 2400 GWh which in itself is a strong case for setting up of giga-scale battery manufacturing plants in India on a fast track.

Meanwhile, the government has, in adherence to the above started showing keen interest in Energy storage. Only a couple of months ago, the Solar Energy Corporation of India concluded what it called the world's largest renewables-plus-energy-storage capacity tender. In the 1.2 GW hybrid plus storage tender, ReNew Power won 300 MW capacity of projects.

## ReNew Power Hosts Storage scientist and Co-director of Columbia Electrochemical Energy Center, Prof. Daniel Steingart at ReNew.Hub

The Indian energy storage market is slowly opening up. According to India Energy Storage Alliance, the total energy storage market between 2015 and 2022 in India is expected to go up from 4.4 GW to 70 GW. Out of 70 GW, over 35 GW of demand is expected from newer applications like wind and solar integration, frequency regulation, peak management, transmission and distribution deferral, diesel replacement, and electric vehicles.

Keeping in mind the emerging trends in the field of storage and to further the discussion on latest technologies in storage, ReNew Power hosted **Prof Daniel Steingart**, leading expert and co-director of Columbia Electrochemical Energy Center at ReNew.Hub in May 2019. Daniel is Stanley Thompson Associate Professor of Chemical Metallurgy at Columbia University and works on critically analyzing performance requirements in batteries. Prof. Steingart's research area includes batteries for EV, grid level storage, low cost batteries and hybrid design. This discussion was attended by Government officials, experts, young storage entrepreneurs and other guests from the field of renewable energy in India.

While Prof. Steingart's talk hinged around newer technologies in storage, several **key takeaways** resulted from the prolonged discussions among the participants. Some of them included.



Prof. Daniel Steingart with members of ReNew Power's Asset Management Team

## Key Takeaways

- India is finally seeing the emergence of a grid-scale energy storage market after years of anticipation.
- Infirm power penetration is gradually increasing in the grid in India and on a global scale, leading to 2 basic issues: (1) grid instability and backing down of plants leading to revenue losses for project owners and (2) Demand patterns are also shifting; early morning and evening peak loads. Storage (eg batteries) can help to some extent resolve (1) and (2) above.
- Batteries can feed power to the grid during peaking load requirements obviating the need for electricity production to be drastically scaled up in a short period of time i.e. transmission from the combination of generators plus storage facilities are maintained at a more constant level. In case of a drop in demand during the day, they can store energy that can be sent to the grid at a later time.
- However, the currently available technology for storage batteries is still at a nascent stage and is not well understood, thus limiting the scope for innovation.
- While building a battery one has to consider 4 different factors - energy density, power density, cycle life/operating expenses, and capital cost. These 4 variables form the corners of what researchers call the “Unfortunate Tetrahedron”.
- No battery will be a perfect solution for everything. There will be trade-offs that have to be made, if we focus more on 1 metric, we will have to give up some of the others - the task is to find an optimal solution that is affordable.
- New ways have been identified to make batteries more efficient, for example, keeping LMO Cathode and Graphite Anode.



Prof. Steingart with Vaishali and Sumant Sinha and Urji, the ReNew Power mascot

## Key Recommendations

- The key to developing effective storage solutions is the cost involved - India is a price-sensitive market and hence it is up to researchers to come up with batteries that are affordable. India needs to put a lot of funds into research and development and equip its central universities with the latest technologies, especially concerned with battery research.
- Industry academia collaboration will also help steer more focused research in this direction. While Industry academia collaboration in India has taken speed in the past decade, partnerships in battery research have been minimal. A renewed focus in this direction can help the country create domestic expertise in battery systems, which will in turn help India’s renewable energy capacity goals.
- To motivate more work in the field of storage, the government of India can look to subsidise and incentivize storage led imports. It should also give tax rebates and concessional advantages for the same.
- According to the EY-FICCI report titled, **Battery Storage - The Next Big Energy Frontier**, the government can provide financial help by setting up a fund for accelerating the deployment of grid-scale energy storage projects by Discoms in the early years. The government, in turn, can be benefited as the Discoms can explore learnings from these projects. This can help address technology, policy, and commercial risks.
- The government can also work on sourcing essential elements such as cobalt and lithium from outside and use them to domestically manufacture Li-ion batteries. This will decrease dependency on battery imports and will strengthen domestic manufacturing, also, in turn, adding impetus to Prime Minister’s Make in India initiative.



Prof. Daniel Steingart addressing ReNewers

## Key Comments



Columbia Electrochemical Energy Center, set up in 2018, is conducting research to advance the current storage technology and aiming to reduce storage costs and/or increase efficiency of storage. This is a journey of innovation by compromise. Storing energy has been a primary challenge for all of humanity. Batteries require metrics that are physically at odds with each other. Innovation in energy storage involves appreciates and dealing with these compromises. This is what the CEEC is doing.

**- Daniel Steingart**

*co-director of the Columbia Electrochemical Energy Center and David Livingston, the deputy director in the Atlantic Council's Global Energy Center*



Today, advantages of energy storage include-

- Electricity generated by intermittent sources can be stored and used later, whereas it would otherwise have to be transmitted for sale elsewhere, or shut down
- Peak generating or transmission capacity can be reduced by the total potential of all storage plus deferrable loads, saving the expense of this capacity
- More stable pricing - the cost of the storage or demand management is included in pricing so there is less variation in power rates charged to customers, or alternatively (if rates are kept stable by law) less loss to the utility from expensive on-peak wholesale power rates when peak demand must be met by imported wholesale power
- Emergency preparedness - vital needs can be met reliably even with no transmission or generation going on while non-essential needs are deferred

**- Sumant Sinha**

*Chairman and MD, ReNew Power*



Today, the focus of governments world over is energy independence for their citizens. Energy storage holds the key to energy independence since storage will ensure anywhere anytime energy supply, independent of source. Stable and affordable storage solutions will open new frontiers in renewables driven transformation of the Indian economy - from decarbonisation to last mile energy access resulting in enhanced quality of lives and greater opportunities.

**- Vaishali Nigam Sinha**

*Chair, ReNew Foundation*

## 4. Geopolitics of Energy Transition

### Context

Historically, energy dynamics has played a key role in determining geopolitical relations, fortifying economies, catalysing coalitions and on occasions, spurring conflicts. Oil has governed geopolitics for a long time, with memories of the Gulf War still fresh. However, presently it is the spectre of climate change, coupled with the economics of renewables that is shaping the geopolitical order, by triggering a transition from traditional sources of energy to renewables. Countries are at different stages in this transition, some are still dependent on coal and oil, while others have shifted a long way towards renewables.

This energy transition is likely to usher in a new era of geopolitics due to the very nature of renewables. While fossil fuels are concentrated in specific geographies renewables are freely available, thus democratizing energy. Also, renewables take the form of flows, which are harder to disrupt, vis-a-vis fossil fuels, which are exhaustible stocks. Again, deployment of renewables is relatively scale neutral, thereby making it a better fit for decentralized forms of energy generation and consumption. Lastly, unlike fossil fuels, renewables have decreasing marginal costs, which enhances their ability to drive change. Decarbonisation policies, technological innovations in renewables and their increasing deployment in the energy mix of countries could induce a paradigm shift in geopolitics.

#### There are five major geopolitical implications of this energy transition:

Firstly, oil surplus nations are likely to see a diminution in their strategic advantages as oil importers shift to renewables, to reduce their import burden and associated geopolitical risks. OPEC countries and those in the MENA region which have traditionally had less diversified economies and have not invested or innovated much in renewables will face challenges as revenues from oil and gas exports decrease, if the energy transition happens faster than expected.

Secondly, a growing electrification of transport, could see the value of internal combustion engines decline. Experts predict a price parity between internal combustion engine cars and electric vehicles in the near future. Countries innovating in batteries and electric cars will be able to reap the industrial and economic benefits of this transition, and enhance their "hard" and "soft" power.

Thirdly, as energy transition enhances electrification, we are bound to see cross-border trade of electricity. We could have more interdependent power systems and grid enlargement might see cross border cooperation like in the Middle East, or you might see traditionally hostile countries strategically avoiding interconnecting their grids, due to feared loss of control. As renewables focused countries work on digitizing electricity grids that mitigate variability, they might become vulnerable to cyber security threats from hostile groups who could potentially hack into these systems and disrupt power supply and/or extrapolate information to cause socio-economic unrest.

Next, we may see minerals at the heart of the energy transition open up another geopolitical conundrum. With many minerals like cobalt, used in batteries, being produced in conflict zones the security of the supply chain and the humanitarian risks associated with the supply of these minerals comes in to question, bringing its own geopolitical risks into the mix.

Last but not least, trade and industrial policy will also undergo a shift as countries begin to use “free” resources to produce energy, democratizing the energy paradigm. There will be cases of protectionism through imposition of tariffs sparking a whole new paradigm of trade wars, closing some doors and opening others elsewhere.

The new geopolitics of energy is bound to see some dislocations enroute. Some economies will move smoothly to a clean energy future, others will move in fits and starts. It’s going to be disorganized, yet inevitable, in order to combat the huge threat of climate change. The energy transition will usher in a new era of geopolitics, with oil being stripped of its pre-eminence.



David Livingston, Deputy Director, Atlantic Council's Global Energy Centre, delivering a talk on “The Geopolitics of Energy Transition”

## Geopolitics Of Energy Transition - A Talk by Prof. David Livingston on 10th June 2019

On 10th June 2019, ReNew Foundation organized a knowledge sharing session on the Geopolitics of the Energy Transition, led by David Livingston, the deputy director in the Atlantic Council’s Global Energy Center and a fellow of the Initiative for Sustainable Energy Policy at John Hopkins University. Catherine Fischer, Public Diplomacy Officer of the North India Office of the US Embassy, and Kavleen Chatwal, Economic and Political Specialist at the US Embassy also helped facilitate the session.

In the session, after an introduction by Sumant Sinha, CMD, ReNew Power, Livingston elaborated on the historical drivers of geopolitics with respect to energy, the declining importance of oil in shaping geopolitics and economies, and deliberations on whether we have reached peak fossil fuel demand. Livingston also went on to talk about the rise of the electric vehicles industry, and how the economics of the industry is set to alter geopolitics, including implications on the global value chain of this industry. Livingston spoke about the implications of interdependent power systems and grid enlargement during the energy transition, and the need for innovation boosting for industries to adapt to the new global order of more electrification due to the energy transition. The transformation of economies as per the energy transition, and the shift in geopolitical power as a result of the decline in oil, which is happening in a linear way, was also brought up by Livingston.

The extremely insightful session provided a new perspective on the structural changes the world is about to experience as a result of the energy transition, which, as brought out clearly in the session, has more than just individual, local, sub-national and national implications, and the effects of this transition will create a paradigm shift in the hard and soft power of various countries, as the economic relevance of previous geopolitical drivers such as oil, comes to a resounding end. The session also highlighted that the global concentration of power will be more dispersed at the culmination of the energy, as renewables take the forefront, which is more decentralized as compared to traditional sources of energy, found in concentrated geographical pockets, and India can easily reap benefits from this transition due to its aggressive renewable energy agenda and targets. Livingston also concluded that the energy transition may not be universally smooth. Some will move towards the clean energy future in bits and patches, and we need to be cognizant that the overhauling of energy systems might be a bit “disorganized”, thus economies need to increase their energy transition preparedness.

### Key takeaways

- The energy transition is set to alter geopolitics as renewable energy resources are available in one form or another in most countries, unlike fossil fuels which are concentrated in specific geographic locations. This reduces the importance of current energy choke points, such as the narrow channels on widely used sea routes that

are critical to the global supply of oil. Most renewables take the form of flows, whilst fossil fuels are stocks. Energy stocks can be stored, which is useful; but they can be used only once. In contrast, energy flows do not exhaust themselves and are harder to disrupt.

- Another reason why the energy transition will impact geopolitics is that renewable energy sources can be deployed at almost any scale and lend themselves better to decentralized forms of energy production and consumption. This adds to the democratizing effects of renewable energy. Renewable energy sources have nearly zero marginal costs, and some of them, like solar and wind, enjoy cost reductions of nearly 20% for every doubling of capacity. This enhances their ability to drive change but requires regulatory solutions to ensure stability and profitability in the power sector.
- Decarbonisation policies and development of renewables and electric cars will cause a paradigm shift in geopolitics. When it comes to energy-importing countries, the consequences will undoubtedly be positive, as they will favour a rise of renewables which will decrease their national import bills and associated geopolitical risks. However, for oil-producing countries, this energy transition will imply a loss of strategic geopolitical advantages as countries sway away from traditional sources of energy.
- There will however be new geopolitical challenges which arise as a result of the transition, especially for oil and gas-producing nations, with a less diversified economy, who still haven't invested or innovated much in renewables, while depending on the revenue from oil and gas exports. The Middle East and North Africa are examples of this, where despite efforts for economic diversification, are still dependent on oil and gas revenues. They will see serious consequences from an economic and geopolitical standpoint, if the energy transition happens faster than expected.
- While countries investing and innovating in renewables will certainly see geopolitical advantages, the associated increase in electrification will see rise in cross-border trade of electricity. There will also be smart electricity grids to mitigate variability and to ensure stability with renewables (which require flexible energy systems) and thus the digitization of electricity grids might pose security threats as hostile groups may have the potential to hack into these systems and shut off power or extrapolate information to cause social and economic unrest.
- Minerals at the heart of the energy transition, like cobalt used in batteries will have their own geopolitical risks. With conflict zones producing many of the minerals required in the energy transition, there can be economic and geopolitical implications due to the security of the supply chain of these components of the energy transition.
- Trade and industrial policy which are important components of geopolitical relations will also see a shift as countries begin to use "free" resources to produce energy, democratizing the energy paradigm. There will be cases of protectionism as countries impose tariffs on renewables but however geopolitical risks as a whole will decrease as countries indigenize production of renewable energy.

## Key Comments



Oil has historically driven geopolitics. Regardless of the specific energy scenario that we look at in the future, in any energy scenario, there will be a peak demand in oil. There will be a long term decline in traditional energy sources and renewables will transform geopolitics.

On the precipice of World War 2, Winston Churchill decided to convert the British fleet from coal powered to oil powered. Now they would have to import the oil, but he wanted a more powerful fuel, which accelerates faster. That was an instance of how securing oil became of paramount importance. Historically, oil exporters used oil markets as mechanism to gain geopolitical advantage.

There is disagreement over peak fossil fuel demand. But all agree that peak fossil fuel demand is coming. There needs to be energy innovation to make clean energy cheaper today. If efficiency measures take off, or if we have electric vehicles, or we shift to fuel switching, we would require significantly lesser barrels of oil. Electrification of transport is the next big trend. By 2022, there will be Internal Combustion Engine/Electric Vehicle parity. EVs are coming of age even sooner. They will have a 15% market share by 2025. Auto makers are also signalling that EV is on the rise. The first million EVs is difficult then momentum takes over. The first million EVs took 240 months, second million took less than 30, third million took less than 15.

Fossil fuel exporters are likely to see a decline in their global reach and influence unless they can reinvent their economy for a new energy era. The decline of oil demand will not be a linear story. It will be a rocky, non-linear ride as refineries across the world reshuffle to maximize the products which are not in decline. Conflicts over critical minerals might increase like cobalt. There will be interdependent power systems. Grid enlargement might see cooperation like in the Middle East. Or you might see countries which should interconnect their grid might not want to do so, due to loss of control. There might be many painful dislocations in this new geopolitics of energy. Some economies will move smoothly to a clean energy future, others will move in fits and patches. It's going to be disorganized.

**- David Livingston**

*Deputy Director, Atlantic Council's Global Energy Centre*

## Key Comments



We tend to confuse electricity with energy. There is a transition when it comes to electricity. We live in fairly volatile times. So far US had provided stable leadership, but now we are seeing a seismic shift. Financial markets are affected. We have seen the geopolitics of oil. We are now seeing rivalry in newer areas like solar.

**- Sumant Sinha**  
Chairman and MD, ReNew Power



It will not be naïve to say that India will certainly benefit geopolitically from the energy transition, as its dependence on energy imports will decrease. India is already at the helm of the International Solar Alliance, giving it a strategic geopolitical advantage in the realm of geopolitics of this energy transition. The renewables industry in India, with its rapid expansion will favour India's position in international dynamics. The energy transition is mainly fuelled by declining costs, pollution and climate change, renewable energy targets, technological innovation, corporate and investor action, and last but not the least, public opinion.

**- Vaishali Nigam Sinha**  
Chief Sustainability Officer, ReNew Power

## Recommendations

- In India, we have seen the Government in recent times take several steps to boost the renewables sector and reduce dependence on fossil fuels. A steady growth in renewables capacity, would help India get closer to energy self-sufficiency and would make it less dependent on imports, and avoid associated shocks due to price and exchange rate volatility. Therefore, increasing renewable energy capacity year-on-year, while meeting national targets, with the MNRE taking the lead in increasing investments and employment in the sector can help India achieve this sufficiency and boost its geopolitical power. Fostering programs for domestic manufacturing will reduce supply chain risks with respect to the global value chain of renewables, while reducing dependence on oil imports through wider renewables access can help India capitalize on the energy transition from a geopolitical lens.
- With the Indian Government having already unveiled a roadmap for adopting electric vehicles by 2030, there might emerge a new trade dynamic, with India targeting the markets in less transitioned countries for export of electric vehicles. However, the roadmap has to be more crystallized, with the private automobile manufacturing players given sufficient incentives to transition to producing more electric vehicles. Significant investments in building the electric charging infrastructure of the country have to be made, for a smoother transition, along with ensuring that these charging stations are also connected to the renewables grid, to reduce traditional energy dependency even further.
- Even as India transitions to renewables, the minerals required for this shift may have to be imported from these conflict zones, a risk which India will have to assess carefully, adopting a humanitarian stance. There will need to be supply chain assessments and audits done while boosting renewables and EVs, to ensure that not only do these minerals come from non-conflict zones, but also that sustainable mining of these minerals is done so as to not further exacerbate environmental degradation or aggravate social unrests. The government of India can make ethical and green sourcing of raw materials mandatory for players involved in the energy transition.
- USA imposing tariffs on solar cells and modules from China, could be a silver lining for Indian manufacturers. We may also see capital and technology emerging as points of contention or cooperation. Any transfer of technology from developed to developing nations will not be without its share of tensions. There may also be conflicts around renewable energy infrastructure, if there is an asymmetrical dependency between producers and consumers. To reduce this asymmetry, global cooperation and knowledge-sharing with respect to innovations and technology dissemination spearheaded by India can be a defining factor to reduce India's own geopolitical risks associated with the energy transition.

- The energy transition will also result in new coalitions, which will form the dominant narrative in geopolitics, such as the International Solar Alliance, with Prime Minister Narendra Modi even declaring that “ISA will play the role of OPEC in the future”. India can provide strategic leadership in these coalitions which favour not only India’s economy and energy security, but also the whole of South East Asia, so as to ensure more regional stability in the impending energy transition and ensure a greater degree of cooperation in the endeavour towards a sustainable future where India can clearly emerge as a global climate leader.



Snippets from Prof. David Livingston’s session on Geo politics of Energy Transition at ReNew.Hub



## About ReNew Foundation

ReNew Foundation is the philanthropic arm of ReNew Power, working towards creating sustainable communities through access to clean energy in rural and semi-rural areas.

Established in the year 2018, ReNew Foundation aims to scale up its efforts in the area of energy access with a focus on last-mile electrification in rural areas.

ReNew Foundation aims to develop sustainable solutions in the area of renewable energy which focus on energy access and thought leadership and to transform education through energy access and sensitize the youth towards the importance of using renewables.

Some of the thematic areas where ReNew Foundation works besides thought-leadership include amplifying the Lighting Lives program of ReNew Power and enhancing renewable energy advocacy among students through workshops and training sessions.

ReNew Foundation is a Section 8 company registered under the Companies Act 2013.



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