CURRENT NEWS

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CLEAN ENERGY TRANSITION AND CRITICAL MINERALS : THE SHIFT FROM A FUEL INTENSIVE TO A MATERIAL INTENSIVE ENERGY SYSTEM

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The Growing Demand for Critical Minerals

The transition to clean energy brings new challenges to energy security, particularly due to the increasing demand for critical minerals and rare earth elements. A report published by the International Energy Agency (IEA), *The Role of Critical Minerals in Clean Energy Transitions*, highlights the intricate relationship between these minerals and the rapid transformation of the energy sector. Understanding the implications of this shift is crucial for shaping policies and strategies that ensure a secure and sustainable energy future.

A publication from

CAG

Citizen consumer and civic Action Group

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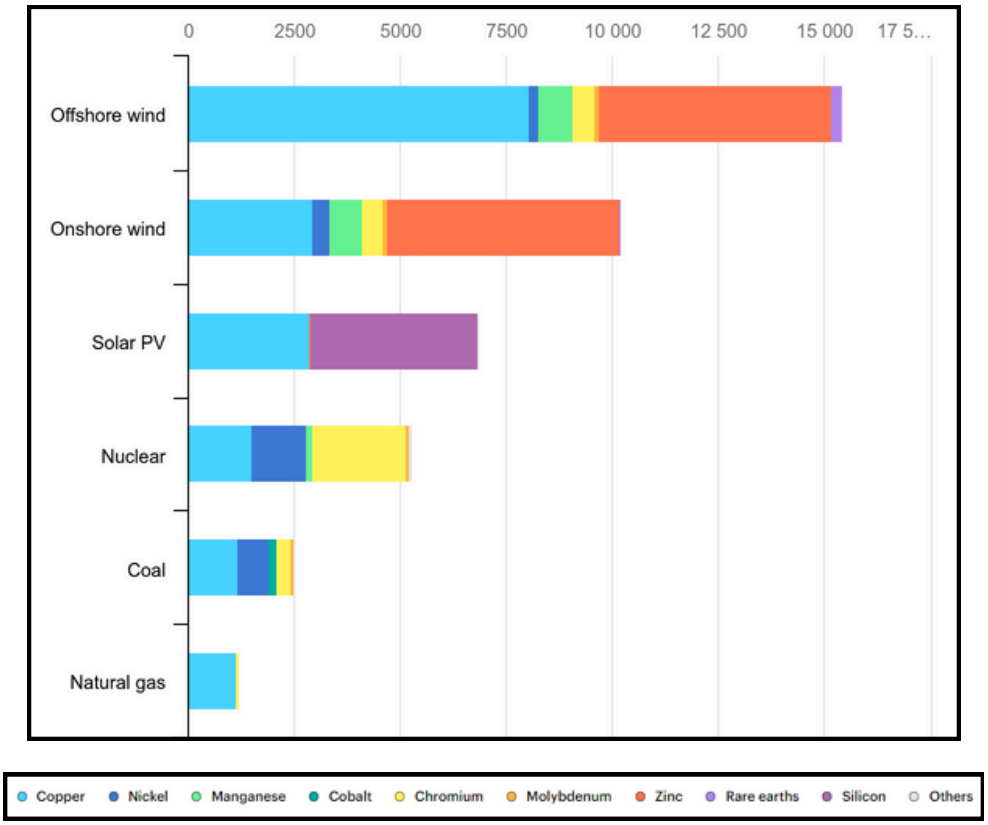


Figure 1 : Minerals used in clean energy technologies compared to other power generation sources | IEA

Solar photovoltaic plants, wind farms, and electric vehicles require significantly more minerals than their fossil fuel-based counterparts. The demand for rare earth elements is projected to grow by 400-600% in the coming decades, with minerals such as lithium and graphite—crucial for EV batteries—seeing demand increases of up to 4000%. A typical electric vehicle uses six times the mineral inputs of a conventional car. Wind turbines rely on neodymium-iron-boron magnets, which contain rare earth elements like neodymium and praseodymium for strength, while dysprosium and terbium make them resistant to demagnetization. Onshore wind farms require nine times more mineral resources than gas-fired plants.

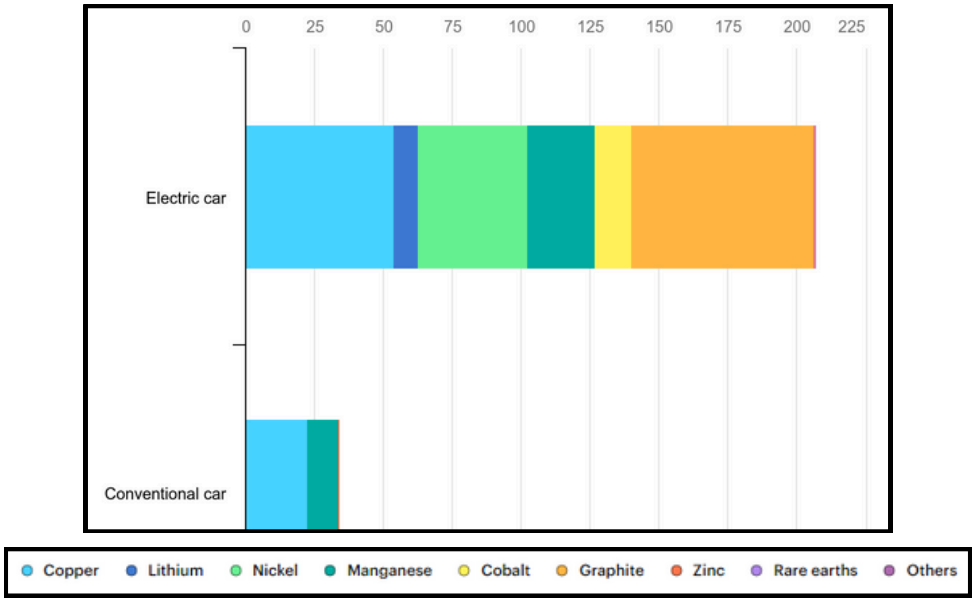


Figure 2 : Minerals used in electric car compare to the conventional car | IEA

Green hydrogen production depends on nickel and zirconium for electrolyzers, while copper and platinum group metals are essential for fuel cell electric vehicles. The growing adoption of solar PV systems is expected to triple the demand for copper, alongside increasing demand for silver and silicon. Concentrated solar power will drive demand for chromium, copper, manganese, and nickel, while geothermal power will require more nickel, chromium, molybdenum, and titanium. Hydropower and bioenergy, in contrast, have relatively low mineral intensity. The expansion of electricity grids will double annual demand for copper and aluminum by 2040.

Figure 3 : Critical mineral needs for renewable energy technologies | IEA

Geopolitical Risks in Mineral Supply Chains

Unlike oil, which is widely produced and traded in liquid markets, the production and processing of minerals such as lithium, cobalt, and rare earth elements are concentrated in a few countries. China currently dominates the market, producing 60-70% of the world's rare earth elements while securing mining rights in Africa. When China halted exports of rare earth elements to Japan in a dispute, many countries became concerned about the political and economic implications of depending on one market and began developing their own rare earth element production. Until 2018, the US was 100% dependent on other countries for 21 critical minerals. Later the government prioritized the development of a domestic supply chain for critical minerals. In India the government approved the National Critical Mineral Mission, which aims to promote exploration of essential minerals, reduce import dependence, and to ensure self-reliance. Thus, the transition to clean energy introduces new trade patterns, geopolitical risks, and supply chain vulnerabilities.

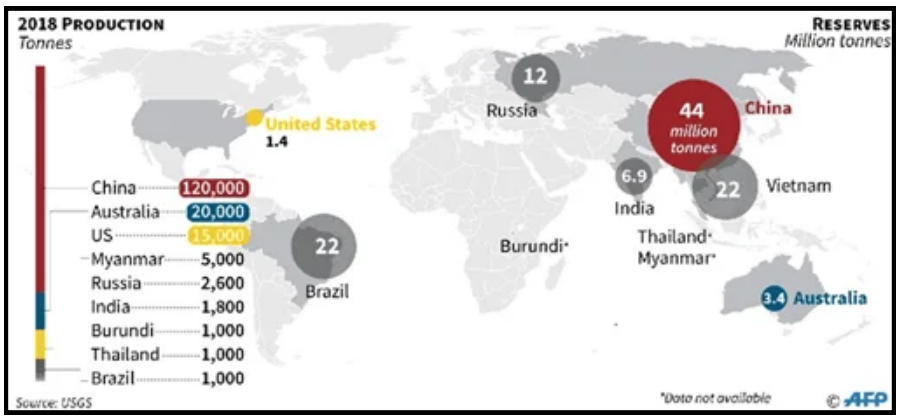


Figure 4 : Rare earth metals production and reserves in various countries | USGS

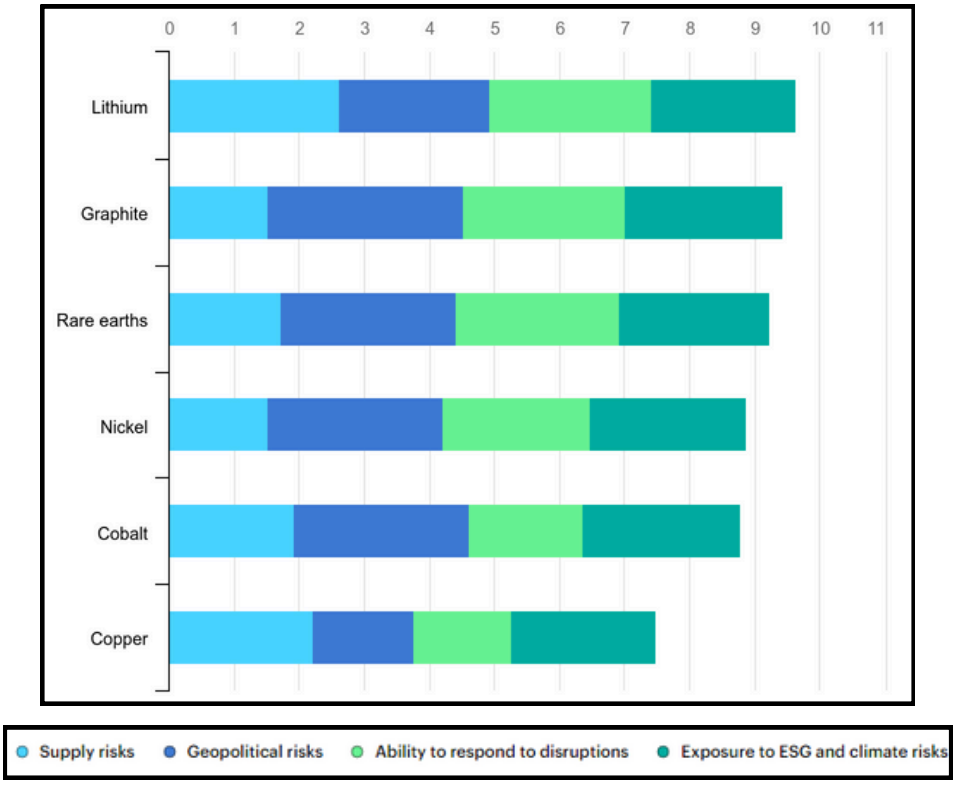


Figure 5 : Clean energy transition risk score for key energy transition minerals | IEA

Innovations in Mineral Extraction

Extracting one ton of rare earth elements generates approximately 30 pounds of dust, 9,600 to 12,000 cubic meters of waste gas containing pollutants like hydrofluoric acid and sulfur dioxide, 75 cubic meters of wastewater, and one ton of radioactive residue—amounting to a total of 2,000 tons of toxic waste. China's Bayan-Obo mine, the largest rare earth element mine in the world, has produced over 70,000 tons of radioactive thorium waste, which is stored in a tailing pond that has leaked into the groundwater. Researchers are exploring alternative extraction methods such as agromining, where hyperaccumulator plants absorb nickel from the soil, yielding over 300 kg per hectare annually—offering a sustainable way to source critical minerals. Biomining uses microorganisms in specialized reactors to extract valuable elements from basaltic rocks. Other emerging techniques, such as deep-sea mining and space mining, could expand the resource base in the future.

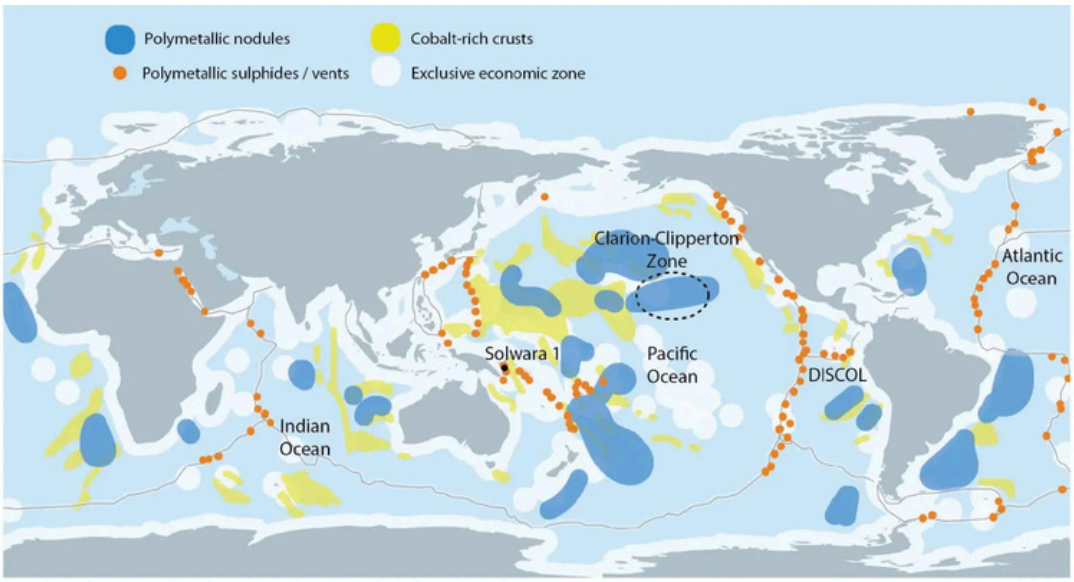


Figure 6 : Distribution of critical mineral resources in the deep sea | Source : WRI

The Role of Recycling in Securing Supply

A crucial distinction between fossil fuels and critical minerals lies in their lifecycle. Unlike oil, which is combusted, minerals can be recovered and recycled, reducing the need for new extraction. Strengthening recycling initiatives and improving supply chain resilience will be key. It is estimated that recycling could cut new mineral extraction needs by 10%, with even greater benefits in regions heavily invested in clean energy technology. For example, the metal with the highest recycling rates is copper. Between 2009 and 2018, global copper consumption averaged 26.7 million tonnes annually, with 32% of this coming from recycled sources. If recycling could have been even more efficient, it could have provided upto 56% of the total copper demand. Thus increasing the recycling rate could satisfy a significant portion of the rising demand for the critical minerals.

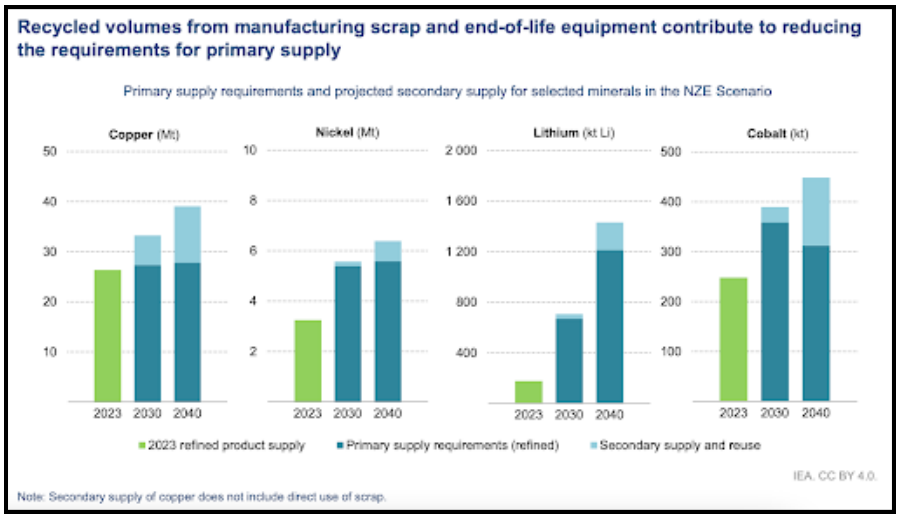


Figure 7 : Primary supply requirements and projected secondary supply for selected minerals in the Net Zero Emission Scenario | IEA

The Way Forward

Critical minerals and rare earth elements are essential for renewable energy technologies. Due to their limited availability and difficulties in mining, the price of these minerals play a crucial role in the cost of renewable energy technologies. This could hinder the progress of global efforts in clean energy transition. The extraction of these minerals from ores are through energy-high processes, with potential consequences for the environment also. More research could identify alternate methods for extraction. To fulfil future demand, and to keep supply more equitable and free of geopolitical pressures, more exploration is needed to identify new mines. An international collaboration and framework is needed to strengthen the supply chain of these minerals and to address price volatility. Also, more R&D is needed to identify alternate materials that can be used in lieu of these critical minerals. Significant amount of these minerals can be extracted by recycling waste from renewables. Hence policies and stringent waste disposal mechanisms and monitoring is needed. Consumers need to be informed about the importance of recycling of these materials, so they know to dispose off renewable energy technologies in appropriate ways. More importantly, consumers, corporates and governments need to acknowledge that even renewable energy comes at significant cost, both to the environment, and to human health, and all possible effort must be expended to optimize its use and recycle it efficiently for mineral extraction at the end of its lifecycle.

Concluded

CONSUMER FOCUS

A petitioner, a commercial consumer, rented a 150-square-feet office space for her legal practice. Due to health issues, the petitioner had to shut down her office between March 3, 2022, and December 2022, with the premises opened just for cleaning purposes over this period. The bill for December 2022 amounted to Rs. 1,562, which was normal, and the petitioner paid it promptly. But in January 2023, she received a bill of Rs. 7,624 from the respondent i.e.Tamil Nadu Power Distribution Corporation Limited (TNPDCL) [formerly known as Tamil Nadu Generation and Distribution Corporation (TANGEDCO)] which was higher compared to her previous bills.

The petitioner complained about the billing issue with the Assistant Engineer, but there was no adequate response. During several meetings with the section officers, the petitioner mentioned that the meter was working well and sought clarification on the bill amount. Rather than providing the requested clarification, the petitioner was informed to pay arrears of Rs.2,00,728/-.

Confused about the charges she was facing, the petitioner chose not to pay any of the amounts listed. As a result, her service connection was disconnected. To address this issue, the petitioner filed a complaint with the Consumer Grievance Redressal Forum (CGRF). During the CGRF hearing, the respondent presented the Meter Relay Test (MRT) report that had been downloaded from the petitioner's meter.

The MRT report declared the meter to be defective due to a "magnetic tamper" that occurred on 14/04/2023. Due to this, the respondent adopted the average billing calculation as per TNERC guidelines for the defective period. The MRT report highlighted that "on comparing the downloaded data with consumer ledger, it was found that the meter readings entered in the consumer ledger from 30/09/2021 to 28/03/2023 were much lesser than that of actual meter reading recorded by the meter. This implies the meter readings were not taken properly, it seems to be a table reading only". Hence it was observed that there was a mistake in reading entry in the consumer ledger card from the very beginning of the service connection effected till 14.04.2023.

CGRF, based on the MRT report, directed the respondent to collect the dues from the petitioner under Regulation 12 of the TNE Supply Code, which addresses billing errors, as well as Regulation 11, concerning the assessment of bills during meter defective period, dating back to April 14, 2023. Dissatisfied with the CGRF's order, the petitioner appealed to the Electricity Ombudsman.

Based on the hearing of both sides, the Electricity Ombudsman observed the following:
1) Was the petitioner's claim of being charged excessively, correct?
2) Is the petitioner's prayer in correcting the excess bills and restoring supply for the service connection tenable?

OMBUDSMAN FINDINGS:

The petitioner's claim that she was billed excessively was not backed up by evidence. Because, the said service connection was obtained for commercial purposes, including the advocate's office, a tea shop, and a hotel, under LT Tariff V. There was no separate meter provided for the room occupied by the petitioner for her legal services. So there seems to be no exclusive recording for her office electricity consumption. Further, the respondent mentioned that the petitioner had not paid current consumption charges due from 31-01-2023. This information was not discussed in the CGRF.

1. The respondent mentioned that there was a mistake in the meter reading entry in the consumer ledger card from the very beginning of the service connection effected till 17.04.2023. The MRT wing had declared the meter as defective from 14.04.2023 due to the occurrence of a magnetic tamper. The total energy consumed during the period between 05/2021 to 01/2023 was accumulated and claimed for the left-out consumption added in the 03/2023 assessment. Hence the petitioner's prayer that she was excessively billed cannot be substantiated by merely considering that she has occupied 150 sq.ft. space. From the findings, the billing claimed by the respondent against the service connection is in order.

2. The petitioner had not paid the current consumption charges from January 2023. Hence, the service connection was disconnected on 17.04.2023.

a. As per Regulation 4 of TNE Supply Code which is

"4. Charges recovered by the Licensee - The charges recovered by the Licensee from the consumer are:- (1) Tariff-related charges, namely-
(i) The price of electricity supplied by him to the consumers which shall be in accordance with the tariff rates as the commission may fix from time to time, for HT supply, LT supply, temporary supply for different category of consumers."

b. As per LT agreement Form-I, Sl.no.12

"I/We certify that we are aware of the above precaution and agree to abide by it.
I/We agree to pay to the Licensee at the applicable tariff/minimum rates/fixed charges/surcharge etc., that may be decided by the Commission from time to time.
I/We agree to abide under all specifications, conditions and provisions laid down in Tamil Nadu Electricity Supply Code, Distribution Code and the applicable Act, Codes, Rules and Regulations and of any modification or re-enactment thereof for the time being in force and subject to the conditions of revisions, amendments approved from time to time."

Based on the co-joint reading of the above, the provisos declare that any consumer who consumes electricity should pay the charges to the licensee without fail.

3. As per the MRT report, there was a mistake in meter reading entries in the consumer ledger card from the very beginning of the service connection. Therefore the Ombudsman pointed to Regulation 12 of TNE Supply Code "Errors in billing". It states that in the event of any clerical error or mistake in the amount levied, demanded or charged by the Licensee, the Licensee will have the right to demand an additional amount in case of undercharging. Hence the bill raised by the respondent for the service connection as per the data downloaded from the meter is in order. Since the petitioner did not pay the arrears, this led to the service disconnection.

The Electricity Ombudsman dismissed the petitioner's claims regarding excessive billing and the unlawful disconnection of their service. In the order, the Ombudsman instructed the petitioner to settle the outstanding arrears and to request reconnection of the service connection in accordance with the TNE Supply Code Regulations.

Important Observation:

From the inception of the service connection, the assessments were incorrectly recorded according to the MRT downloaded report. The respondent only became aware of this mistake when the petitioner pointed it out during the December 2022 assessment. It is not clear if any action was taken against the official responsible for these incorrect readings. During the CGRF hearing, the respondent also failed to mention an important fact: that the service connection was not just used only for her office, but also provided for other businesses, including a hotel and tea shop. This information came to light only when the respondent included it during the Electricity Ombudsman hearing, and the petitioner did not dispute it. If this information had been presented during the CGRF proceedings, it is likely that this case could have been solved satisfactorily at the level of the CGRF itself.

SOURCE: OMBUDSMAN CASE

NEWS FROM TAMIL NADU

Trichy's first solar power plant inaugurated

In a shot in the arm for green energy, municipal administration minister K N Nehru on Friday commissioned Trichy city's first solar power plant at Panjapur developed by the corporation at Rs 50 crore. The local body can save Rs 9 crore from its annual electricity bill by feeding the electricity generated from the plant to Tangedco's grid. Officials said that the Panjapur solar power plant, developed under the smart cities mission programme, has a capacity of 9.6 megawatt (MW). Four solar power generation units (2.4 MW capacity each) are developed on about 33 acres near TrichyMadurai national highway. With 29,328 panels mounted on concrete pillars positioned at an elevated place from the ground, the solar plant is expected to generate 159.7 lakh electricity units per year at the rate of 43,000 units a day. The generated power will be fed to Tangedco's substation at E Pudur, 4km away from the plant, through high-tension cables. "Electricity produced by the plant will be adequate to compensate for the power consumption of eight drinking water collector wells and one sewage pumping station. Altogether, the plant could save Rs 9 crore per year in the electricity expense," a senior corporation official told TOI. A private agency is appointed by the local body to operate and maintain the solar plant for 10 years. The lifetime of solar panels is around 25 years. Officials said that the Panjapur solar park is the first project implemented directly by a municipal corporation in the state. After inaugurating the plant, minister Nehru and mayor Mu Anbalagan commissioned new 120 watts streetlights installed on a newly built median on E Pudur to Panjapur Main Road.

SOURCE: THETIMESOFINDIA, DECEMBER 27,2024

NEWS FROM ACROSS THE COUNTRY

India adds RE capacity by 14.2% and pipeline projects by 28.5% in one year

India is on course to reach the ambitious target of achieving 500 gigawatts (GW) from non-fossil fuel sources by 2030. As of November 2024, the total non-fossil fuel installed capacity has reached 213.70 GW, a 14.2% increase from last year's 187.05 GW. The total non-fossil fuel capacity, including installed and pipeline projects, surged to 472.90 GW, a 28.5% increase from the previous year's 368.15 GW. During FY 24-25, a total of 14.94 GW of new renewable energy capacity was added till November 2024, nearly doubling the 7.54 GW added during the same period in FY 23-24. In November 2024 alone, 2.3 GW of new capacity was added, a fourfold increase from the 566.06 MW added in November 2023, according to data from the Ministry of New and Renewable Energy (MNRE).

Solar installed capacity rose from 72.31 GW in 2023 to 94.17 GW in 2024, a growth of 30.2%. Including pipeline projects, total solar capacity surged by 52.7%, reaching 261.15 GW in 2024, compared to 171.10 GW in 2023. Wind power installed capacity rose from 44.56 GW in 2023 to 47.96 GW in 2024, reflecting a growth of 7.6%. Total wind capacity, including pipeline projects, increased by 17.4%, from 63.41 GW in 2023 to 74.44 GW in 2024. The data says bioenergy capacity rose from 10.84 GW in 2023 to 11.34 GW in 2024, reflecting a growth of 4.6%. Small hydro projects saw a slight increase, from 4.99 GW in 2023 to 5.08 GW in 2024, with total capacity, including pipeline projects, reaching 5.54 GW. Large hydroelectric projects grew incrementally, with installed capacity rising from 46.88 GW in 2023 to 46.97 GW in 2024, and total capacity, including pipeline projects, increasing to 67.02 GW from 64.85 GW in the previous year. In nuclear energy, installed nuclear capacity grew from 7.48 GW in 2023 to 8.18 GW in 2024, while the total capacity, is now at 22.48 GW.

SOURCE: FORTUNEINDIA,DECEMBER 25, 2024

WORLD NEWS

Google announces $20B renewable energy project for powering data centres

In order to power its AI expansion and data centres, tech giant Google plans to invest $20 billion along with partners to build renewable energy, battery storage and grid upgrades. Google signed a deal with renewable developer Intersect Power and investment fund TPG Rise Climate. The plan is to have 1 GW of wind, solar and battery storage if there is a 1 GW scale data centre, with enough capacity to last two to four hours. The UK and Qatar struck an economic and technological partnership of £1 billion to foster the growth of climate technology across both nations. It will lead to the creation of climate tech hubs, generate employment and investment in startups focused on green technologies like carbon management, energy efficiency and renewable energy. British auto and engineering giant Rolls Royce is also part of this deal, and will invest in technologies to improve energy efficiency and low carbon emissions in the auto sector, and create new sustainable fuels.

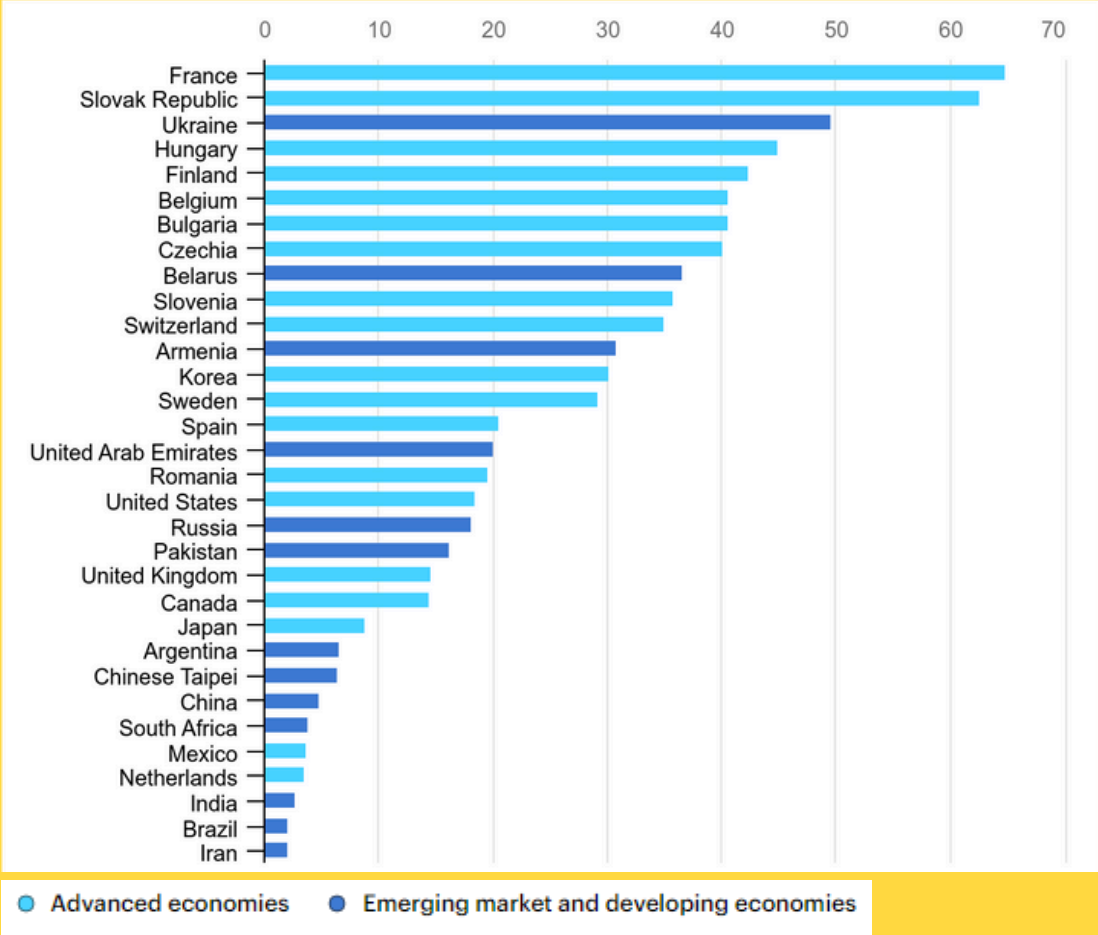
In the 12 months through September 2024, climate financing has fallen 29%, found PwC's 'State of Climate Tech 2024' report. It fell lower than even 2019 levels, before the climate tech market took an upswing. The total investment in this period was $56 billion, reflecting a macro-economic trend of market slowdown, due to higher interest rates. However, there are silver linings in the US and UK markets. In the US, investments in climate tech startups was steady, while the UK showed a 24% increase in climate tech investment. The US government committed to loaning $7.5 billion to build two electric vehicle battery plants in Kokomo, Indiana, reported the Associated Press. The loan will be received by a joint venture between Stellantis and Samsung SDI. Expected to create around 2,800 direct new jobs, and many more in subsidiary parts-supplier industries coming up in a nearby park, the project will be undertaken by StarPlus Energy

SOURCE: CARBONCOPY, DECEMBER 16, 2024

PUBLICATIONS

- **Off-grid Renewable Energy Statistics 2024, IRENA**
- **Modification of the scheme of Budgetary Support for the cost of Enabling Infrastructure of Hydro Electric Projects, MoP**
- **EV Battery Supply Chain Sustainability, IEA**
- **Tamil Nadu Electricity Regulatory Commission (Deviation settlement mechanism and related matters) (Amendment) Regulations, 2024, TNERC**
- **Per Capita Consumption of Energy, PIB**

SHARE OF NUCLEAR ENERGY IN TOTAL ELECTRICITY GENERATION BY COUNTRY, 2023



SOURCE: IEA

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