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The building blocks of an India-U.S. energy future

Strengthening India-U.S. Cooperation

- The U.S. Vice-President J.D. Vance reaffirmed interest in deepening bilateral cooperation with India, particularly in energy and defence sectors.
- India's foreign policy highlighted the importance of a broader agenda including energy, defence, technology, and human mobility.
- These themes have consistently shaped the bilateral relationship, though with varying emphasis depending on the administrations in power.
- There is now a strategic window for both nations to invest afresh in these priority areas.

India's Energy Security Imperatives

- India's energy policy is guided by three core priorities:
    - Access to adequate energy resources at stable and predictable prices.
    - Secure and resilient energy supply chains.
    - Steady progress toward a sustainable and diversified energy mix.
- Nuclear energy and critical minerals will play a pivotal role in addressing these priorities, making them crucial for bilateral energy and technology cooperation.

Critical Minerals as Strategic Resources

- The global energy transition relies not only on electricity ("electrons") but also on materials ("elements"), especially critical minerals.
- China's near-monopoly on rare earth processing (around 90%) and its export restrictions underline the vulnerability of current supply chains.
- These minerals are essential for clean energy technologies, advanced electronics, and defence systems, yet face unstable supply routes.

2024 India-U.S. Critical Minerals Agreement

- In 2024, both nations signed a Memorandum of Understanding (MoU) to diversify global supply chains for critical minerals.
- This agreement must be backed by a well-structured and long-term framework based on three guiding principles:

A. Broadened Strategic Perspective

- Critical minerals should be treated not merely as a mining issue but as foundational to many sectors—energy, defence, AI, EVs, semiconductors.
- A broader framing allows for cross-sector skill-building and technology sharing between India and the U.S.

B. Bilateral and Plurilateral Policy Action

- Cooperation should span bilateral and regional levels, including multilateral platforms like the Quad (India, U.S., Japan, Australia).
- An India-U.S. Critical Minerals Consortium should promote:
    - Joint exploration and processing.
    - Co-investment in third-country projects (Africa, South America, Southeast Asia).
    - Shared use of advanced mineral processing technologies.
- Transparency tools such as an **India-U.S. Mineral Exchange** and **blockchain-based traceability** (like the EU's Battery Passport) are crucial for supply chain integrity.
- Strategic joint stockpiles should be built using existing facilities such as India's Strategic Petroleum Reserves and the U.S. National Defense Stockpile.

C. Long-Term Vision and Patience

- Unlike battery plants, mining and processing projects can take 12–16 years to complete.
- A 20-year roadmap with mid-term milestones should be created, in alignment with India's Critical Minerals Mission.
- Attention should also be paid to:
    - Data sharing protocols.
    - Investment monitoring.
    - Workforce skilling.

- Bilateral R&D partnerships under the U.S.-India Initiative on Critical and Emerging Technology (iCET).

Nuclear Energy: A Low-Carbon Backbone

- India's surging electricity demand and its net-zero ambition require a stable, low-carbon energy source to supplement intermittent renewables.
- Nuclear power is one such solution. Despite an ambitious 2047 target of 100 GW nuclear capacity, India's current installed nuclear capacity is just over 8 GW.
- To meet the target, India must commission 5–6 GW of nuclear capacity annually from early 2030s onward.
- Under certain scenarios, India may need **over 200 GW of nuclear energy** to meet its **2070 net-zero goal**.

Reforms to Unlock Nuclear Growth

To make the 2047 nuclear vision a reality, three key reforms are essential:

A. Reduce Project Timelines

- Shortening nuclear project durations from 9 to 6 years could reduce electricity cost by 8%.
- This would require:
  - Standardised nuclear reactor designs.
  - Accelerated regulatory approvals.
  - High-quality project management and skilled manpower.

B. Enable Private Sector Participation

- Incentives and risk reduction are necessary to attract private investment into nuclear power.
- Measures include:
  - Credible power purchase agreements (PPAs).
  - Competitive bidding frameworks.
  - Long-term offtake and payment guarantees.
- Small Modular Reactors (SMRs) with lower costs, land-use, and flexible deployment options are particularly suitable for private players.
- SMRs have industrial applications such as powering AI data centres or green steel production.

C. Amend Civil Liability Act (2010)

- India must amend this law to allow private investment in nuclear plants.
- Recent approval for U.S.-based Holtec to transfer SMR tech to Indian firms (L&T, Tata Consulting Engineers) shows the potential of India-U.S. tech collaboration.
- However, safety remains paramount. India should:
    - Integrate advanced waste management and decommissioning tech.
    - Establish national strategies for safe SMR waste disposal and land repurposing.

Financial System Readiness for Nuclear Expansion

- The capital required for achieving 100 GW nuclear capacity is approx. $180 billion.
- With India's domestic financial sector already exposed to power sector lending (~$200 billion), new financing models and international collaboration are crucial.
- Co-development, tech transfer, and reliable offtake agreements will be key to attract global firms and de-risk projects.

Strategic Outlook Amid Global Uncertainty

- The IMF's April 2025 World Economic Outlook flags increased global instability due to trade and tariff tensions.
- In this uncertain environment, a robust and strategic India-U.S. partnership can anchor India's energy security and sustainable development.
- The U.S. brings technological expertise and investment capital; India contributes scale and a growing clean energy market.
- Success depends on a **long-term roadmap, institutional coordination, and resilience-focused architecture of cooperation**.

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