Financing India’s clean energy transition: Challenges and Opportunities

**Dr Arunabha Ghosh**
Founder-CEO, CEEW

International Energy Agency (IEA) workshop on Clean Energy Transitions in Emerging Economies
14 September 2022
Impacting sustainable development at scale with **data**, **integrated analysis**, and **strategic outreach**

![Image](https://example.com/image.png)

**Transformations**
- Low-carbon Economy
- Energy Transitions
- Power Markets
- Industrial Sustainability
- Sustainable Livelihoods

**Quality of Life**
- Clean Air
- Sustainable Water
- Sustainable Food Systems
- Sustainable Cooling
- Sustainable Mobility

**Enablers**
- Sustainable Finance
- Technology Futures
- Circular Economy
- Climate Resilience
- International Cooperation

**Special Initiatives**
- CEEW-CEF Centre for Energy Finance
- Powering Livelihoods
- Emerging Economies
- UP State Office

**Key Statistics**
- 200+ Multidisciplinary team
- 320+ Peer-reviewed publications
- 160+ Instances of increased data transparency
- 460+ Roundtables & conferences
- 22 Indian states engaged
- 110+ Bilateral & multilateral initiatives promoted
88% of all electricity demand will come from emerging markets

Maxims for energy (r)evolution

Energy security ≠ Energy independence
A resilient supply chain will ensure energy security for India, while enhancing synergies between India and other countries

Energy leapfrog ≠ Energy transition
Robust technology transfer will allow India to leapfrog conventional bridge steps (e.g., coal → natural gas → hydrogen for steelmaking)

Indigenisation ≠ Protectionism
Foreign direct investment coupled with reduced trade barriers will enable domestic industry growth and expand global market access

India’s double leapfrog — connecting nearly all households to electricity and its renewable energy rollout — is one of the most revolutionary in scale

Source: Ghosh (2021); Bond and Ghosh et al. (2021)/ Reaching for the Sun: Emerging Market Leapfrog/ CEEW
How transformational is net zero in India?

Source: Hitesh choudhary
Transitions in the electricity sector are going to be massive

Source: Chaturvedi and Malyan (2021)/Implications of a Net-Zero Target for India’s Sectoral Energy Transitions and Climate Policy
Transport, industrial and building sector will need to redefine their energy architectures

Sectoral transition pathways to net-zero, India

- Decline in emission intensity of GDP
- Share of fossil in primary energy
- Share of biofuels in liquid fuels
- Share of electricity in freight trucks
- Share of electricity in industrial energy use
- Share of non-hydro RE in electricity generation

<table>
<thead>
<tr>
<th>Year</th>
<th>Share (%)</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
<th>2060</th>
<th>2070</th>
<th>2080</th>
<th>2090</th>
<th>2100</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

Source: Chaturvedi (2021); Chaturvedi and Malyan/ CEEW (2021)
How much clean energy finance is needed?

Hey! We've (almost) promised to (almost) deliver your (finance) ceiling.

But that's just the floor!
Emerging investment opportunity in India

<table>
<thead>
<tr>
<th>Sector</th>
<th>Select indicators</th>
<th>Status in 2070¹ (unless stated otherwise)</th>
<th>Investment requirement² (USD bn)</th>
<th>Investment gap² (USD bn)</th>
<th>Investment support² (USD bn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>Coal</td>
<td>Peak by 2040, ~0% by 2060</td>
<td>8,412</td>
<td>3,098</td>
<td>1,239</td>
</tr>
<tr>
<td></td>
<td>Solar</td>
<td>5,630 GW</td>
<td></td>
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<tr>
<td></td>
<td>Wind</td>
<td>1,792 GW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nuclear</td>
<td>225 GW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industry</td>
<td>Coal</td>
<td>Peak by 2040, ~0% by 2065</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hydrogen</td>
<td>19% share in industrial energy use</td>
<td>1,494</td>
<td>448</td>
<td>179</td>
</tr>
<tr>
<td>Mobility</td>
<td>EVs (% of car sales)</td>
<td>84%</td>
<td>198</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>EVs (% of freight truck sales)</td>
<td>79%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>10,103</td>
<td>3,546</td>
<td>1,419</td>
</tr>
</tbody>
</table>

USD 1.4 trillion in investment support till 2070 equates to an average annual value of USD 28 billion over the next 50 years, varying from USD 8 billion annually in the first decade, to USD 42 billion annually in the fifth decade.

Note: Amounts in constant 2020 USD billion
Source: Pratap and Sindhu (2021)/ Investment Sizing India’s 2070 Net-Zero Target /CEEW; Chaturvedi and Malyan (2021)
Solar and wind financing landscape in India

**Leading solar and wind developers (cumulative installed capacity, up to June 2021) in India**

<table>
<thead>
<tr>
<th>Solar PV</th>
<th>Capacity (MW)</th>
<th>Wind</th>
<th>Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adani</td>
<td>4,723</td>
<td>Greenko Energy Holdings</td>
<td>3,192</td>
</tr>
<tr>
<td>Acme Solar Holdings</td>
<td>2,900</td>
<td>ReNew Power</td>
<td>2,912</td>
</tr>
<tr>
<td>ReNew Power</td>
<td>2,688</td>
<td>Sembcorp</td>
<td>1,750</td>
</tr>
<tr>
<td>Greenko Energy Holdings</td>
<td>2,175</td>
<td>Mytrah</td>
<td>1,469</td>
</tr>
<tr>
<td>Azure Power</td>
<td>2,102</td>
<td>Tata Power</td>
<td>932</td>
</tr>
<tr>
<td>Tata Power</td>
<td>1,765</td>
<td>CLP</td>
<td>925</td>
</tr>
<tr>
<td>NLC</td>
<td>1,370</td>
<td>Continuum Energy</td>
<td>807</td>
</tr>
<tr>
<td>NTPC</td>
<td>1,140</td>
<td>Hero Future Energies</td>
<td>806</td>
</tr>
<tr>
<td>Avaada Power</td>
<td>900</td>
<td>Torrent Power</td>
<td>649</td>
</tr>
<tr>
<td>Hero Future Energies</td>
<td>794</td>
<td>Adani</td>
<td>647</td>
</tr>
</tbody>
</table>

*Note: Anecdotally, much of the funding backing Indian developers at a corporate level (not SPV level) is sourced internationally (pension funds, sovereign wealth funds, private equity funds, other financial investors etc)*

**Domestic (INR)**

- **Institutional Debt (Banks + NBFC)**
  - **Dominant Source**
    - Quantum challenging to determine
    - For reporting, RE is clubbed with others under “power sector”

- **Debt Capital Markets (Bonds)**
  - **Still Untapped**
    - Extremely credit quality conscious, even more so than international debt capital markets

**International (USD)**

- **Recently Emerging**
  - USD 1.35bn project debt raised by Adani Green in March 2021 from 12 international banks

- **Fast Growing**
  - Many bond issuances of hundreds USD million
  - Typically to retire expensive INR institutional debt

**Equity**

- ~25% of capital deployed per SPV

**Debt**

- ~75% of capital deployed per SPV

**RE Project Special Purpose Vehicle (SPV)**

- Several hundred RE SPVs in India
- Aggregating 114.1 GW of installed RE
- Representing a 28.2% share of India’s generating capacity

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How do we re-structure our finances?
A blend of different pools of capital

1. **Financing for large scale renewables deployment** through innovative de-risking mechanisms that pool risks across countries to lower the cost of finance.

2. **Transition finance for orderly decommissioning** of fossil fuel assets through transition bonds.

3. **Financing for research and development for emerging technologies** through mechanisms such as pooling financial, human and technical resources.

4. **Developing insurance mechanisms against climate shocks** that pool various kinds of climate risks and are capitalised through an allocation of Special Drawing Rights.
Finance beyond a negotiated maximum and a delivered minimum (1/3)

Singh et al. (2020)/ RE-Financing India's Energy Transition/ CEEW

**Scale**

- India needs USD 2.5 trillion (2015-2030)
- 500 GW RE needs USD 200+ billion of capital investment
- USD 18 billion investment in RE in 2019
- 30% EVs is USD 206 billion sales opportunity (including USD 2.5 billion charging stations)

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**Financial innovation from instruments**

India's RE sector is caught in a three-way circularity

- Establishing a subsidised credit enhancement facility for domestic renewable energy bond issuances
- Investments mobilised by credit enhancement will lead to an additional 1 per cent of India's GDP
Finance beyond a negotiated maximum and a delivered minimum (2/3)

Financial innovation from regulation

- **Lack of a common definition and disclosures** on green taxonomy prevents standardisation in the market, and interrupts international clean energy financing into domestic markets.

- **Need to link and harmonise** international and domestic capital by adopting a granular, standardised sustainable green taxonomy.

- Bring in greater transparency and credibility, and enable market participants to identify and assess sustainability-related risks and opportunities.

- **Sebi’s BRSR initiative relates to climate disclosure** and ensures that investors have access to standardised disclosures on ESG parameters.

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**Regulation**

- Climate risk exposure
- Green tagging
- Tax incentives for green bonds
- Matchmaking via accelerator programmes
- Green securitisation
- Standard-setting (Basel Committee on Banking Supervision; Network for Greening the Financial System)

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Risk

- De-risking utility-scale renewables against non-project risks
- Credit enhancement for DRE for small businesses
- Risk guarantees for R&D

Financial innovation from institutions

- **Make India a hub** for sustainable clean energy finance for emerging markets
- **Pilot Global Clean Investment Risk Mitigation Mechanism (GCI-RMM)** to ease access to non-project risk management tools and reduce transaction costs, particularly in emerging markets

Ghosh and Harihar (2021)/ Coordinating Global Risk Mitigation for Exponential Climate Finance/ CEEW
Thank you
ceew.in | @CEEWIndia | @GhoshArunabha