



Abetting UAE-India Alliance

Nangia Andersen LLP

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Report on

Modern Energy

Building sustainable resilience through collaboration India-UAE Partnership in Renewable Energy



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Foreword



Major General (Retd.) Sharafuddin Sharaf
Chairman - UIBC
(Vice Chairman - Sharaf Group)

In an era defined by rapid globalization and demand for sustainable development, the collaboration between nations becomes paramount. The partnership between India and the United Arab Emirates (UAE) exemplifies this synergy, particularly in the realm of modern energy initiatives. As both nations endeavour to achieve the United Nations Sustainable Development Goals (SDGs), their focus on renewable energy stands as a beacon of hope for a cleaner and more sustainable future.

This report is a collaborative effort of UAE-India Business Council (UIBC) and Nangia Andersen LLP, delves into the burgeoning opportunities within the modern energy sector, specifically within the India-UAE corridor.

The aim is to provide invaluable insights and strategic guidance to new entrants and existing companies alike, who are poised to capitalize on the vast potential within this dynamic landscape.

The major initiatives such as India's National Solar Mission and the Green Energy Corridor project, alongside the UAE's ambitious Energy Strategy 2050, underscore the unwavering dedication of both nations towards fostering renewable energy adoption. These frameworks not only highlight a shift towards sustainable practices but also present a myriad of opportunities for businesses to thrive in an increasingly green-centric economy.

Within the pages of this report, readers will find comprehensive coverage of various facets of modern energy initiatives. From solar and wind energy to emerging technologies like green hydrogen and electric vehicles, we explore the breadth and depth of opportunities available for investment and expansion. The report also sheds light on critical infrastructure developments such as Battery Energy Storage Systems (BESS) and Hydro Pump Storage Projects (PSP), pivotal in facilitating the transition towards a more resilient and efficient energy ecosystem.

We hope this study would be informative and instrumental in unleashing new prospects for businesses in renewable energy for both India and the UAE.

Foreword



Suraj Nangia
Managing Partner
Nangia Andersen LLP

As the global landscape evolves, the strategic partnership between the United Arab Emirates and India holds immense potential, driven by a shared vision of progress and prosperity. This serves as a catalyst for forging meaningful connections and facilitating dialogue between businesses, government entities, and thought leaders from both nations. By leveraging synergies and harnessing the collective strengths of the UAE and India, the council paves the way for mutually beneficial trade, investment, and cooperation across various sectors.

In an era where the urgent call to action for sustainable development resonates louder than ever, the energy sector stands at the forefront of transformative change. As the world struggles with the challenges of climate change and the imperative to decarbonize our economies, the shift towards renewable energy sources has become not only a necessity but also a beacon of hope for a cleaner, greener future.

As we delve into the details of the flourishing partnership between India and the United Arab Emirates in the modern energy sector, it is imperative to acknowledge the monumental strides achieved in the pursuit of a sustainable future. The collaboration between these two nations stands as a testament to the power of shared vision, strategic investment, and unwavering commitment to environmental stewardship. Through joint endeavours in modern energies, India and the UAE have not only propelled their own economies forward but have also set a compelling example for global cooperation in combating climate change.

Exploring the partnership between India and the United Arab Emirates in renewable energy, it's clear that big steps have been taken for a cleaner future. Together, these countries are making solar and wind energy more accessible and investing in new technologies. Let's use this as inspiration to keep working towards a sustainable future together.

As we navigate the complexities of the modern energy landscape, collaboration and knowledge-sharing will be paramount. Through forums such as the UIBC, we have the opportunity to exchange ideas, forge partnerships, and chart a course towards a sustainable energy future. This report captures the essence of our collective efforts and serves as a guiding light for future endeavours in building a greener, more prosperous world.

Foreword



Arindam Ghosh

Partner - Government & Power Sector Advisory
Nangia Andersen LLP

In the vast expanse of our global landscape, one sector stands at the forefront of transformation, innovation, and sustainability: the energy sector. As we navigate the intricate web of environmental challenges, economic imperatives, and societal aspirations, the imperative for change in how we produce and consume energy has never been more urgent.

In this pivotal moment, the world finds itself at a crossroads, where the choices we make today will shape the destiny of generations to come. It is within this context that the profound strides taken by the United Arab Emirates (UAE) and India in embracing renewable energy emerge as beacons of hope and inspiration. The modern energy transition, characterized by a shift away from fossil fuels towards cleaner, more sustainable alternatives, represents not just a technological evolution, but a paradigm shift in our collective consciousness. It is a testament to the unwavering commitment of visionary leaders and the relentless pursuit of innovation that the UAE and India have emerged as architects in this journey towards a greener future.

As we embark on this journey towards a sustainable energy future, it is imperative that we recognize the interconnectedness of our actions and the profound impact they have on the planet and its inhabitants. The decisions we make today will reverberate for generations, shaping the world we leave behind for our children and grandchildren.

In India, significant strides have been made in the energy sector, marking a decisive shift towards sustainability and innovation. The launch of the Green Hydrogen Mission represents a transformative journey, aiming to produce 5 MMT of green hydrogen annually by 2030, thereby reducing carbon emissions and fossil fuel imports across various industries. Noteworthy initiatives include blending hydrogen into city gas distribution grids by GAIL Limited, NTPC's introduction of hydrogen-blended fuel-cell electric vehicle buses in Leh and plans for constructing green hydrogen and green ammonia plants by various Indian companies. Additionally, the government's ambitious plans to expand the National Gas Grid, City Gas Distribution network, LNG Terminals, and nuclear power capacity signify a concerted effort towards diversifying the energy mix and ensuring energy security. The promotion of pumped hydro storage projects and collaborations for biofuel production underscore India's commitment to harnessing diverse sources of clean energy and advancing towards a sustainable future.

In this report, we have worked hard to capture the essence of this transformative moment in the energy sector. From groundbreaking innovations to bold policy initiatives, from technological advancements to cross-border collaborations, the report showcases the remarkable progress made by the UAE and India in spearheading the transition towards a cleaner, more sustainable energy future.



01

**About UAE- India
Business Council
(UIBC)**



01 About UAE-India Business Council (UIBC)

UAE-India Business Council (UIBC) is the Official Joint Business Chamber set up by both the Governments for promoting economic synergy between the UAE and India. UIBC was formally launched by His Highness Sheikh Abdullah bin Zayed Al Nahyan, UAE Minister for Foreign Affairs and Smt. Sushma Swaraj, Hon'ble Minister of External Affairs of India during 11th Session of the India-UAE Joint Commission Meeting on 3rd September 2015 in New Delhi.

UIBC aims to create an inclusive bilateral trade environment between UAE and India by linking businesses from both the countries, and supporting long-term commercial partnerships for developing strategic relationships between businesses and government officials from both the countries.

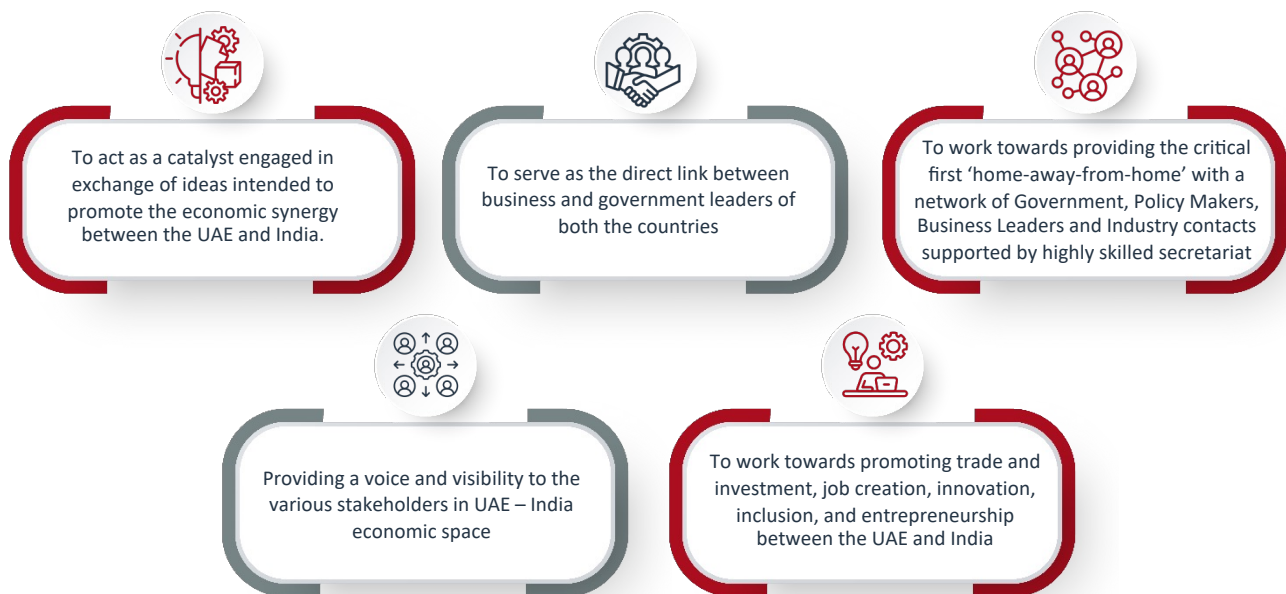


Figure 1: Mission of UIBC

UIBC acts towards promoting investment promotion and business collaborations/ JVs between UAE and Indian businesses by organizing B2B networking meetings, policy forums and investment focused events, delegations, and other facilities required to succeed. It serves to provide a voice and visibility to the various stakeholders in UAE – India economic space and work towards promoting trade and investment, job creation, innovation, inclusion, and entrepreneurship between the UAE and India.



02

**Executive
Summary**



02 Executive Summary

Highlighting the partnership between India and the UAE in the renewable energy industry, the report delves into key aspects of their collaboration. It emphasises the changing energy landscape, moving towards cleaner energy sources due to technological advancements, environmental considerations, and shifting consumer preferences. The report delves into the results of COP 28, highlighting worldwide initiatives to enhance climate ambition and support for climate actions.

The text explores the significance of energy efficiency in India's energy transition, highlighting initiatives such as the Just Energy Transition (JET) that target the reduction of greenhouse gas emissions and the promotion of a fair shift to renewable energy sources. India's report highlights the ambitious goals for expanding non-fossil fuel energy and emphasises the crucial role of energy efficiency in reaching these targets.

In addition, the report details the UAE-India Business Council's objective of enhancing economic cooperation between the two nations and fostering partnerships in the renewable energy industry. The document also covers the latest advancements and partnerships between India and the UAE in clean technology.

The report highlights the significance of working together and implementing sustainable strategies to enhance resilience in the renewable energy industry.





03

**Evolving Energy
Landscape**

03 Evolving Energy Landscape

Global energy infrastructure is currently experiencing a paradigm shift. Energy production and consumption have been unidirectional since long, with grids and utilities managing and distributing energy generated from conventional fossil fuels to consumers (including those in the commercial, industrial, residential, and transportation sectors). Energy was regarded as a simple commodity, wherein cost-effectiveness and dependability were prioritised. By default, fossil fuels were selected owing to their cost-effectiveness and widespread availability. The dominant approach involved procuring the most affordable energy source possible, guaranteeing a plentiful supply to maintain operations.

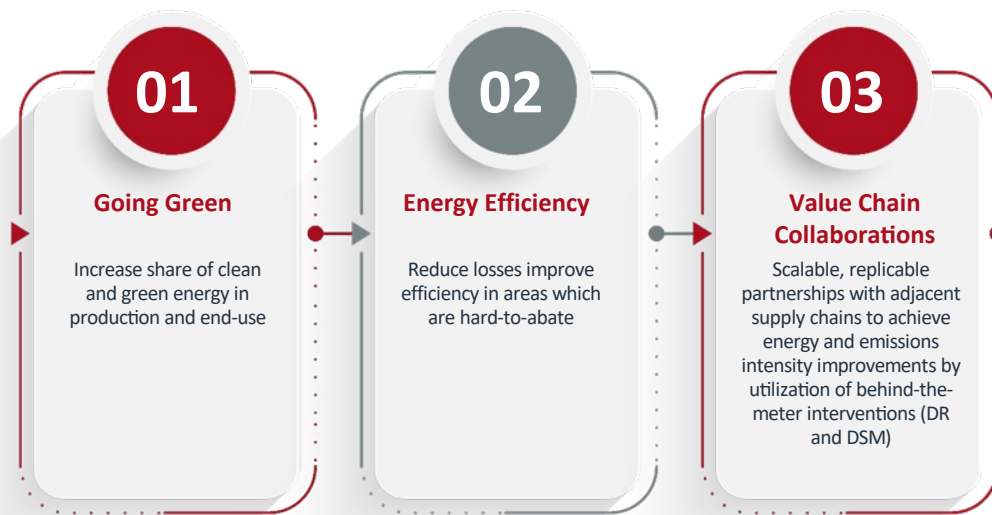
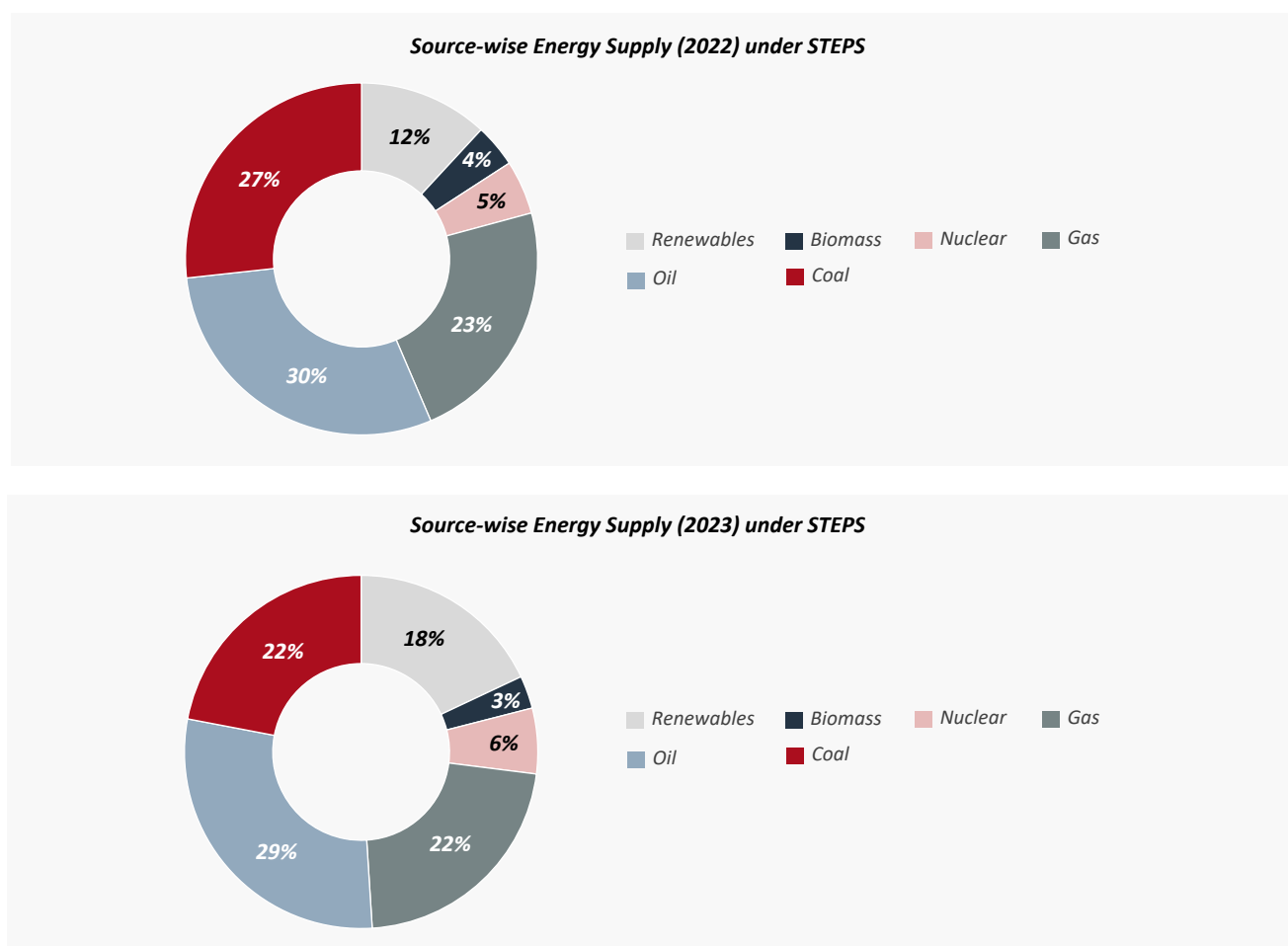


Figure 2: Evolving landscape of energy

The energy landscape has now been evolving driven by factors such as technological advancements, environmental concerns, policy developments, and changing consumer preferences. Recent release of World Energy Outlook 2023, emphasises a 40% increase in investment in clean energy since 2020. This surge can be attributed to the efforts made to reduce emissions. Furthermore, it is worth noting that the economic argument in favour of well-established clean energy technologies is robust. Energy security is a crucial consideration, especially for countries that rely on fuel imports. Additionally, industrial strategies and the goal of generating clean energy jobs are playing significant roles as now we can see notable examples of a rapid and increasing rate of change in the industry. As a result, clean energy fuels is gaining adequate momentum to initiate a paradigm shift, with the proportion of energy consumption reliant on fossil fuels gradually declining and shifting towards renewable energy consumption. The energy scenario as developed by International Energy Agency (IEA) under Stated Policy Energy Scenario (STEPS)¹ is also envisaging a growth in share of renewable energy supply vis-à-vis fossil-based energy. The energy supply from renewable sources is estimated

¹ The Stated Policies Scenario (STEPS) is designed to provide a sense of the prevailing direction of energy system progression, based on a detailed review of the current policy landscape

to increase 58% from 75 EJ in 2022 to 120 EJ in 2030. This supply is also going to increase 300% and reach to 227 EJ by 2050.



*Source: World Energy Outlook 2023

Figure 3: The rapid rise of Renewables envisaged in future

However, in order to accomplish the intended objectives and target, it is critical that we transform renewable energy technology into a worldwide public good, thereby ensuring its accessibility to all. This can be accomplished by eliminating obstacles to the transfer of knowledge and technology, such as barriers related to intellectual property rights. In order to reduce overall expenses, critical technologies such as battery storage systems must be deliberated and appropriately researched.

3.1. COP 28 – A significant step towards green

An inter-ministerial delegation from India attended the 28th Session of the UN Climate Change Conference (COP 28) held in Dubai, United Arab Emirates from 30th November’2023 to 13th December’2023. The major outcome from COP 28 included the decision on Outcome of the First Global Stocktake, ratcheting up global climate ambition before the end of the decade.

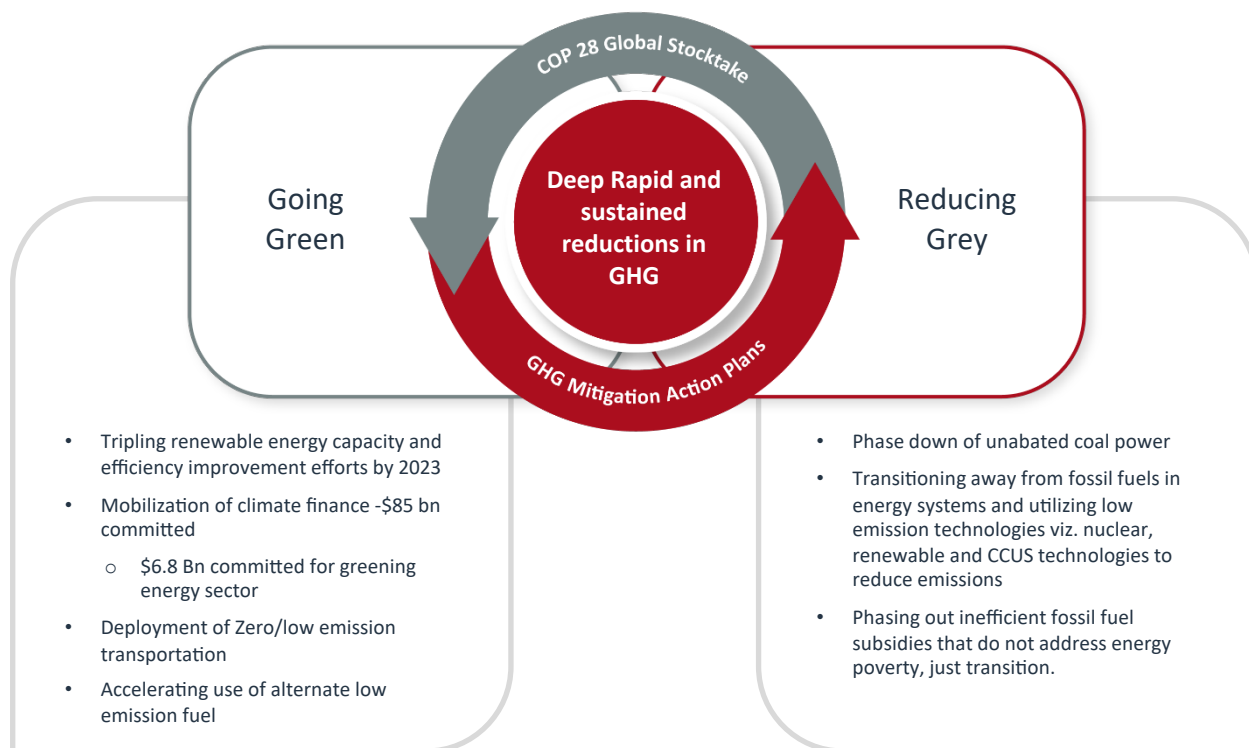


Figure 4: Key Takeaways² from COP28 – Global Stocktake held in UAE

These global efforts will be taken up by the countries in a nationally determined manner considering the Paris Agreement and their different national circumstances. Another major outcome of COP 28 is the agreement on the operationalization of the Loss and Damage Fund and its funding arrangements.

3.2. Funding Climate Actions

Several national governments and organisations made climate finance promises at COP 28. These promises included funding for the Green Climate Fund, the Adaptation Fund, the Least Developed Countries Fund, and the Special Climate Change Fund. Apart from commitments to fund climate actions, a decision on creation of Loss and Damage Fund was adopted at COP 28 and it was decided that the Fund will be serviced by new, dedicated and independent secretariat. It was also decided that the Fund will be supervised and governed by the Board. The Fund is accountable to and functions under the guidance of the Conference of Parties serving as the meeting of the Parties to the Paris Agreement (CMA).

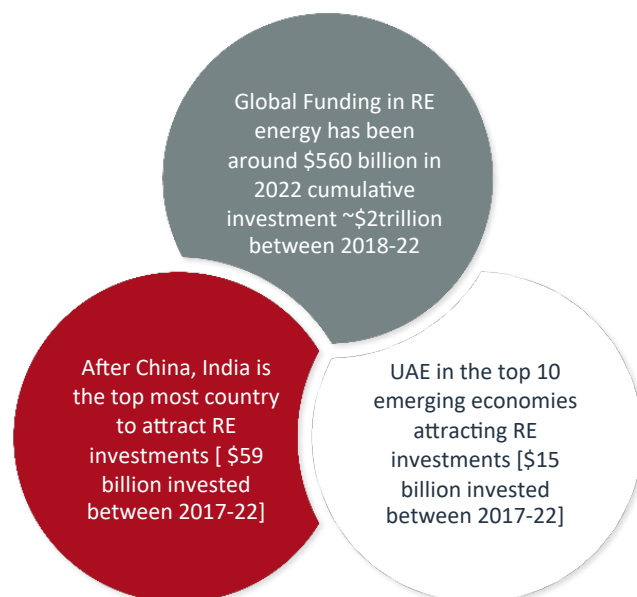


Figure 5: Investment trends in RE sector

² Source: UNFCCC

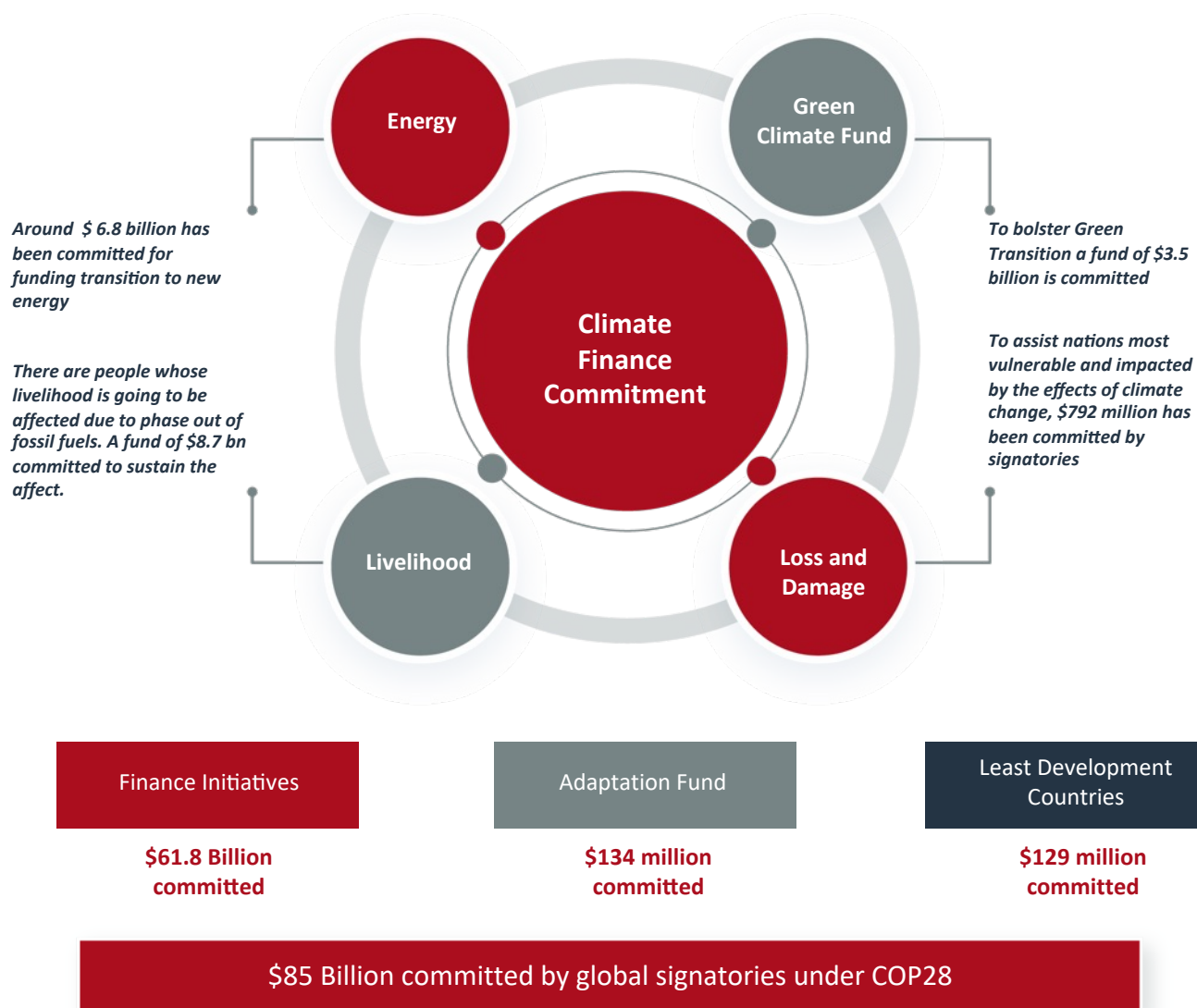


Figure 6: Climate Finance Commitment³

Since the decision, an amount of around USD 790 million to date has been pledged by several countries, including United Arab Emirates, Germany, United Kingdom, European Union, Japan. The purpose of the Fund is to assist developing countries that are particularly vulnerable to the adverse effects of climate change in responding to economic and non-economic loss and damage associated with the adverse effects of climate change, including extreme weather events and slow onset events.

³ Incremental progress, adaptation, finance and nature: COP28 key takeaways that will drive sustainability, dated 15-12-2023

3.3. Energy Efficiency: The First Fuel for India's Just Energy Transition - AEEE



Authored by Pramod Kumar Singh, Senior Director – Research & Programmes, AEEE & Vikas Nimesh, Senior Research Associate, AEEE

As the world struggles with the urgent need to combat climate change, the global narrative on energy is undergoing a transformative shift, with the Just Energy Transition (JET) at its core. This paradigm shift moves us from fossil fuel dependency to a future powered by renewable and sustainable energy sources such as wind, solar, and hydropower. The essence of JET lies in its environmental ambition to reduce greenhouse gas emissions and its commitment to ensuring that this transition benefits every segment of society equitably. It addresses the socio-economic impacts on communities and workers tethered to the fossil fuel industry, aiming for a just and inclusive transition.

Internationally, Just Energy Transition Partnerships (JETPs) have emerged as a testament to this commitment, with nations like South Africa, Indonesia, and Vietnam entering into substantial financial and technical collaborations with developed countries and groups like the G7. These partnerships, marked by significant financial pledges, underscore a collective global effort to support cleaner energy transitions in developing economies. India has defined its goals and trajectory in this global movement, targeting an expansion of non-fossil fuel energy to 500 GW by 2030, among other ambitious goals.

At the heart of India's strategy for achieving its JET objectives is **Energy Efficiency**, often hailed as the "first fuel" for sustainable development. The Indian Government has rolled out various initiatives, including Standards and Labeling programs by the Bureau of Energy Efficiency (BEE), Energy Conservation Building Codes (ECBC) by the Ministry of Power, and the National Mission for Enhanced Energy Efficiency (NMEEE) under the National Action Plan on Climate Change (NAPCC), alongside educational and human resource development schemes. These initiatives have collectively contributed to a substantial energy saving of 50.81 Mtoe in 2022- 23, equating to 6.62% of the country's total primary energy supply. This focus on energy efficiency aims to optimize the output from each unit of energy consumed, thereby significantly curtailing overall energy demand. For India, where economic expansion and population growth propel an escalating energy demand, the implementation of energy efficiency across multiple sectors offers a pragmatic approach to diminish fossil fuel dependency, reduce carbon emissions, and support the integration of renewable energy sources into the national

grid. India's updated Nationally Determined Contributions (NDCs) include a pledge to cut the emission intensity of its GDP by 45% by 2030 from 2005 levels and to achieve net zero emissions by 2070, with 50% of power capacity from non-fossil sources.

Moreover, "Smart Energy Management Systems" have emerged as pivotal in enhancing India's energy efficiency. These systems optimize energy usage and distribution by leveraging technology and data analytics, ensuring a stable and reliable energy supply, particularly from intermittent renewable sources such as wind and solar power. Referencing studies from the European Commission in 2013, it's highlighted that households could see an average electricity bill reduction of 12% annually, while commercial entities could see reductions up to 58%. The implementation of smart grids and meters facilitates real-time energy monitoring and management, offering consumers detailed insights into their usage patterns. India sets a bold goal within this arena, aiming to deploy 250 million smart meters by 2026, underscoring its commitment to sustainable energy management.

The synergy between energy efficiency, smart energy management, and renewable energy sources is critical for a stable and sustainable energy transition. By reducing the overall energy demand and managing energy flows more efficiently, India can ease the pressure on its renewable energy systems, ensuring they meet the nation's growing energy needs without compromising environmental sustainability or social equity. This strategic approach not only supports India's international climate commitments, including its Paris Agreement targets and its net-zero emissions goal by 2070, but also promotes sustainable economic growth and development.

As India continues to navigate its path toward a Just Energy Transition, the emphasis on energy efficiency and smart energy management underscores its dedication to a future that harmonizes economic growth with environmental sustainability and social justice. It is a testament to India's role as a global leader in the renewable energy sector, showcasing a balanced approach that could serve as a blueprint for other nations aspiring to achieve their energy transition goals in a just and equitable manner.





04

**Contours of
Modern Energy**

04 Contours of Modern Energy

4.1. The Canvas

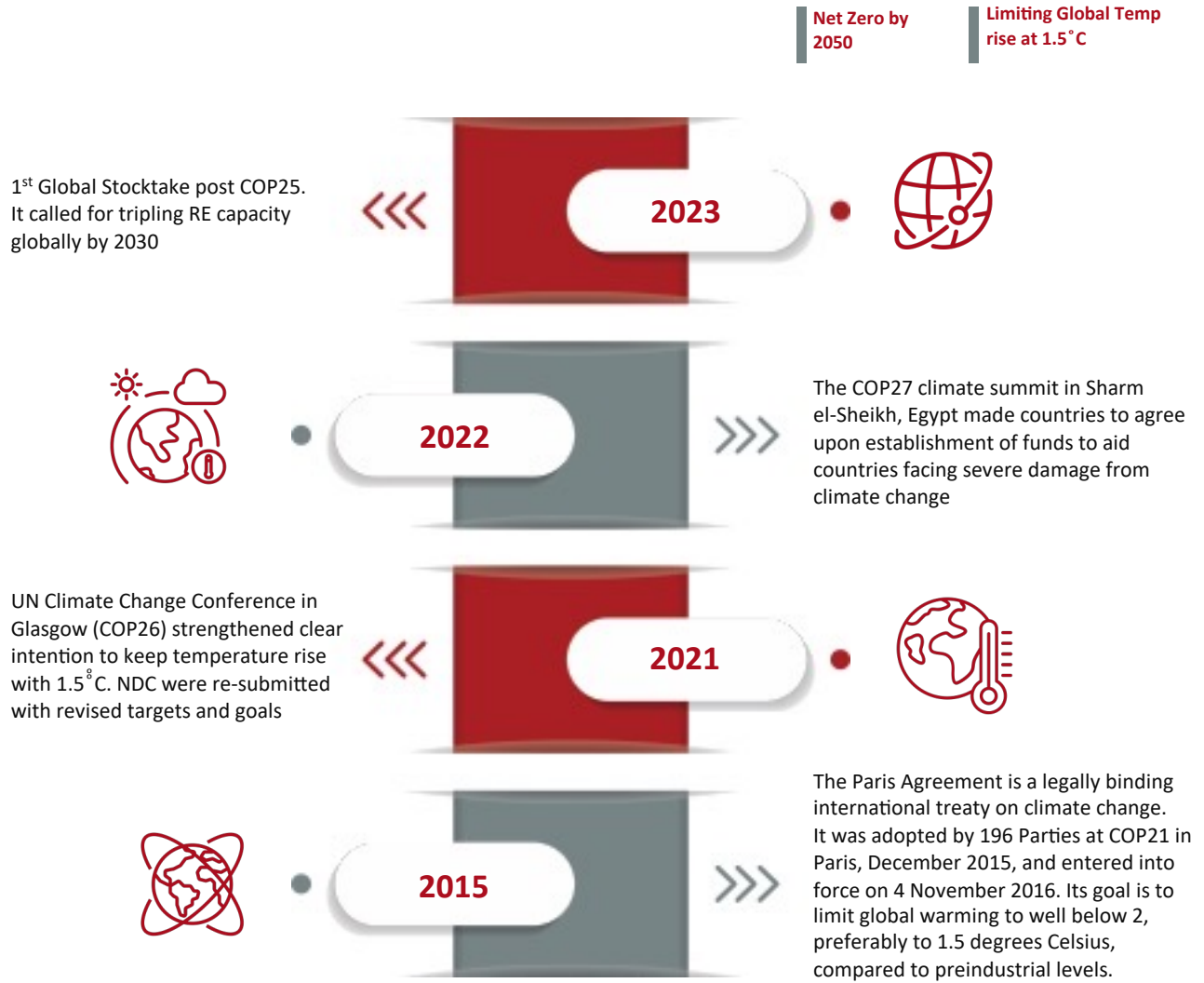


Figure 7: Progress made so far

Since 2015, there has been a growing impetus on deployment of clean technology and energy systems. An exponential shift has towards green energy. But it is seen that progress is rapid in systems which have matured clean technologies and where costs are going down quickly, like in case of electricity generation and transport. International Energy Agency (IEA) has been proactively tracking progress of Energy systems and technologies⁴.

⁴ Tracking Clean Energy Progress 2023, IEA, July 2023

% growth in Deployment in 2022

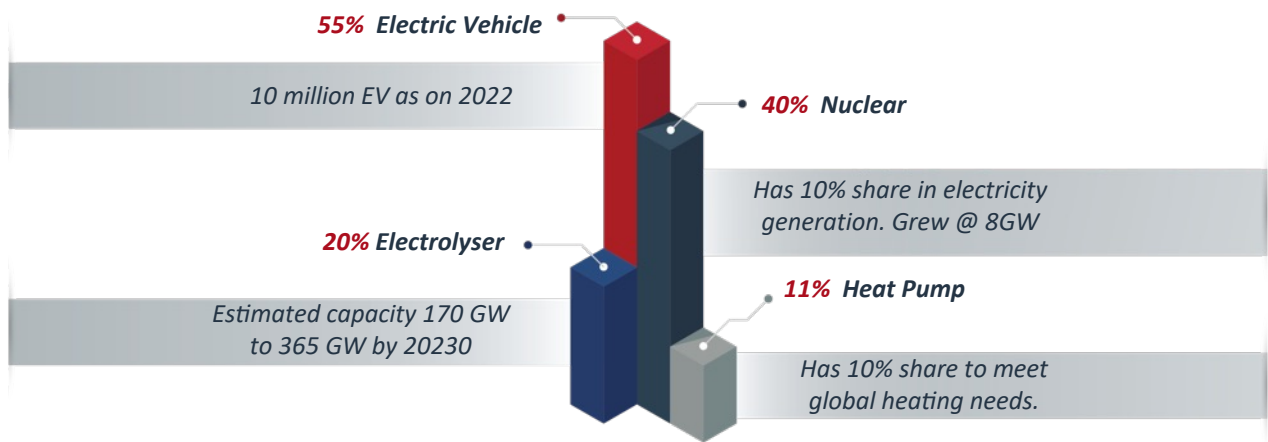


Figure 8: Sectors excluding renewable energies seeing rapid growth in 2022

From Figure 8, we can see that most of the progress has been made in deployment of clean technologies which have either seen a down-trend in costs. We can see that hydrogen production today has seen a policy thrust and therefore it is envisaged that electrolyser capacity will continue its rapid progress and is estimated to reach a capacity of 170 GW-365 GW.

Table 1 below provides the area of clean energy deployments and the green depicts the areas which have had seen the rapid progress. Clearly it can be inferred that most of the deployment has been in area of solar PV, EVs and lighting. Therefore, the key focus requires that clean technologies need to be brought to market quickly, especially for parts of the energy system that are harder to clean up, like heavy industry and long-distance transportation

Table 1: Canvas of Modern Energy

Energy System	Cross-Cutting Technologies & Infrastructure	Electricity Generation	Oil & Natural Gas	Low emission fuels	Transport	Manufacturing	Buildings
Energy Efficiency	CO2 Transport and Storage	Coal	Methane Abatement	Biofuels	Cars and Vans	Steel	Heating
Behavioural Changes	CO2 Capture and Utilisation	Natural Gas	Gas Flaring		Trucks and Buses	Chemicals	Space Cooling
Electrification	Bioenergy with Carbon Capture and Storage	Solar PV			Rail	Cement	Lighting
Renewables	Direct Air Capture	Wind			Aviation	Aluminum	Appliances and Equipment
Bioenergy	Electrolysers	Hydroelectricity			International Shipping	Paper	Building Envelopes
Hydrogen	District Heating	Demand Response			Electric Vehicles	Light Industry	Heat Pumps
Carbon Capture, Utilisation and Storage	Data Centres and Data Transmission Networks	Nuclear Power					
Innovation		Grid-scale Storage					
International Collaboration		Smart Grids					
Digitalisation							
	<i>Matured / Progressing rapidly</i>						
	<i>Still evolving / slow progress than envisaged</i>						

4.2. Renewable Energy growth to double in next 4 years worldwide

Renewable energy sources, such as solar, wind, hydropower, biofuels, and others, are at the centre of the shift towards energy systems that use less carbon and last longer. In the past few years, generation capacity has grown very quickly. This is because policies have helped and the costs of solar photovoltaics and wind power have decreased rapidly. The deployment of renewable energy sources in the transportation, power, and heating sectors is a significant factor in containing the average global temperature increase to 1.5°C. Renewable energy sources enable the near-total decarbonisation of electricity generation under the Net Zero Emissions by 2050 scenario. Renewable heat and transport fuels, meanwhile, contribute significantly to the reduction of emissions in industry, construction, and buildings.

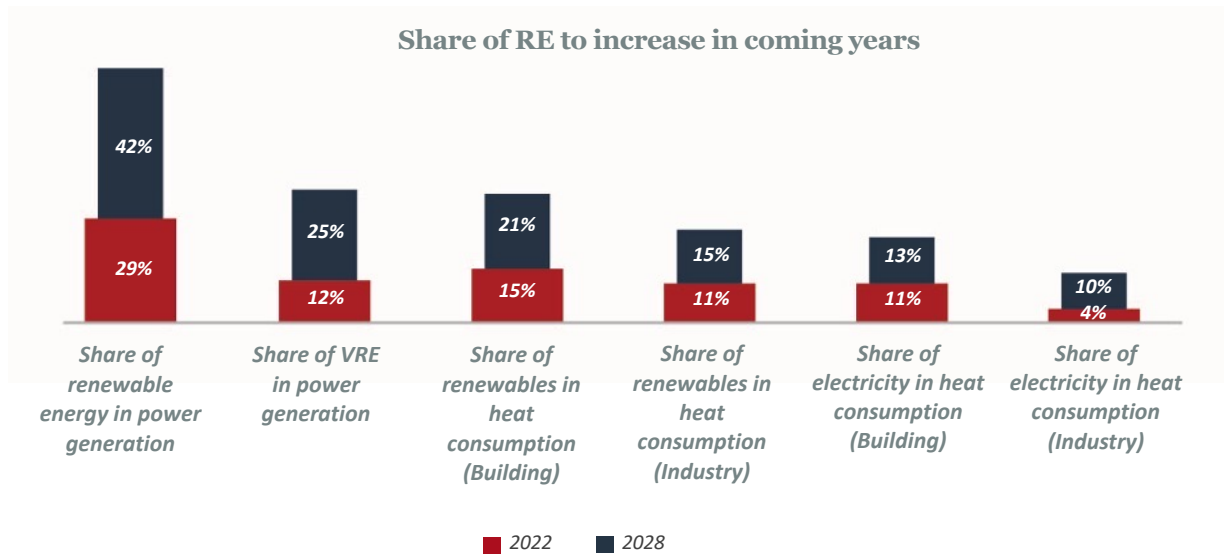


Figure 9: Share of RE both in electricity generation and industrial will rapidly increase

The electricity industry continues to be the most promising sector for renewable energy sources, as solar photovoltaics and wind have experienced rapid growth in recent years, supplementing hydropower's already substantial contribution. However, electricity consumption represents a mere one-fifth of the worldwide total, and it is imperative that renewable energy sources continue to play a more substantial role in heating and transportation as part of the energy transition.

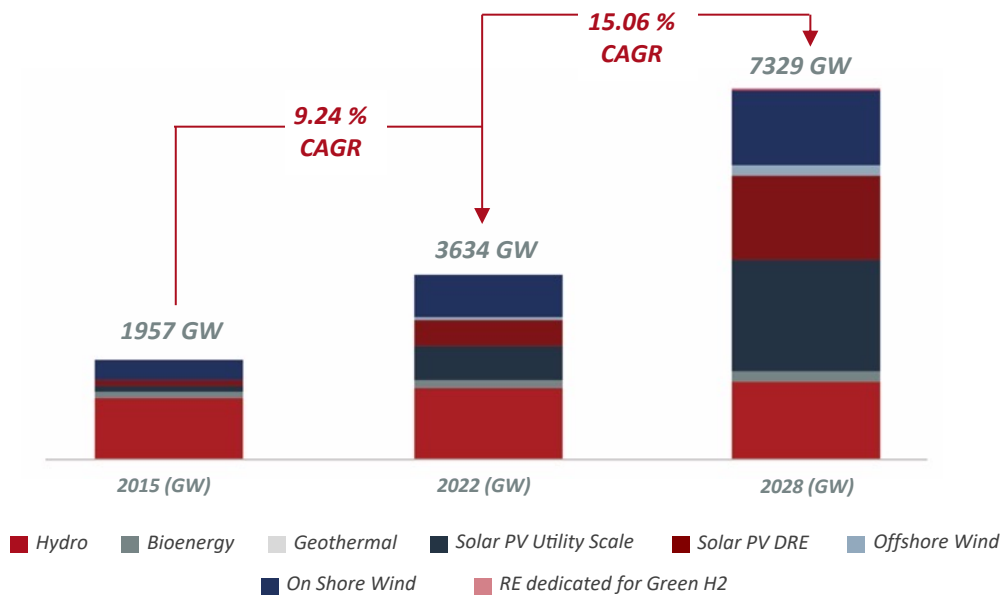


Figure 10: Envisaged RE capacity by 2028

Given the significant role of Renewable Energy in energy transition, it is envisaged that the cumulative capacity of renewable is estimated to grow @ CAGR from 9.24% in last seven years to @CAGR of 15.06% in next 6 years between 2022 and 2028. This trend is envisaged all over the world and therefore it becomes significant that the planning of RE energy should not only look project specific areas but also look in to fostering Knowledge Transfer, development of critical technologies under a "shared case" and harnessing energy equity through bi-lateral cross border energy transfers.

4.3. Renewable energy for sustainable development



Authored by Mr. Rajan Varshney, DGM- New Initiatives National Thermal Power Corporation (NTPC).

The primary objective for deploying renewable energy in India is to advance economic development, improve energy security, enhance access to energy, and mitigate climate change. Sustainable development is achievable through the use of renewable energy, ensuring access to affordable, reliable, sustainable, and cleaner energy for citizens. Strong government support and the increasing awareness towards combatting climate change and favourable economic climate have propelled India to become one of the top leaders in the world's most attractive renewable energy markets.

Energy is a necessary element for socio-economic development. The high economic growth of developing nations in the last decades has led to an accelerated rise in energy consumption. This trend is expected to continue. Predicting future power consumption is essential for making enabling environmental and economic policies. Similarly, an outlook on future power consumption helps determine future investments required for renewable energy. Energy supply and security have become not only essential issues for the development of human society but also for global political and economic reasons. Hence, international comparisons are resorted to with respect to past, present, and future power consumption patterns.



At a time when the debate rages worldwide regarding the future of fossil-fuel-based energy, India is rapidly diversifying its energy sources. CSP with Thermal storage can provide reliable firm and dispatchable RE power. Moreover it can produce very high temperatures for Photocatalytic splitting of water to produce cost-effective Hydrogen and Ammonia etc. even without using Electrolysers. Also 24x7 Carbon capture and use in producing solar fuels becomes economically feasible. Further oxyhydrogen or Brown's gas has been produced using HHO electrolysers for co-firing with coal or gas boilers, gasifiers etc. in various industries for heat.

It can also effectively reduce carbon intensity by directly in a very economical manner without having to first make Hydrogen consuming large amount of energy and then burning it to produce only some energy.

As is evident, India and the UAE are also actively supporting and promoting renewable energy, during the G20, COP28, and the recent Memorandum of Understanding signed between both nations at Vibrant Gujarat 2024. Companies from India and the UAE, such as Reliance, TATA Renewable Power Limited, NTPC, Masdar, OCIOR, etc., are also supporting their nations' initiatives.

The collaboration between India and the UAE in pursuing these ambitious energy objectives commenced immediately after evaluating the Millennium Development Goals-2015. India aims to attain Energy Equity, striving for per capita energy consumption to align with the global average level by 2050. Concurrently, the UAE's Energy Strategy 2050 seeks to enhance the share of clean energy in its overall energy mix.

To achieve a reliable system, it is strongly suggested that renewables be used in a hybrid configuration of two or more resources. Bold and consistent enabling policies and tax incentives can be effective tools to attract global investments resulting in huge social benefits much beyond the economic advantages.

Disclaimer: Views expressed are my personal and may not be that of my employer.



05

**Meeting
Sustainability
Targets - Recent
trends for
renewable energy**

05 Meeting Sustainability Targets - Recent trends for renewable energy

5.1. United Arab Emirates

The United Arab Emirates (UAE), is the first country in the Gulf Cooperation Council (GCC) to sign and ratify the Paris Agreement in 2015, and have announced the UAE net-zero 2050 initiative in October 2021. The initiative aims to achieve net-zero emissions by 2050 (the Net- Zero 2050).

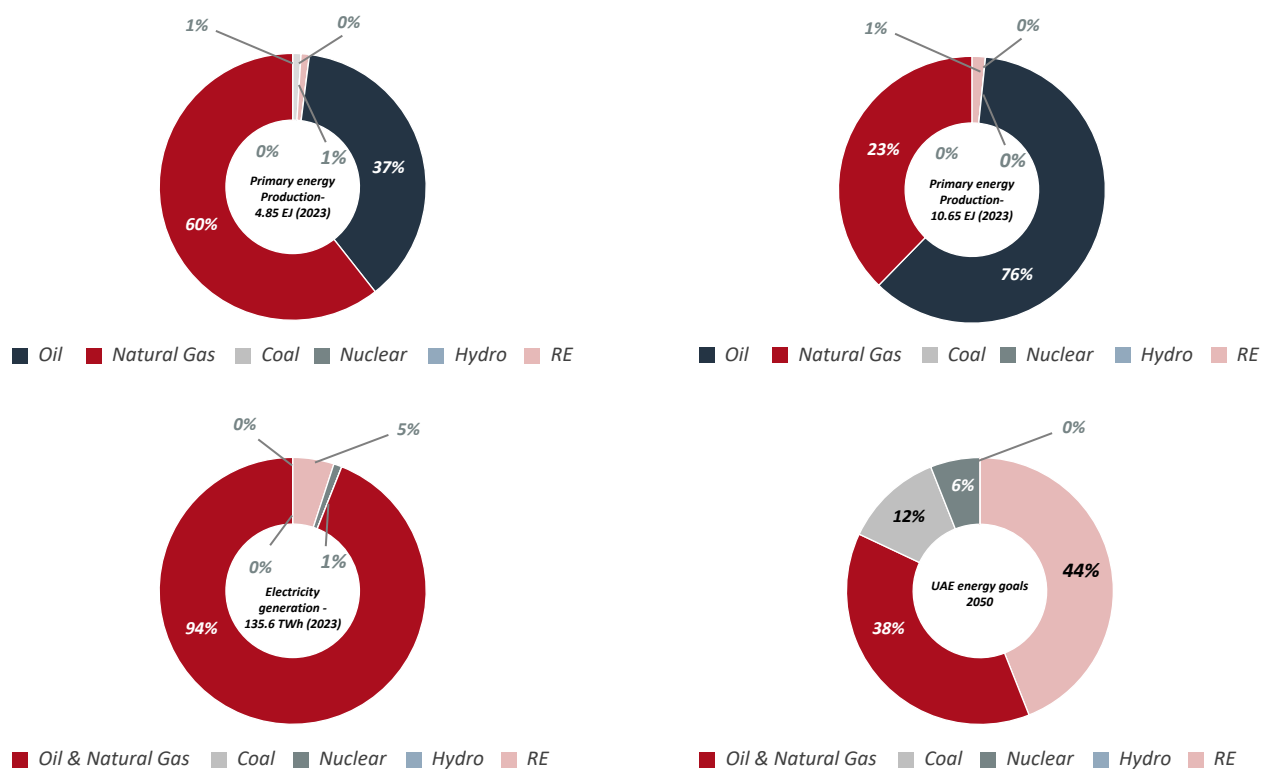


Figure 11: UAE's Energy Overview

From the above figure we can see that UAE has been the hub of hydrocarbon investment in past. The UAE has invested heavily in increasing hydrocarbon production capacity and developing midstream and downstream infrastructure to accommodate future growth in hydrocarbon production. However, at the same time, the UAE has increasingly focused on developing non-hydrocarbon energy sources such as nuclear and renewables to increase its influence in environmental leadership and climate action. The UAE is the first country in the Middle East to commit to reaching net zero emissions by 2050 and has hosted the United Nations (UN) climate change conference, COP 28 in December 2023.

The UAE federal government and the country's seven emirate governments signed the Net Zero Charter 2050 in March 2023. Net Zero Charter⁶ outlines the country's commitment to develop action plans and strategies to address drivers of climate change and achieve net zero emissions.

⁵ Data source: Country Brief Analysis, August 2023, EIA

⁶ Updated UAE Energy Strategy 2050, July 2023

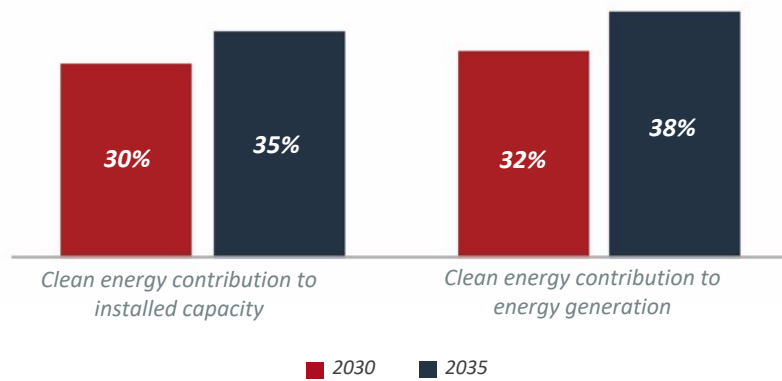


Figure 12: UAE's Net Zero Ambition

UAE has proposed a four-phase implementation strategy to achieve net-zero by 2050. The funds committed to achieve this target is ~ 150 to 200 AED billion which will focus on specific enablers such as policies and regulatory, technical, and technological tools to facilitate transition in the power sector and achieve net zero by 2050.

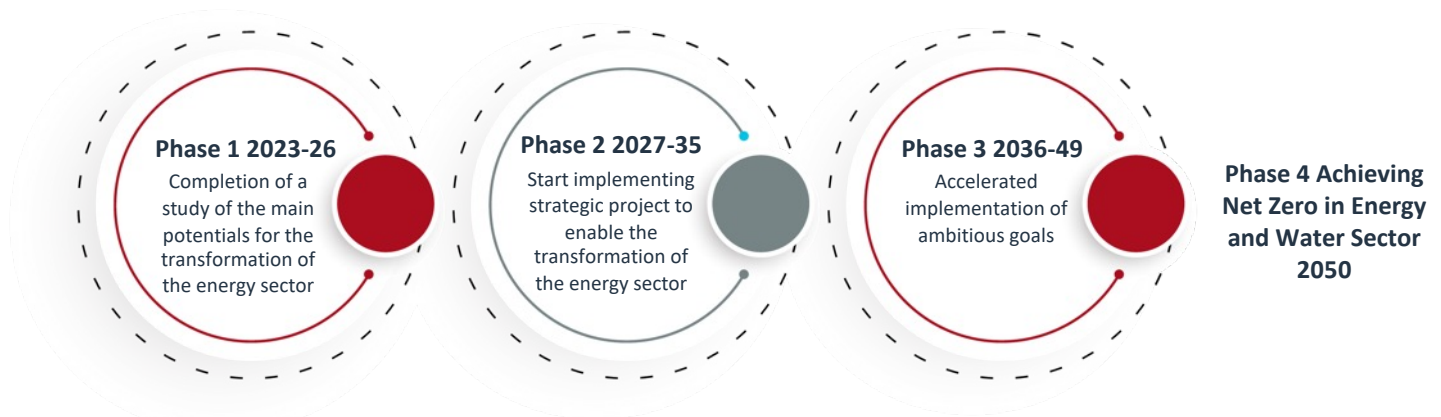


Figure 13: 4 phase implementation strategy to achieve Net Zero

5.1.1. Energy transition landscape of UAE

The United Arab Emirates is endowed with huge oil and gas resources, making it a leading player in global energy markets and sustaining one of the world's wealthiest per capita economies. It is also positioning itself at the forefront of tackling the climate crisis; making multi-billion-dollar investments in renewables at home and abroad, being the first Gulf state to commit to net zero by 2050. This decision has been based on the increasing effects of climate change on UAE's living conditions. A survey by Energy Institute⁷ revealed that citizens of UAE contemplate climate change as the major reason for rising temperatures and shorter winters. This has led to harsher working conditions. To tackle situation UAE has announced several initiatives to achieve net zero emissions by 2050. These include its Hydrogen Strategy, Energy Efficiency and the Green Mobility.

⁷ Energy Barometer 2023 – The UAE Transition

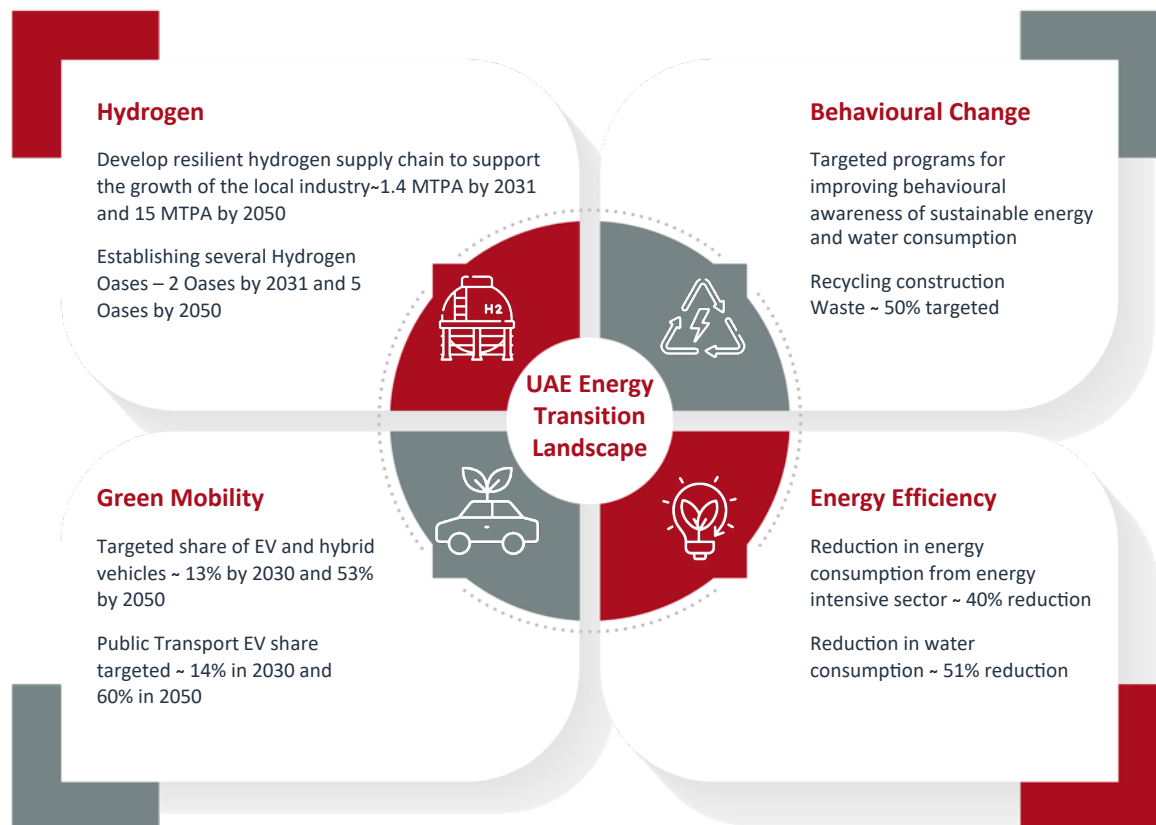


Figure 14: UAE Energy Transition Landscape

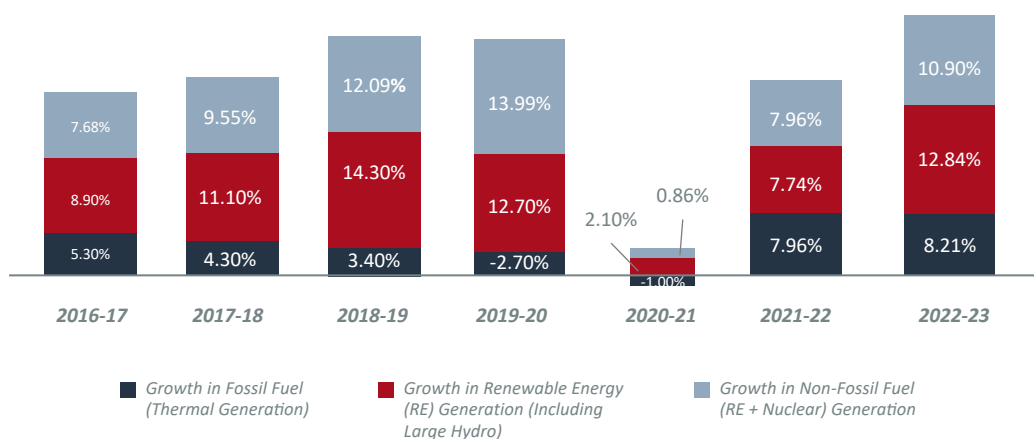
5.1.2. Significant Strides –Modern Energy in UAE

UAE at present has the three of the world’s largest solar power plants, 2GW by EWEC (Al Dhafra), 1.2 GW by EWEC (Noor Abu Dhabi) and 2GW with an additional 0.75 GW under construction being developed by DEWA (Mohammed bin Rashid Al Maktoum Solar Park). It is also to acknowledge that electricity produced by these plants have the lowest levelized costs. The UAE is also reducing emissions from its baseload power generation. The Hassyam power plant has been switched to run on natural gas in 2022. Moreover, it is built with carbon capture and storage-ready specifications. In order to augment and expedite the implementation of renewable energy sources, efforts are being made to bring online baseload power generation with zero or reduced emissions. Since 2020, the Barakah nuclear power plant has supplied 2.8 GW to the grid. By reducing landfill emissions over the course of their lifetimes, waste-to-energy power plants contribute to the diversification of baseload power generation. Sharjah is currently having functional 30MW WTE power plant. Additionally, a 70 MW WTE plant in Abu Dhabi and a 200 MW plant in Dubai are in the works.

Additionally, the UAE is implementing energy storage technology on a massive scale. With a capacity of 108 MW, Abu Dhabi is host to one of the largest virtual battery plants globally, which effectively mitigates the necessity for supplementary gas power plants. Concurrently, Dubai is slated to inaugurate a 250 MW pumped-storage hydropower plant by the conclusion of 2024. An additional 300 MW of battery energy storage is currently being developed and is expected to go online in 2026. Additionally, Dubai is in the process of constructing a 700MW molten salt thermal energy storage system, scheduled for operation in 2024.

5.2. India

India ranks 4th in Renewable Energy Installed Capacity (including Large Hydro), Wind Power, and Solar Power. It has also set an enhanced target at the COP26 of 500 GW of non-fossil fuel-based energy by 2030. With over 188.27 GW [as at 31-12-2023] (including large hydro and nuclear) renewable energy accounts for approximately 42 percent of the country's total capacity. India experienced the most substantial annual growth in renewable energy additions in 2022, at 9.83%. As of December 2023, the installed solar energy capacity has increased by a factor of 30 over the previous nine years, reaching 73.31 GW.



5.2.1. Energy transition landscape of India

The renewable energy landscape in India is on an upward trajectory, with 2023 poised to be a year of significant growth and innovation. The country's ambitious targets, supportive policies, and increasing investments indicate a bright future for renewable energy. As India continues its transition towards a sustainable and low-carbon economy, the renewable energy sector is playing a pivotal role in driving economic growth, job creation, and reducing greenhouse gas emissions. It is to be acknowledged that as on November 2023, India is ranked 6th among 40 most attractive markets for renewable energy investments as per the Renewable Energy Country Attractiveness Index (RECAI)⁸.



⁸ RECAI uses various criteria to compare the attractiveness of renewables markets, such as the magnitude of the development pipeline, that reflect the absolute size of the renewable investment opportunity. It is biannually released by E&Y

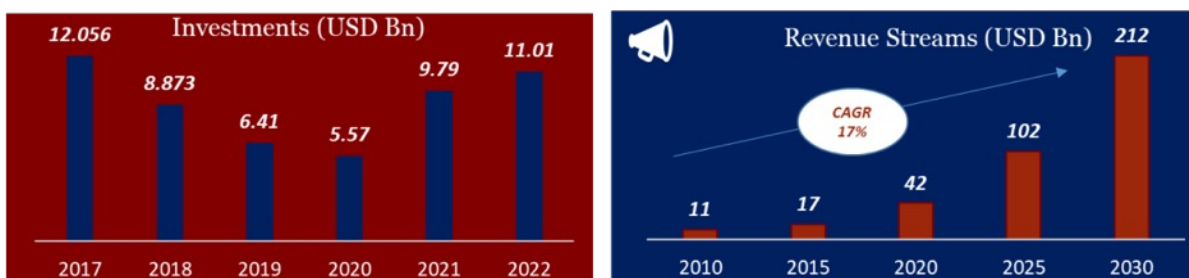
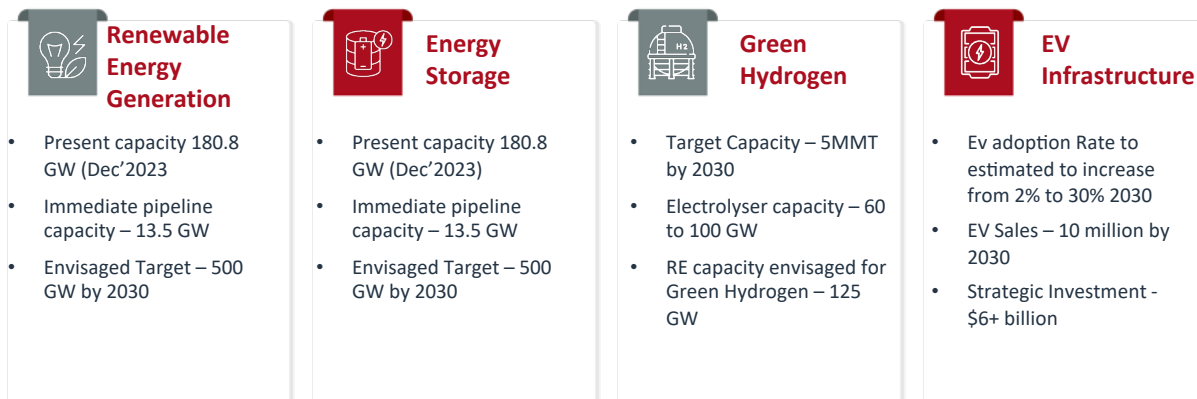


Figure 15: India's renewable energy stride

While the renewable energy sector in India has made remarkable progress, it still faces challenges that need to be addressed. These include issues related to grid integration, land acquisition, financing, and skill development. Knowledge incubation centres will be required for appropriate skill building. The adoption of emerging technologies like energy storage, smart grids, and blockchain can further enhance the efficiency and reliability of renewable energy systems.

5.2.1. Significant Strides – Modern Energy in India

- Green Hydrogen** – India has launched Green Hydrogen Mission. By 2030, the National Green Hydrogen Mission is expected to produce 5 MMT of green hydrogen annually. The Mission proposes replacing Grey Hydrogen with Green Hydrogen in fertiliser, petroleum refining, steel, shipping, and other industries to reduce carbon emissions and fossil fuel imports. Import reduction is projected to reach ₹ 1 lakh crore by 2030. The programme includes incentives for manufacturing electrolysers and producing green hydrogen, pilot projects for green steel, mobility, shipping, decentralised energy applications, hydrogen production from biomass, hydrogen storage, and development of Green Hydrogen Hubs along with research and development programmes. The country's Green Hydrogen adoption status can be seen as under
 - GAIL Limited began India's first hydrogen-blending project in city gas distribution grid. 2% hydrogen is blended into CNG and 5% into PNG networks.
 - NTPC has blended up to 8% (vol/vol) green hydrogen in PNG Network at NTPC Kawas Township
 - Indian CPSE NTPC has also launched Hydrogen based Fuel-Cell Electric Vehicle (FCEV) Buses in Leh

- Additionally, several Indian companies plan to build Green Hydrogen/Green Ammonia plants.
- Under the National Green Hydrogen Mission's Strategic Interventions for Green Hydrogen Transition (SIGHT) scheme (Mode – I, Tranche – I), a Request for Selection (RfS) has been issued for selecting green hydrogen producers to build 450,000-ton production facilities in India.
- NGEL and SMP, Kolkata signed a deal to build a Green Hydrogen hub in Kolkata on September 27, 2023. SMP, Kolkata, and Saif Powertec Ltd., Bangladesh, signed an MoU on September 25, 2023, to create a multimodal container transport route between India and Bangladesh. Mongla, Chattogram, and Pangoan River Ports will facilitate trade and shipment between the two countries.
- **Natural Gas** - Natural gas makes up 6.7% of India's energy basket. The government wants natural gas to make up 15% of the energy mix by 2030. To achieve this Government of India has undertaken task of expanding the National Gas Grid (24,623 kms operational and 10,860 km under construction), City Gas Distribution (CGD) network (300 Geographical Areas (GAs) with Minimum Work Plan of approx. 12.50 crore PNG connections, 17,751 CNG Stations, and 5.42 lakh inch-km pipeline by 2023) and LNG Terminals (47.7 MMTPA to 66.7 MMTPA). Government has announced concessional royalty/royalty holiday provisions, relaxed approvals, reduced revenue share from Category II & III basins for early field monetization, and natural gas marketing and pricing freedom.
- **Nuclear Power** - The government plans to increase nuclear power capacity from 7480 MW to 22480 MW by 2031-32. At present there are 23 nuclear reactors however, States like Gujarat, Rajasthan, Tamil Nadu, Haryana, Karnataka, and Madhya Pradesh are building and commissioning ten reactors with a total installed capacity of 8000 MW. Additionally, the Government has accorded in-principle approval to set up 6 x 1208 MW nuclear power plant in cooperation with the USA at Kovvada in Srikakulam district in the state of Andhra Pradesh.
- **Pumped Hydro Storage** - On April 10, 2023, the Ministry of Power issued Guidelines to promote Pumped Storage Projects. Given the importance of PSPs in grid stabilisation and peaking power demand, guidelines have been created to promote and direct their development. Central Electricity Authority has revised PSP DPR Formulation and Concurrence Guidelines. Under the revised guidelines, the DPR concurrence timeline for the following PSPs has been reduced from 90 days to 50 days for PSPs developed as captive or merchant plants and for others it has been shortened from 125 to 90 days.
- **Biofuels** – In order to boost production of biofuels, India's largest integrated power utility, NTPC Limited, has signed a non-binding MoU with Numaligarh Refinery Limited (NRL) for partnership in the proposed bamboo-based Bio-Refinery at NTPC Bongaigaon and other green projects NRL is a subsidiary of Oil India Limited, which refines and sells petroleum.

5.3. India-UAE Partnership: Fostering Collaborative Growth in Renewable Energy



*Authored by Ms Monika,
Manager - Strategy and
Business Development,
ReNew*

At the forefront of the worldwide transition to sustainable energy solutions, there exists a transformative partnership between India and the UAE, as was evident in the recent MoU signed by the two countries to boost strategic collaboration in sustainable industrial development. Signed by Dr. Sultan Al Jaber, UAE Minister of Industry and Advanced Technology, and Shri Piyush Goyal, India's Minister of Commerce and Industry, paves the way for developing the industrial sector in line with advanced technology and sustainability standards.

With supply chain resilience, renewable energy, and energy efficiency, among the seven key areas of the MoU, this partnership builds on the existing synergies between the two countries in climate action. India's proficiency in solar and wind energy harmonizes with the UAE's Energy Strategy 2050. Strengthened by tax agreements and simplified visa processes, this collaboration encourages inventive solutions, shared growth, and the initiation of groundbreaking projects. It also acts as a catalyst for Indian companies to extend their operations from India to the Middle East, and be partners in UAE's energy transition journey.

India Emerging as the Global Renewable Energy Powerhouse

Under the proficient leadership of Prime Minister Sh. Narendra Modi, India has made significant strides in renewable energy, solidifying its role as a key player in the global sustainable development agenda. India's renewable energy capacity has grown significantly under the present government, from 72 GW in 2014 to 176 GW in 2023. Surpassing its 2022 clean energy targets, India is now on track to achieve the ambitious 50% renewable energy capacity by 2030.

India's progress in wind energy has been exemplary as it today ranks among the top four nations globally in terms of installed capacity. This journey has been marked by technological innovation, aided by a supportive policy framework to enhance accessibility, efficiency, and cost-effectiveness, some examples of which are listed below:

1. Feed-in tariffs and R&D grants have fueled cutting-edge turbine development
2. Manufacturing incentives have given a boost to job creation
3. Detailed resource mapping, streamlined approvals, and expanded transmission lines have enhanced accessibility and efficiency

4. Cost-effectiveness is driven by reverse auctions, tax breaks, and green bonds
5. RPOs guarantee a market for wind-generated electricity, while RECs unlock further revenue streams
6. Grid balancing mechanisms ensure smooth integration

This multi-dimensional approach enabled India to become a hub for global wind manufacturing, as it attracts global giants like Vestas and Siemens Gamesa as well as rising stars, to set up shop in India. Driven by a significant rise in domestic demand, homegrown companies such as Suzlon and Inox Wind have emerged as key players in the wind energy market. With an eye on regional exports, India's wind turbine manufacturing future looks bright. India's progress in solar energy and its global leadership in driving its growth has been a big success story too. The establishment of the International Solar Alliance (ISA) highlights India's dedication to fostering global collaboration on solar innovations, attracting international investments that benefit both the domestic sector and contribute to the global transition to cleaner energy. This fuels projects like utility-scale solar farms with a combined capacity exceeding 10 GW and advanced battery storage solutions capable of powering millions of homes. Within India, these investments have created over 20,000 jobs and accelerated technological advancements through 15 technology transfer agreements with ISA member nations. They have also empowered over 30 developing nations with India's solar expertise, helping them avoid greenhouse gas emissions equivalent to planting millions of trees. The ISA is more than an alliance, it's a testament to India's leadership in building a global solar ecosystem. This collaboration, backed by data and shared resources, illuminates a brighter future powered by the sun, potentially impacting the lives of hundreds of millions around the world.

India-UAE Partnership: A Strategic Catalyst for Strengthening Bilateral Trades

The strategic partnership between India and UAE leverages supportive MoUs, tax treaties, and streamlined visa procedures. India plays a pivotal role as a facilitator for mutually advantageous growth in the UAE's renewable energy sector.

The recent MoU underscores the strategic collaboration between the UAE and India in sustainable industrial development. Poised to significantly impact the renewable energy business of both nations, and enhance competitiveness in key sectors, the focus of the MoU on renewable energy and energy efficiency includes collaboration in advancing energy storage technologies, Smart Grid, and IoT deployment, with joint efforts in R&D set to accelerate innovation. Cooperation extends to AI technologies, space systems, Industry 4.0, and advanced technologies, emphasizing a commitment to shaping a sustainable and technologically advanced future.

A key aspect of the New Delhi-Dubai collaboration is the tangible impact of tax treaties, reducing the tax burden on entities engaged in cross-border ventures. The Double Taxation Avoidance Agreement (DTAA) between India and the UAE prevents double taxation on various income types, leading to measurable cost savings, establishing a transparent financial framework, and providing a quantifiable competitive advantage in financial efficiency.

Furthermore, streamlined visa processes between India and UAE enhance business relations with tangible outcomes. Simplified visa procedures increase business travel frequency, reducing administrative burdens and saving valuable time for professionals in both Indian and UAE-based entities. This acceleration in decision-making processes aids timely project execution, fostering higher trade volumes and investments that significantly contribute to economic prosperity for both nations.

Leveraging Indian Expertise to fuel UAE's clean energy goals

This strategic partnership lays the foundation for pioneering endeavors such as RenServ Global Pvt. Ltd., as a flagship undertaking introduced by ReNew, a leading force in the global renewable energy sector. RenServ, an innovative Special Purpose Vehicle (SPV), is positioned to redefine third-party Operations and Maintenance (O&M) services for global wind and solar projects.

In partnership with ReNew, RenServ Global Pvt. Ltd. is emerging as a strategic force in reshaping global renewable energy operations. Going beyond the role of a conventional service provider, RenServ brings forth technical expertise and a robust commitment to sustainable practices. Venturing into wind and solar energy projects in the UAE, RenServ commits to elevating operational efficiency and playing a substantial role in the nation's clean energy objectives.

From regular maintenance to proactive strategies that anticipate and mitigate potential issues, RenServ is designed as a one-stop solution for all challenges related to the efficiency of renewable energy assets. By being physically present in the region, the SPV can respond promptly to the unique challenges and opportunities faced by the UAE's renewable energy sector. It brings tangible enhancements in operational efficiency and shortened project timelines. This localized approach fosters a deeper understanding of the UAE's energy landscape and strengthens RenServ's commitment to being a reliable partner in the region's journey towards sustainable energy solutions.

A Global Blueprint for Renewable Energy Success

The collaboration between India and UAE serves as a powerful example of how global partnerships can address the pressing challenges of climate change. The recent MoU marks a significant step forward for the industry globally. It demonstrates the importance of cooperation and shared goals in achieving a sustainable future. While RenServ may be one participant in this larger initiative, its success ultimately reflects the broader industry trend towards collaborative efforts and its potential for positive impact.





06

**Enabling
Framework**



06 Enabling Framework

6.1. Policy and Regulatory Environment in UAE

It is to acknowledge that the landscape derived by UAE is is centred around addressing the country's energy supply and demand, with the ultimate goal of providing clean, secure, and affordable energy while also working towards reducing greenhouse gas emissions. The UAE operates as a federation comprising seven emirates. Consequently, the formulation of climate policies necessitates the participation of numerous entities, in accordance with the constitutionally mandated legal and executive jurisdictions and roles. The UAE Council on Climate Action, which was established in 2022 as an inter-ministerial, inter-emirate governance body, ensures that policies and interventions at the federal and emirate levels are in agreement. The United Arab Emirates has also announced the launch of a strategic initiative to pursue net zero emissions in October 2021. This initiative builds on over 30 existing strategies across all sectors.

Power and Water	Industry	Transport	Buildings	Waste	Agriculture
"We the UAE" Vision 2031 UAE National Climate Change Plan 2050 : UAE Environmental Policy (MOCCAE) UAE Centennial 2071 Abu Dhabi Environmental Vision 2030					
Dubai Carbon Abatement Strategy RAK Energy Efficiency and Renewable Energy Strategy 2040			National System for sustainable Agriculture (MOCCAE) UAE Food Security Strategy (MOCCAE)		
Abu Dhabi Demand Side Management and Rationalisation (DOE) Green Public Procurement for Energy and Water Efficiency (DSCE and RAK Municipality)			UAE Circular Economy policy (MOCCAE)	Abu Dhabi Agriculture Plan (ADAFSA)	
UAE Hydrogen Roadmap (MOEI)		Dubai Smart Municipality		Dubai waste Minimisation Strategy 202-2041 Dubai Integrated Waste Management Masterplan 2021-2041 Abu Dhabi Integrated Waste Masterplan	
Dubai Clean Energy Plan 2050		Dubai Demand Side Management Strategy			
National Energy Strategy 2050		Abu Dhabi Transport Mobility Management Strategy Abu Dhabi Surface Transport Master Plan Dubai Autonomous Transportation Strategy Dubai Green Mobility Initiative Dubai Comprehensive Flexible Mobility Plan			
Water Security Strategy (MOEI)	UAE Energy Efficiency Programme				
UAE Energy and Water DSM Programme	Carbon Footprint reduction (ADNOC)				
Dubai Integrated Energy Strategy TAQA ESG Strategy	EGA Optimisation Emirates Steel Optimisation Arkan Cement Optimisation				
				Sustainability Assessment/Manufacturing	
				UAE Green Business Toollit	

	Federal Level
	Emirate Level
	Company Level

Figure 16: Policy level enabling programmes run in UAE to achieve Net-Zero

The Ministry of Climate Change and Environment oversaw a society-wide process in which all relevant entities participated in order to develop the UAE Net Zero 2050 Strategic Initiative (which includes the 2030 targets outlined in the NDC). A collaborative effort was undertaken by governmental entities at all levels (federal, emirate, city, and municipality) to formulate the strategic plan necessary to achieve the targets specified in this NDC by 2030.

6.2. Policy and Regulatory Environment in India

Similar to UAE, India is committed to implementing renewable energy sources in order to safeguard energy security and combat climate change. Efforts to mitigate climate change are concentrated in the energy, transportation, residential, and agricultural sectors. Concurrently, the GoI is implementing a host of innovative mechanism for accelerated renewable energy deployment.

Government of India has taken several steps to boost solar, wind, and green hydrogen production, including:

- Waiving Inter State Transmission System (ISTS) charges for solar and wind power sales between states by 30 June 2025, with graded charges thereafter
- Setting up trajectory for Renewable Purchase Obligation (RPO) is set for 2030
- Launch of new initiatives like National Bioenergy Programme, Renewable Energy Research and Technology Development (RE-RTD) Programme, and schemes for electrolyser manufacturing
- Building new transmission lines and substations for renewable power evacuation
- Establishing a Project Development Cell to attract and facilitate investments

Considerable investments have been made in setting up solar parks, a green energy corridor (which aims to synchronize electricity produced from renewable sources with conventional power stations in the grid), smart grids, as well as on transmission infrastructure upgrades. To secure domestic supply chains, budget, FY 2022-23 committed INR 195 billion to the Production Linked Incentives (PLI) scheme for manufacturing integrated solar panels. The PLI scheme (which is significantly broader than only solar panels) involves GoI-backed incentives on incremental sales from products manufactured domestically. Other initiatives include research into alternatives to lithium-ion batteries for renewable energy storage. This includes hybrid renewable energy, such as a combination of solar and wind, as solutions for industry requirement of continuous, reliable power.



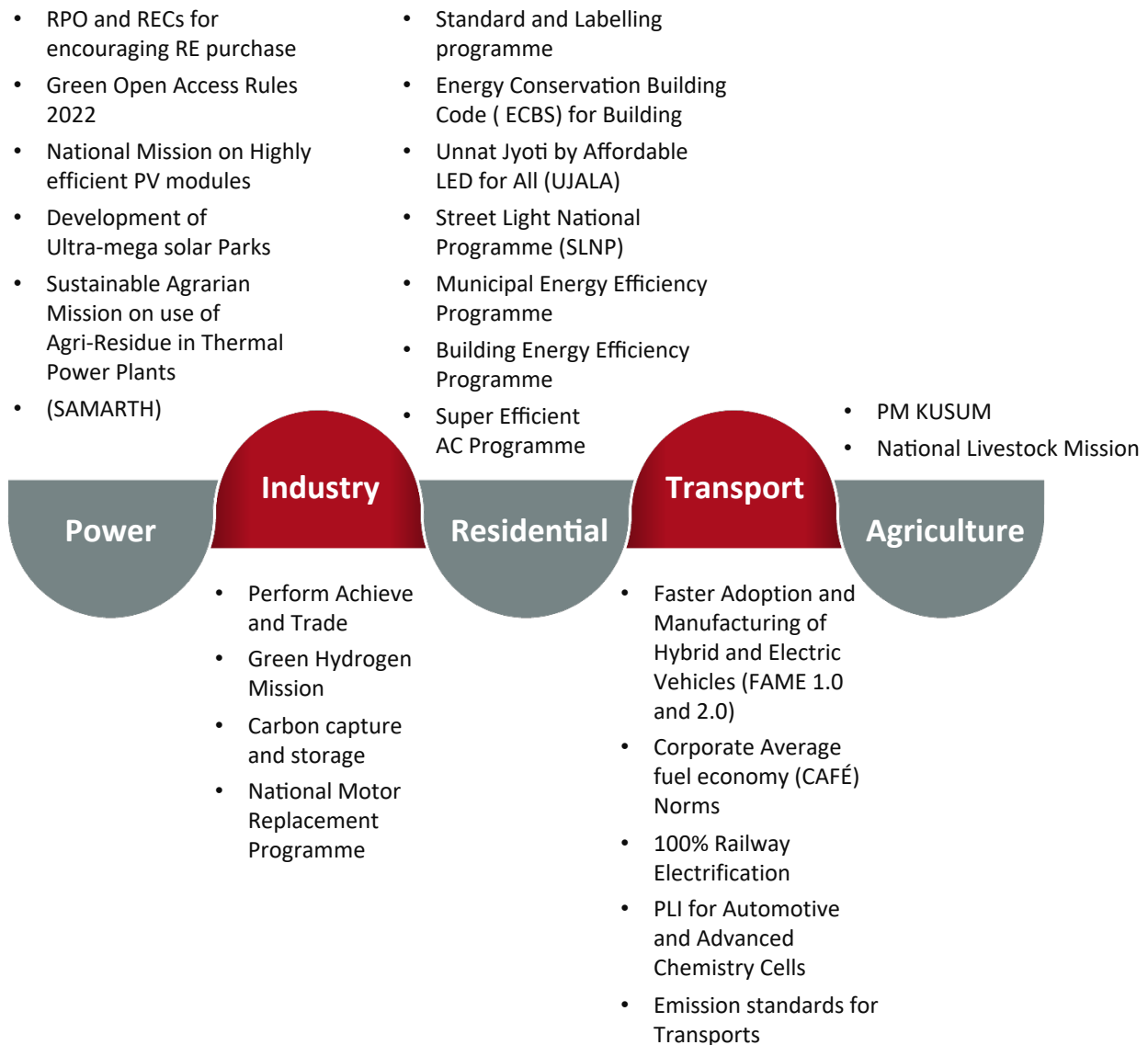


Figure 17: Policy level enabling programmes run in India to achieve Net-Zero

In addition to efforts outlined in the NAPCC and India’s Nationally Determined Contribution (NDC), following announced policy initiatives also hold key to reducing India’s emissions and encouraging Renewable Energy Growth

Other Key Policy Initiatives

- Net Zero Emissions by 2070 (announced in 2021)
- Renewable energy and transmission targets, including aims to raise power generation from non-fossil sources to 50% of all capacity (from 42% at present) and achieve 500 GW of non- fossil capacity by 2030;
- A Carbon Market authorized by India’s Energy Conservation (Amendment) Act, 2022 which allows the government to provide for a carbon-trading scheme

6.2.1 Focus on alternatives – Mission on Advanced and High-Impact Research (MAHIR)

India is proactively focussing its effort in developing new technologies to support its clean energy transition. Urgently required is advanced, high-impact research on the most recent and emerging energy sector technologies. To maintain a competitive edge in the swiftly evolving realm of innovation, it is imperative to promptly discern nascent technologies. It is to acknowledge that these technologies will be the primary drivers of future economic growth and transform India into a global manufacturing hub. Presently, India has identified 8 areas of research viz.

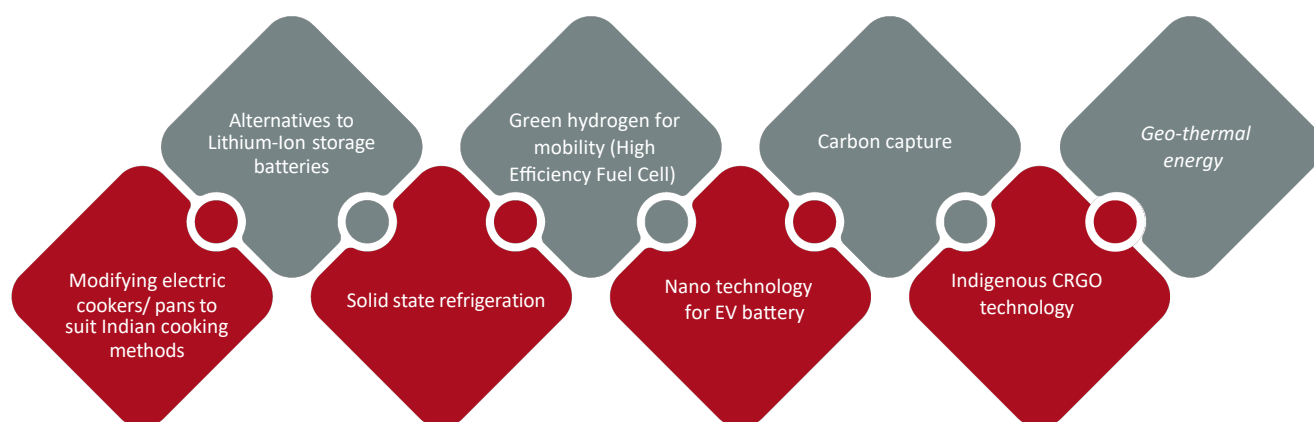


Figure 18: Alternate technology focus of India under 'MAHIR'

Ministry of Power and Ministry of New and Renewable Energy have decided to jointly set up a National Mission on advance and high-impact research (MAHIR) on the latest and emerging technologies in energy sector initially for a period of five (5) years from FY 2023-24 to FY 2027-28. It is to note that the Mission will follow the technology life cycle approach, i.e., Idea to Product. The Mission will have a two-tier structure. The first tier will be an Apex Committee and the second tier will be a separate Technical Scoping Committee. Additionally, pilot projects of technologies developed by Indian startups shall be funded by the Mission, which shall also facilitate their commercialization. Furthermore, the Mission will facilitate international cooperation to ensure the transfer of technology and the seamless exchange of knowledge. Additionally, the Mission will pursue partnerships with preeminent laboratories worldwide in order to jointly develop technologies.

6.3. Strengthening Ties for a Sustainable Future



Authored by Mr. Ishpreet Singh Gandhi, Founder of Stride Ventures

About Ishpreet Singh Gandhi

Ishpreet Singh Gandhi, the visionary behind Stride Ventures and StrideOne, is passionately committed to the vibrant startup ecosystem. Under his leadership, Stride is redefining financial solutions for startups, championing the cause of inclusive and exponential growth in the startup world. With a portfolio of over 120 startups and sanctioning over INR 7000 crore to the ecosystem, Stride stands as a founder-friendly financial institution at the forefront of empowering transformative ideas and sustainable development.

Strengthening Ties for a Sustainable Future: India and UAE's Renewable Energy Collaboration - Collaboration between the two countries to enhance modern energy initiatives

In an era where environmental concerns are paramount, the global shift towards renewable energy sources represents not just a response to ecological challenges, but also a recognition of the economic and social benefits of clean energy. The Paris Agreement was a pivotal moment, encouraging nations to reduce their carbon footprints significantly. Among these global efforts, the collaboration between India and the United Arab Emirates (UAE) in the renewable energy sector stands out as a beacon of progressive partnership and innovation.

In early 2023, India and the UAE significantly advanced their renewable energy collaboration, aligning with the ambitious goals both nations have set to transition towards sustainable energy. The agreement under the One Sun, One World, One Grid (OSOWOG) initiative and the recent signing of MoUs marked a crucial step in this journey. The enhanced cooperation within the I2U2 groups is another important aspect of these developments, especially with respect to recent cross-border renewable energy collaborations. India stands 4th globally in Renewable Energy Installed Capacity (including Large Hydro), 4th in Wind Power capacity, and 4th in Solar Power capacity. To reach 500 GW of non-fossil-based electricity generation by 2030. In 2023 alone, about 13.5 GW of renewable energy capacity was expected to be installed, representing an investment of approximately ₹74,000 crores. This ambitious target is further bolstered by the National Green Hydrogen Mission, with an outlay of ₹19,744 crores, aiming to make India a global hub for green hydrogen production, usage, and export.

Additionally, India's potential for offshore wind energy generation is significant, with an initial assessment estimating about 70 GW off the coasts of Gujarat and Tamil Nadu. The country has also enhanced its solar park scheme capacity from 20,000 MW to 40,000 MW, with 50 solar parks approved across 12 states. Furthermore, there's a focus on rooftop solar programs, with about 741 MW capacity installed during January to November 2023, along with an additional approximately 2.77 GW capacity installed in all sectors.

The UAE's Energy Strategy 2050 complements India's goals, aiming to triple the contribution of renewable energy and invest between AED 150 and AED 200 billion by 2030. This strategy is part of a long-term national program to balance rising energy demand with environmental sustainability.

Key objectives include reducing emissions, increasing energy consumption efficiency, and enhancing the share of renewable and clean energy in the energy mix. By 2030, the UAE plans to increase its installed clean energy capacity from 14.2 GW to 19.8 GW and create 50,000 new green jobs, aiming to achieve net zero emissions by 2050.

The India-UAE collaboration in renewable energy is critical for addressing global challenges like limited natural resources. A notable example is the partnership between LOHUM Cleantech, an Indian startup, and UAE authorities to establish the UAE's first EV battery recycling plant. This facility will significantly contribute to managing EV battery recycling demands and exemplifies the potential of cross-border collaboration in overcoming resource scarcity.

The concerted efforts of India and the UAE in pursuing these ambitious renewable energy targets demonstrate a clear commitment to sustainable development. Both India and the UAE are setting in place funding routes for research and development-heavy businesses to expand collaboration in renewable energy. Recent visits by Indian officials to the UAE have resulted in key MoU signings around this topic, emphasising the mutual interest in developing new technologies and processes to harness and use renewable energy efficiently.

As India and the UAE stride forward in their clean energy endeavours, they set an example for global movement towards a sustainable and resilient future. Their collective efforts, backed by supportive policies, government initiatives, and incentives, hold immense promise for a cleaner, greener world. This partnership is not just a necessity in the face of climate change but also a strategic collaboration that leverages India's technical expertise and market potential with the UAE's financial resources and strategic vision. Together, they represent a powerful alliance in the global renewable energy landscape, driving innovation, investment, and sustainable development at a large scale.



6.4. Optimizing the Green Machine: A Look at Logistics in Renewable Energy, TCI-IIMB Supply Chain Sustainability Lab



Dr. Aditya Gupta



Dr. Mohan Krishna

Authored By Dr. Aditya Gupta and Dr. Mohan Krishna S, TCI-IIMB Supply Chain Sustainability Lab, Supply Chain Management Centre, Indian Institute of Management, Bangalore

Introduction:

The logistics sector plays a significant role in the advancing and penetration of renewable energy technologies. Through efficient movement of solar panels, power apparatus, wind turbines and other related accessories to smart route optimization and planning, logistics continues to be the unseen hand and driving force. It can be considered more of an invisible fuel in the green machine. Technology could be employed to optimize inventory, data-driven forecasts, and intelligent grids. It is essential to unlock the combined power of logistics and technology for a clean and sustainable future. Some of the inherent challenges in the logistics of renewable energy are listed below which could be addressed by innovations and developments in technology.

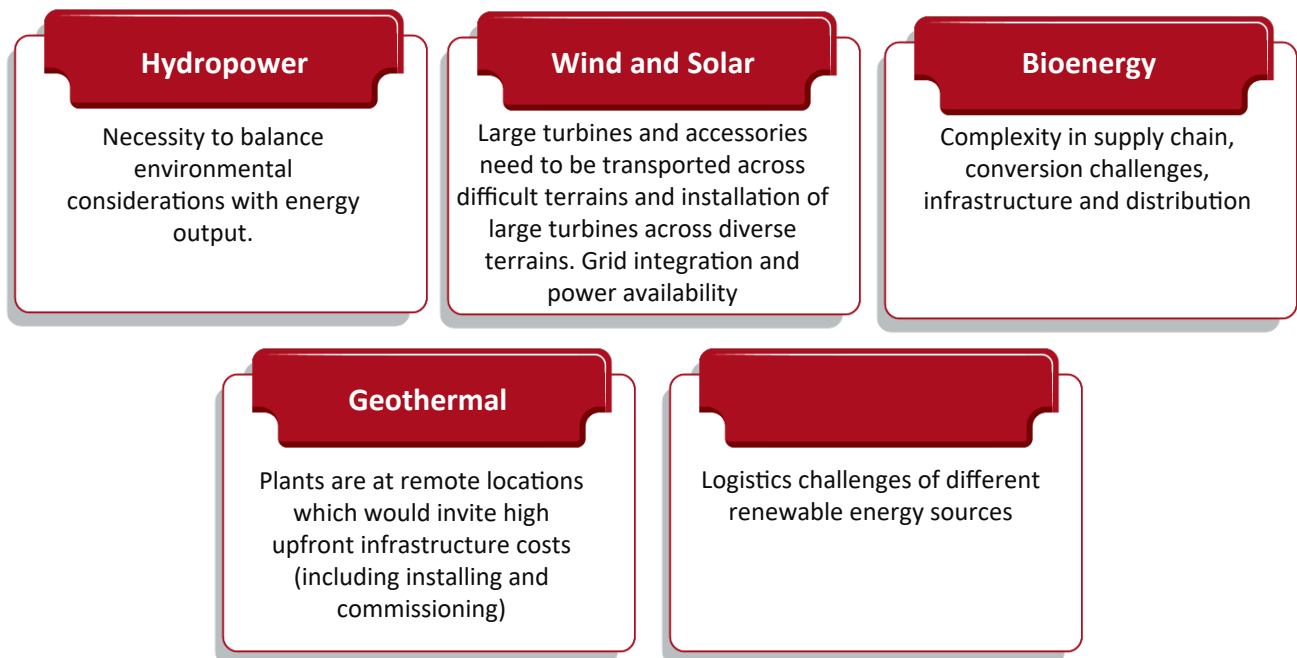
- **Movement of huge machinery/components in difficult terrains:** Wind turbine blades and components are massive in size. Solar panels are delicate and contain sensitive electronic components as well. Ferrying them in hard and strenuous terrains would strain the infrastructure and increase the logistics costs.
- **Seasonal variations:** Solar power is intermittent and requires sufficient energy storage capabilities as well. Integrating it with the power grid is complex, considering the fact that there are issues related to waste and stability.
- **Seamless grid connection:** Renewable sources of energy which are at distant locations from the consumers need to be supplemented with smarter infrastructure and innovative storage solutions.
- **Time stamp and magnitude of paper trails:** Bureaucratic bottlenecks in the form of regulations and paperwork delay the commissioning of important renewable energy projects.

This article has identified and would explore the three main technological solutions which would optimize the logistics of renewable energy sector across the world. They comprise of digitalization, advanced infrastructure deployment and innovation in materials and production.

The article is made up of the following sections. Section 1 discusses the introduction and highlights the inherent challenges which are present in the logistics of renewable energy sector. Section 2 discusses the bottlenecks of different renewable energy sources and their impact. Section 3 deliberates the emerging solutions for optimized logistics. Section 4 showcases real- world examples of technology positively impacting logistics in specific renewable energy projects. Section 5 outlines the way forward followed by conclusion.

The Bottlenecks affecting the efficiency:

The infographic below explores the logistical challenges faced by the renewable energy sector.



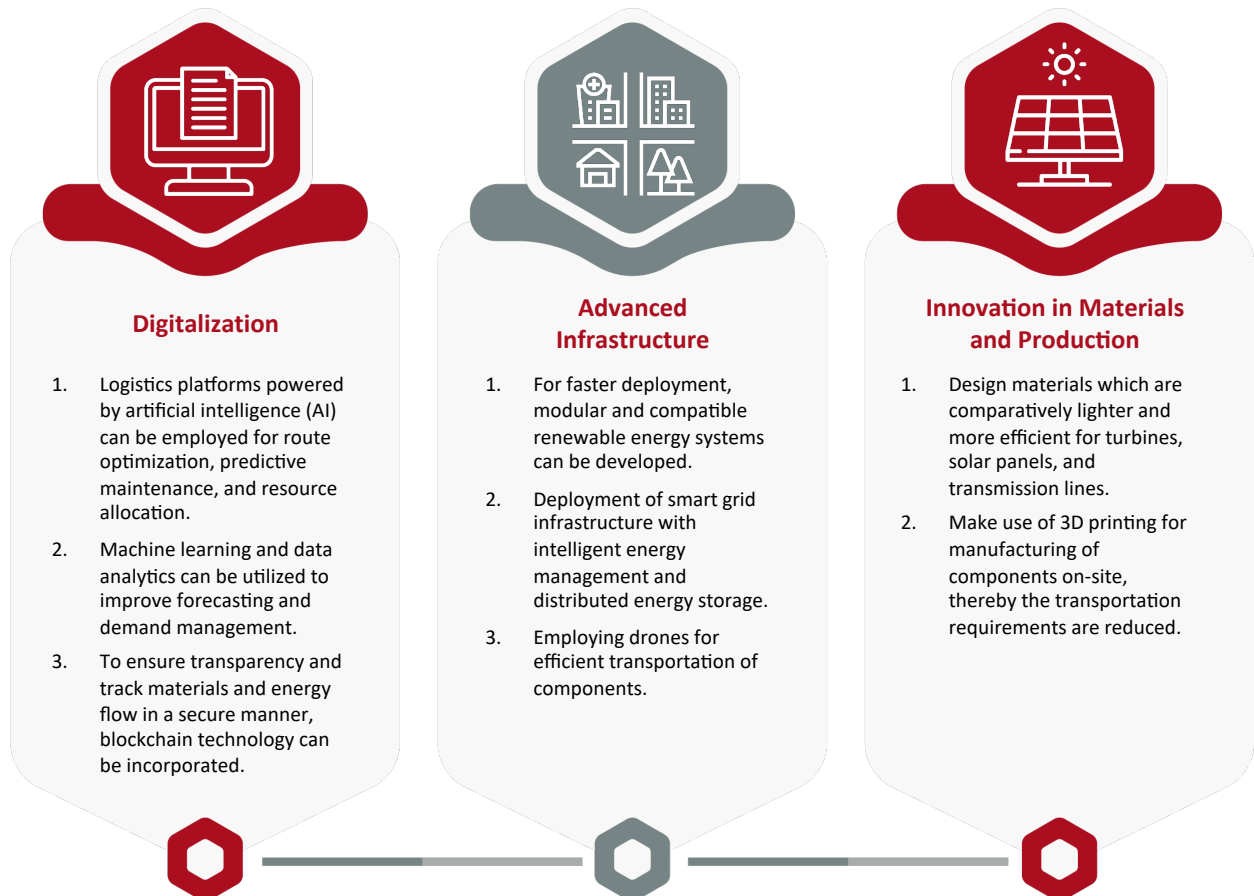
These bottlenecks impact the sector in the following ways:

- Delays in project execution
- Increased logistics/operational costs
- Wastage in energy leading to reduction in overall efficiency
- Inefficiency in transportation and infrastructure development
- Environmental concerns.

These bottlenecks need to be tackled using a multi-pronged approach involving all the relevant stakeholders like the national and the federal governments, industry players, and technology developers. Some of the crucial steps which may be taken to overcome these challenges are Investment in upgradation of the infrastructure, streamlining permitting processes, adopting digitalization, and supporting novel financial models. These are required to unlock the full potential of efficient logistics in the renewable energy sector.

Leveraging technology: Emerging solutions for optimized logistics

The renewable energy sector faces a complex dilemma. There is a need to harness clean, decentralized energy sources while taking care of inherent obstacles related to logistics. To have sustained growth and impact, the industry must have sufficient innovative solutions at its disposal for streamlining and optimizing its supply chain. The below infographic tries to focus on some of the emerging solutions which can pave the way for a greener future



Additionally, the Internet of Things (IoT) plays a significant role owing to a high magnitude of data, people and physical objects that are involved across the supply chain. A network of sensors used across the supply chain for real-time data collection on operational and performance aspects provides data driven insights to aid decision makers. This also improves operational efficiency and reduces the costs associated. Devices which are IoT enabled have a mechanism for remote monitoring of assets. This ensures optimal allocation of resources, predictive maintenance, and fast response to emergency scenarios. The sector, by adopting these emerging technologies, can easily streamline its logistics, have a competitive edge, minimize its overall environmental footprint, and move towards a more sustainable future.

Case Studies: Best practices of how technology is improving logistics in specific renewable energy projects

Case Study 1 : A leading global software company for traffic planning, simulation, and real-time management

The company designed a software suite for efficient transport planning and simulation. The tool uses historical traffic data and weather patterns for optimizing the routes for transportation of turbine components, leading to reduced fuel consumption and delivery times. The tool aids decision-makers from logistics and renewable energy companies to make informed choices that lead to improved mobility, reduced congestion, and minimal environmental impact.

Benefits:

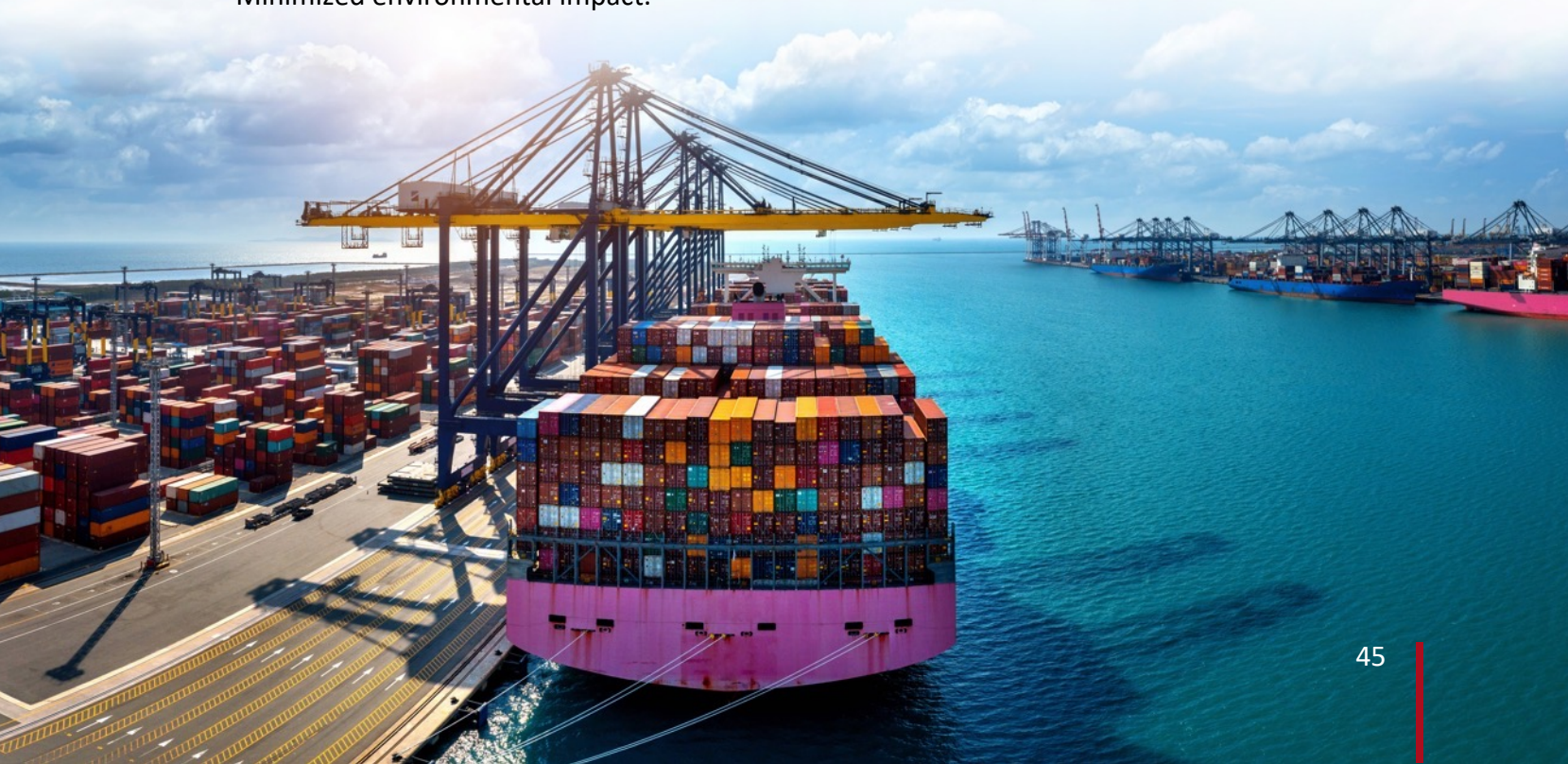
- Network design, route analysis, scheduling for optimizing passenger experience and operational efficiency, testing different traffic scenarios.
- Consider the different planning scenarios and evaluate its cost and benefits.
- Analyzing safety by identification of potential accident hotspots.
- Environmental impact assessment: Analysis of emissions and noise pollution considering different traffic scenarios.

Case Study 2: A leading logistics firm

The company designed and developed a planner suite, with the objective of revolutionizing route optimization using artificial intelligence (AI).

Benefits:

- Optimal path mapping, route optimization, real-time route adjustments to minimize delays and fuel consumption.
- Diverse locations can be managed, ensuring integration with maintenance schedules.
- Minimized environmental impact.



The Road Ahead: Challenges and Opportunities

There is tremendous scope for leveraging emerging technologies to optimize the logistics in the renewable energy sector. It has been observed that there are tangible benefits of optimizing the logistics in the renewable energy sector in terms of cost reduction, efficiency gains, and environmental impact. However, there is still concern about widespread adoption of the same owing to issues related to data privacy, cybersecurity, and potential job displacement.

Challenges	Description
Technological Immaturity	<ul style="list-style-type: none"> • Complexity in logistics: The existing AI models may not be able to cope with the unique challenges of renewable energy logistics like seasonal variations and far off locations. • Data Integration: Acquiring and processing data from several diverse sources (sensors, weather, grid) is complex. • Blockchain scalability: The current blockchain technologies need to be scaled up to handle huge volumes of energy supply chain transactions.
Concerns related to cost	<ul style="list-style-type: none"> • Upfront investment cost: AI and blockchain technologies require a high capital investment. • Operation and Maintenance cost: There is huge cost associated with software subscriptions, data storage and maintenance etc.
Workforce skilling and upgradation	<ul style="list-style-type: none"> • Technology know-how: The workforce needs to be trained in AI, data analytics, and blockchain to adopt these technologies. • Training upgradation: Sufficient time and resources need to be allocated to train the current workforce
Impact of market and regulations	<ul style="list-style-type: none"> • Evolving regulations: The current set of regulations is still evolving for emerging technologies. • Incentives: Support is lacking in terms of strong financial incentives, like • carbon pricing or tax breaks.

But this could be potentially offset with immense opportunities for new jobs in new and developing technology sectors and environmental benefits.

Conclusion:

It is an undisputed fact that logistics would play a significant role in sustainable energy development and technology would act as a catalyst to offset the existing challenges and aid the adoption of clean and green energy. All the relevant stakeholders must make a conscious effort in investment in sustainable technologies and fostering innovation in the renewable energy sector.

About the Authors

Dr. Aditya Gupta is the Chief Operations Officer, TCI-IIMB Supply Chain Sustainability Lab at the Supply Chain Management Centre of IIM Bangalore. Dr. Gupta's areas of expertise include Carbon Accounting, Supply Chain Sustainability, Corporate ESG management and Circular Economy.

Dr. Mohan Krishna is Manager-Research, TCI-IIMB Supply Chain Sustainability Lab at the Supply Chain Management Centre (SCMC) at IIM Bangalore. His research interests include energy sustainability and supply chain, electric vehicles - battery value chain, battery management systems, and IoT based building energy management systems etc.





07

**India & UAE
collaboration in
“Clean-Tech”**



07 India & UAE Collaboration in “Clean-Tech”

Increased susceptibilities to climate change and the accelerated rate of global warming have compelled the international community to seek out clean, environmentally friendly renewable energy alternatives. In the existing scenario, collaborations should not be only limited to information exchange or sourcing of funds, the collaboration need to also entail the following:

- Task sharing, in which India and UAE can devote specified resources and personnel to conducting part of a common work programmer
- Cost sharing, in which India and UAE can contribute to a common fund for conducting an experiment or equipment purchase, operation of a single facility, or for information exchange.

7.1. Recent Developments

Over the past few years, India and GCC nations have strengthened their cooperation in the field of renewable energy. The United Arab Emirates (UAE) vowed on 3 October 2021 to allocate \$75 billion in sovereign funds to India in support of their shared objective of promoting clean energy. Furthermore, India and the UAE are collaborating to initiate the production of solar power equipment. India and the UAE signed a memorandum of understanding on January 13, 2023, to work together on the development of green hydrogen and the installation of an undersea cable connecting India and the UAE as part of the 'One Sun, One World, One Grid' initiative.

A bilateral agreement between India and the UAE regarding the interconnection of their respective electricity grids is imminent. The United Arab Emirates and India reached a mutual agreement on January 25, 2023, to investigate potential areas of cooperation pertaining to nuclear energy and prospects in the Indian Ocean region. Under the aegis of I2U2, India and the United Arab Emirates are collaborating to advance a hybrid renewable energy project in the Indian state of Gujarat.

7.2. Our Take

It is to acknowledge that Both countries remain significantly invested in traditional sectors. It is imperative that the recent strengthening of ties between two countries can be utilized at the broader level to encourage investment in clean energy. Additional investigation into potential engagement opportunities in the area of Green hydrogen, clean transport, energy efficiency may lead to investors interests in funding economic viable projects.



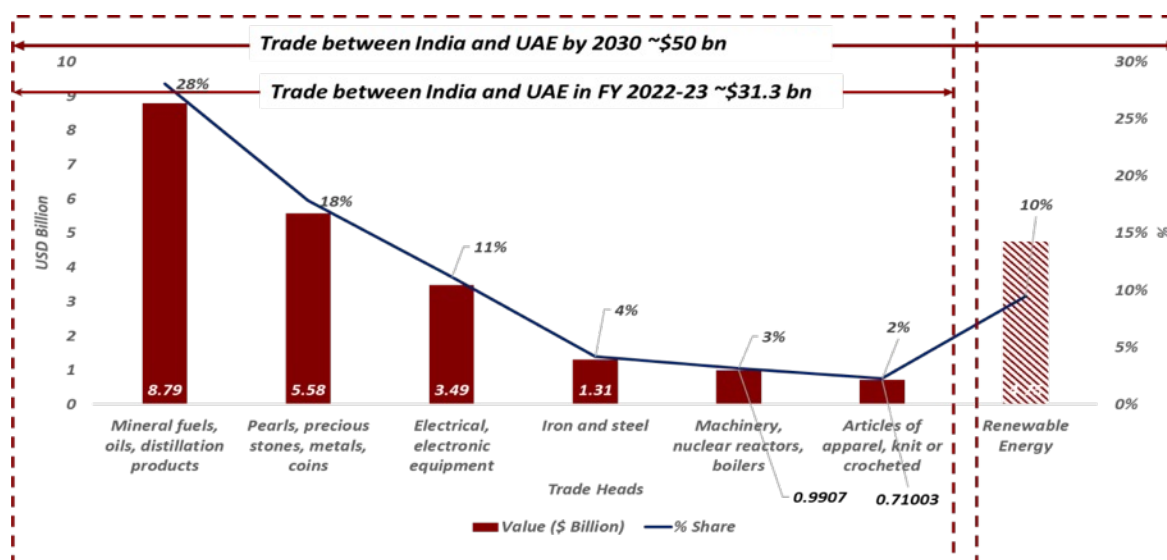


Figure 19: NAC Analysis on Trade Investments between India and UAE

Other than investments efforts have to be focussed in following areas

- **Joint R&D hubs** – By creating specialised research facilities, both countries can capitalise on their respective expertise in the concurrent development of state-of-the-art technologies for producing green hydrogen, wind, and solar energy. The UAE's financial strength and India's research prowess can propel clean energy innovation.
- **Manufacturing collaborations** - UAE investments and technology partnerships have the potential to enhance India's ambitious aspirations of establishing itself as a prominent global hub for solar manufacturing. The formation of joint ventures for the production of high-efficiency solar panels for export and domestic markets can generate substantial economic value.
- **Collaboration in Green Hydrogen** - Collaboration between India and the UAE could be instrumental in the development of a green hydrogen trade corridor. This would position India as a significant producer and exporter of this environmentally friendly fuel, while the UAE, leveraging its current energy infrastructure and strategic location, would function as a pivotal distribution hub. Recent research from McKinsey projects that by 2050, the worldwide market for green hydrogen will be worth USD 700 billion. This presents a tremendous opportunity for both nations.
- **Streamlining investments** - Promising startups operating in renewable, energy efficiency and clean-tech sector can secure vital funding by establishing specialised venture capital funds that cater to investors from both India and the UAE. Moreover, tax incentives and streamlined regulatory frameworks have the potential to entice greater inflows of foreign capital into the startup ecosystem of India.
- **Incubator Network** - The establishment of a joint incubator network comprising bi-national incubators in pivotal cities such as Delhi, Mumbai, and Dubai has the potential to facilitate knowledge exchange and cross-border collaboration in the area of concentrated solar power plants, use of geothermal energy, advanced technology in battery storage
- **PPP collaboration** - Public-private partnerships (PPPs) involving Indian construction firms and sovereign wealth funds from the United Arab Emirates have the potential to secure financial resources for critical infrastructure initiatives in India specially focussed in clean-tech domain. The UAE's expertise in effectively overseeing public-private partnerships (PPPs) can provide India with significant insights in policy and regulatory framework.

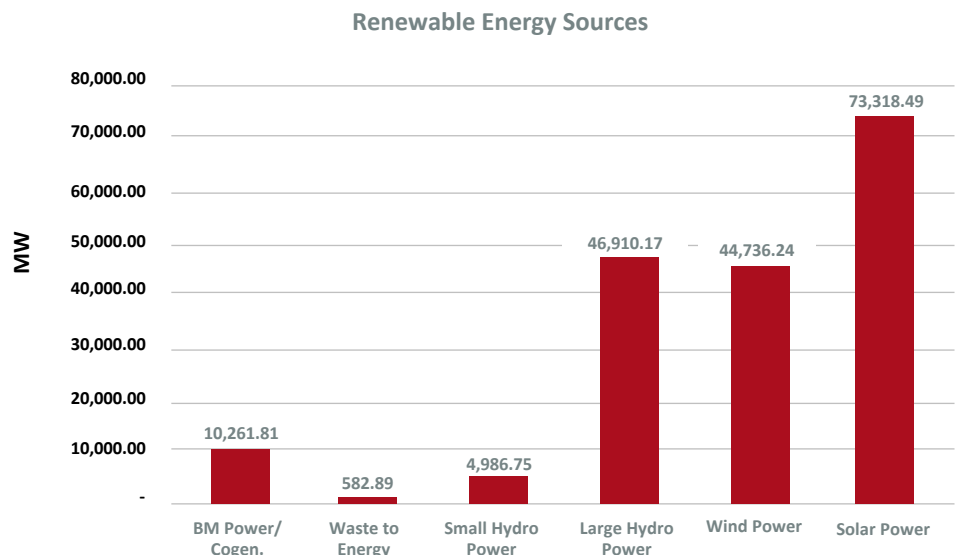
7.3. India – UAE energy collaboration – The way Ahead



Authored By Mr. Kunal Kanda, Associate Director, (Head – Plant & Machinery Valuation), Cushman & Wakefield India Pvt. Limited

Underneath the scorching heat of the Indian subcontinent and the expansive deserts of the UAE, another type of fire is building: the heat of aspiration, of a common goal for an energy security when reliance on fossil fuels is reduced. Two countries with very different geographies and economies, India and the United Arab Emirates, are developing an extraordinary alliance in renewable energy that will hopefully shed light on both their own and the world's futures. The United Arab Emirates is investing in large-scale solar projects all across India, capitalizing on its position as a world leader in solar energy. An excellent case in point is the 1.2 GW solar energy project in Rajasthan, which is a collaboration between businesses in the UAE and India. An enormous solar farm covering an area of 2,500 ha would produce enough renewable energy to provide for more than 750,000 households, demonstrating the game-changing possibilities of this collaboration. However, the partnership extends much beyond financial backing. India, with its trained workforce and industrial expertise, is playing a critical role in developing and installing cost-effective solar systems. In the future, everyone will be able to access inexpensive solar energy because to this knowledge sharing, which promotes innovation.

India: India aims to achieve net zero carbon emissions by 2070 and 50% of its electricity needs from renewable sources by 2030. Renewable Energy includes Bio Power – BM Power / Cogen & Waste to Energy, Small Hydro Power, Large Hydro Power, Wind Power and Solar Power. As on 31st December 2023, the installed capacity as per CERC in India includes:



- Installed renewable power generation capacity has increased at a fast pace over the past few years, posting a CAGR of 14.58% between FY16 and FY23.
- As on 31st December 2023, 42% of the total power installed capacity is from Renewable Sources.
- India plans to reach 4,50,000 MW of installed renewable energy capacity by 2030 with 2,80,000 MW expected from solar power. This will provide investment opportunities worth US\$ 221 billion by 2030.
- The country ranks fourth worldwide in terms of the total installed wind power capacity.

UAE:

- By 2050, Dubai aims to obtain 75% of its energy blend from renewable sources, according to the Dubai Renewable Energy Strategy 2050. Clean coal, solar power, wind power, and nuclear power are the main points.
- Aiming to become a sustainable city by 2030, Sharjah Sustainable City is a program that prioritizes renewable energy, energy efficiency, and environmentally friendly transportation.
- The Abu Dhabi Hydrogen Roadmap lays out the city's intentions to spearhead environmentally friendly hydrogen production and export on a worldwide scale. Hydrogen transportation infrastructure, renewable energy sources, and electrolysis facilities are all part of it.

India and UAE Partnership:

Solar cell efficiency, energy storage, and smart grid integration are just a few of the areas where the two nations are working together on joint R&D projects. Capacity building and knowledge sharing through workshops, training programs, and exchange programs are facilitating the exchange of best practices and knowledge between the UAE and India. Joint ventures, public-private partnerships, and green bonds are being used by the two nations to entice investors to fund renewable energy projects.

The partnership between India and the UAE is not without its obstacles, despite the robust policy framework and encouraging initiatives. Some developers may be put off by the high initial expenditures required by renewable energy projects. Connecting renewable energy sources with intermittent outputs, such as solar and wind, to pre-existing power networks is a complex technological issue. To entice investments, it is essential to streamline the permitting procedure and establish a stable regulatory environment. Both countries are heavily involved in renewable energy-related global events and programs, including IRENA and the Clean Energy Ministerial. An important factor propelling the India-UAE partnership ahead is the business sector. Renewable energy initiatives in both nations are receiving investments from several global corporations.

Expectations from Both Governments

- Delays and additional expenses associated with renewable energy project approvals can be mitigated by eliminating unnecessary red tape.
- Ensuring transparency and anticipation regarding feed-in tariffs, tax incentives, and additional mechanisms of financial support.
- Establishing stringent rules for the environmentally friendly generation, storage, and transportation of hydrogen.
- Making investments in energy storage and smart grid technology to solve grid integration difficulties.

- Creating a renewable energy fund to invest in renewable energy initiatives that show promise in both nations.
- Beginning collaborative projects to study and improve state-of-the-art renewable energy sources.
- To produce a competent labour force for the renewable energy industry, it is necessary to establish collaborative training and capacity development initiatives.
- Developing channels for companies and other stakeholders in both nations to communicate and share information.
- Making it easier to import and export supplies and equipment for renewable energy sources through customs processes.
- Renewable energy products and services can benefit from preferential trade agreements.
- Connecting businesses in the two nations through trade missions and other forms of business matching.
- Assisting Indian businesses looking to invest in renewable energy in the United Arab Emirates and vice versa.

Multilateral Development Banks (MDBs) such as the World Bank, the Asian Development Bank (ADB), and the International Finance Corporation (IFC) can be of great assistance. They are capable of imparting technical guidance and best practices to private enterprises and governmental entities in both nations with regards to the conceptualization, execution, and oversight of renewable energy initiatives. For framework development, MDBs can offer a hand to governments in crafting sensible legislation that guarantees grid integration and encourages investments in renewable energy. When it comes to expanding their use of renewable energy, India and the UAE can find strong support from MDBs. With their financial backing, technical knowledge, and collaborative platform, MDBs can hasten the two nations' shift to renewable energy sources and add to the global effort to combat climate change.



7.4. A Deep Dive into the India-UAE Collaboration in Renewable Energy - Current Initiatives and Future Potential"



*Authored By Lt Cdr
Ravindranath Reddy,
Dy CEO, Andhra
Pradesh Maritime
Board (APMB)*

As the world grapples with the challenges posed by climate change and strives for sustainable development, the collaboration between India, world's fifth largest economy and the United Arab Emirates (UAE), one of the most influential global trading, transport and financial powerhouse, in the realm of renewable energy emerges as a beacon of hope. This article delves into the current initiatives undertaken by the two nations and explores the immense potential that lies ahead in their joint efforts to harness clean and renewable energy sources for sustainable development.

Current Initiatives:

1. Rewa Ultra Mega Solar Park: A Trailblazing Partnership

Rewa Ultra Mega Solar Park in Madhya Pradesh is the joint venture between India's Solar Energy Corporation of India (SECI) and the UAE's Masdar (Abu Dhabi Future Energy Company) which exemplifies the commitment of both nations to transition towards sustainable energy. The park is spread around an area of 1590 hectares and boasts a massive capacity of 750 megawatts, making it one of the largest solar parks globally. The collaboration between SECI and Masdar has not only set new benchmarks for solar power tariffs but has also paved the way for innovative financing and distribution models, showcasing the economic viability of large-scale solar projects. The project has received World Bank Group's President's Award for innovation and excellence.

2. Adani Green Energy and Abu Dhabi Investment Authority (ADIA) Partnership: Empowering India's Renewable Landscape

Adani Green Energy and Abu Dhabi Investment Authority (ADIA) Partnership: Empowering India's Renewable Landscape
The collaboration between Adani Green Energy and the Abu Dhabi Investment Authority (ADIA) is a testament to the strategic investments flowing from the UAE into India's burgeoning renewable energy sector. ADIA has invested USD 2 Billion in 3 companies of the Adani Group- Adani Green Energy, Adani Transmission and Adani Enterprises. This partnership aligns with India's ambitious target of achieving 500 gigawatts of renewable energy capacity by 2030 and provides a robust foundation for scaling up clean energy projects.

3. *Green Hydrogen Collaboration: Pioneering the Next Frontier*

Recognizing the pivotal role of green hydrogen in the global transition to a low-carbon economy, India and the UAE have joined forces to explore opportunities in hydrogen production. The collaboration aims to leverage the UAE's expertise in hydrogen technologies and India's vast renewable energy potential to establish a robust green hydrogen ecosystem. India and UAE have signed an MoU on cooperation in the field of Green Hydrogen and Development and Investment under Prime Minister Narendra Modi's 'One Sun, One World, One Grid initiative.' India and the UAE have reached an agreement on launch of feasibility study on laying Under Sea Cable connecting India to the UAE.

4. *Joint Research and Development Initiatives: Fuelling Innovation*

Beyond project-based collaborations, India and the UAE are actively engaged in joint research and development initiatives to foster innovation in renewable energy technologies. These initiatives encompass a wide spectrum of activities, including the development of advanced solar technologies, energy storage solutions, and smart grid systems. By pooling their scientific and technological resources, both nations aim to accelerate the deployment of cutting-edge solutions that will shape the future of renewable energy.

5. *International Renewable Energy Agency (IRENA): A Collaborative Hub*

The International Renewable Energy Agency (IRENA) serves as a pivotal platform for fostering collaboration between India and the UAE. As members of IRENA, both nations actively participate in global dialogues on renewable energy policies, share best practices, and contribute to the agency's initiatives. IRENA plays a crucial role in facilitating knowledge exchange, promoting international cooperation, and supporting the development of a sustainable and inclusive global energy landscape.

Potential for Future Collaboration:

1. *Scaling Up Solar and Wind Power Capacities:* The immense solar potential of India, coupled with the UAE's financial capabilities and technological expertise, creates a conducive environment for scaling up solar power capacities. Future collaborations could focus on developing mega solar parks, implementing advanced photovoltaic technologies, and integrating solar power into the mainstream energy grid. Similarly, leveraging the abundant wind resources in both nations presents opportunities for joint ventures in wind energy projects, contributing to a diversified and resilient renewable energy portfolio.
2. *Energy Storage Solutions:* The intermittency of renewable energy sources underscores the importance of effective energy storage solutions. Collaborative efforts between India and the UAE could concentrate on developing and implementing advanced energy storage technologies such as battery storage, pumped hydro storage, and innovative grid solutions. Investing in storage infrastructure enhances the reliability and stability of renewable energy systems, paving the way for increased integration into the energy mix.
3. *Smart Grids and Energy Efficiency:* Building smart grids and enhancing energy efficiency are crucial components of a sustainable energy transition. The integration of smart grid technologies can optimize the distribution and consumption of renewable energy, improving overall system efficiency. India's commitment to the development of smart cities aligns with the UAE's vision for sustainable urbanization, providing a fertile ground for collaborative initiatives in building smart and energy-efficient infrastructure.

4. *Hybrid Renewable Energy Systems:* Combining the strengths of different renewable energy sources in hybrid systems can maximize energy production and enhance grid stability. Collaborative projects could explore the integration of solar, wind, and other clean energy sources into hybrid systems, leveraging the complementary nature of these technologies. Hybrid systems offer the potential to provide reliable and consistent power supply, overcoming the challenges associated with the intermittency of individual renewable sources.
5. *Capacity Building and Skill Development:* As the renewable energy sector continues to evolve, capacity building and skill development become imperative. India and the UAE can collaborate on initiatives aimed at training a skilled workforce, fostering research and development capabilities, and nurturing a culture of innovation in the renewable energy sector. Such collaborative efforts will not only benefit both nations but also contribute to the global pool of expertise in renewable energy technologies.
6. *Exploring New Frontiers: Ocean and Geothermal Energy:* Beyond Solar, Wind, and Hydrogen, there is potential for collaboration in untapped renewable energy sources such as Ocean and Geothermal energy. Both India and the UAE have coastlines that can be harnessed for Ocean energy, including Tidal and Wave energy. Geothermal energy, often overlooked, presents opportunities for sustainable power generation. Collaborative research and pilot projects in these domains could unlock new avenues for clean energy production.

Conclusion:

The India-UAE collaboration in renewable energy is not merely a partnership between two nations; it is a shared commitment to a sustainable and resilient future for the planet. The current initiatives, ranging from large-scale solar parks to cutting-edge research, showcase the tangible impact of this collaboration. As both nations continue to deepen their engagement, the potential for future collaboration is vast and promising. By focusing on scaling up capacities, embracing innovative technologies, and exploring new frontiers, India and the UAE have the opportunity to redefine the global energy landscape and inspire other nations to join the journey towards a cleaner and more sustainable future.



08

Major Players

08 Major Players



As a pioneer in advancing the clean energy sector and a key enabler of the UAE's vision as a global leader in sustainability and climate action, Masdar has developed projects in more than 40 countries across six continents and has invested, or committed to invest, in worldwide projects with a combined value of more than US\$30 billion.



Mubadala is a sovereign investor that manages a global portfolio and is a subsidiary of Mubadala Investment Company (Mubadala). Mubadala has been investing in renewable energy since 2016 through the establishment of Masdar.



As a pioneer in advancing the clean energy sector and a key enabler of the UAE's vision as a global leader in sustainability and climate action, Masdar has developed projects in more than 40 countries across six continents and has invested, or committed to invest, in worldwide projects with a combined value of more than US\$30 billion.



Adani Green Energy Limited (AGEL) is an Indian renewable energy company that develops, builds, owns, operates, and maintains solar, wind, and hybrid power plants. AGEL is headquartered in Ahmedabad, India and is owned by the Indian conglomerate Adani Group. AGEL is one of the largest renewable companies in India, with a current project portfolio of 5,290 MW



ReNew is India's largest renewable energy solutions provider by commissioned capacity. They operate wind, solar, and hydro energy projects across India. As of November 2022, their commissioned capacity is 7.7 GW, which is enough to power about 14 million homes in India

About UIBC

The **UAE-India Business Council (UIBC)** is the official Joint Business Chamber set up by both the Governments for promoting economic synergies between the UAE and India. UIBC was formally launched by His Highness Sheikh Abdullah bin Zayed Al Nahyan, UAE Minister for Foreign Affairs and Late Smt. Sushma Swaraj, Hon'ble Minister of External Affairs of India during 11th Session of the India-UAE Joint Commission Meeting on 3rd September 2015 in New Delhi. UAE major companies like DP World, Sharaf Group, Lulu, Etihad Airways, First Abu Dhabi Bank, Emirates NBD, Emaar, etc. are some of the key members.

For more information, kindly visit uibc.org

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Business Enquiries:-

Suraj Nangia

Managing Partner

Nangia Andersen LLP

suraj.nangia@nangia-andersen.com

Arindam Ghosh

Partner - Government and Public Sector Power
Advisory

Nangia Andersen LLP

arindam.ghosh@nangia-andersen.com

Mukesh Kalra

Head

Business Development

trade@uibc.org

Research Authors:-

Subharth Saha

Manager - Government and Public Sector
Power Advisory

Nangia Andersen LLP

subharth.saha@nangia-andersen.com

Priyanka Kumari

Assistant Manager

Research & Consultancy

UAE-India Business Council

uibc@uibc.org

Pratibha Chuphal

Senior Associate

Design Communications

pratibha.chuphal@nangia.com

Nangia Andersen LLP

A member firm of  ANDERSENGLOBAL 