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India's EV Ambition Needs a Grid Strategy to Match

Context

- India's transition toward **electric vehicles (EVs)** has gained momentum due to rising **crude oil prices** and recurring geopolitical tensions in the **Strait of Hormuz**, which repeatedly expose the country's dependence on imported fuel.
- Electric two-wheelers are becoming increasingly popular among urban commuters because of their affordability, low maintenance costs, and immediate fuel savings.
- However, the larger challenge of electrification lies not in scooters or passenger vehicles, but in building a powerful and reliable **electricity grid** capable of supporting large-scale transport demand, especially from freight transportation.

The Arithmetic of a Second Power System

- **Rising Electricity Demand**
 - India currently has nearly 420 million registered vehicles. Full electrification of this fleet would require an additional **900-1,100 TWh** of electricity every year.

- Even if only half the fleet becomes electric by 2047, around **500 TWh** of extra electricity generation would still be necessary, equivalent to nearly one-third of India's present annual power production.
- Electrifying transport therefore means constructing a second large-scale power system alongside the existing one.

- **Limited Grid Impact of Two-Wheelers**

- Electric scooters and motorcycles dominate public attention because they are highly visible and politically attractive.
- Subsidies and increasing petrol prices have accelerated their adoption.
- Yet their actual burden on the grid remains relatively small. Even if all **309 million two-wheelers** were electrified, they would require only **55-75 TWh** annually, less than 7% of total projected EV electricity demand.
- Their visibility is therefore much greater than their actual impact on electricity consumption.

The Real Challenge: Freight Transport

- India has around 6.26 million heavy goods vehicles (HGVs), each operating with high energy intensity and covering nearly 60,000 km annually.
- Electrifying these vehicles alone would require approximately **450-565 TWh** of electricity every year.
- When **medium goods vehicles (MGVs)** are included, total freight demand rises to nearly **500-600 TWh**.
- Thus, a very small percentage of vehicles accounts for the majority of future EV-related electricity demand.
- Electrifying India's roads therefore largely means electrifying its supply chains, logistics systems, and industrial transportation networks.

What Happens at Seven in the Evening?

- **The Problem of Peak Demand**

- If millions of EVs begin charging simultaneously during evening hours, the grid could experience severe stress, leading to **power shortages**, tariff increases, and supply instability.
- Across several states, operators seeking high-tension charging connections already face delays because financially stressed **discoms** lack the infrastructure and funding required for large-scale upgrades.

- **Smart Charging Solutions**

- **Time-of-use pricing**, workplace charging during daytime solar hours, battery-swapping networks, and large-scale energy storage systems can distribute electricity demand more efficiently throughout the day.
- However, India still lacks a national standard ensuring that EV chargers respond intelligently to grid conditions.
- Chargers installed today without **smart-charging capability** may become expensive retrofit liabilities in the future.

What the Grid Actually Needs

- **Need for Reliable and Clean Energy**

- Transport electrification requires both massive additional electricity generation and uninterrupted reliability.
- Freight depots, highways, and urban charging hubs need continuous power throughout the day and night.
- Different energy sources offer different advantages. Solar power and wind energy provide scalable and low-cost clean electricity but depend heavily on weather conditions and operate at lower **capacity factors**.
- **Nuclear power** offers stable, low-carbon **baseload energy**, although it requires high investment and long construction periods.
- **Role of Energy Storage and Diversification**
 - Pumped hydro, battery storage, and limited use of **natural gas** can help balance fluctuations between electricity generation and demand.
 - A diversified and cleaner energy mix is therefore essential for sustaining EV growth.
 - Expanding **coal dependence** would weaken the environmental benefits of electrification.
 - Replacing imported oil with imported coal would merely shift India's energy dependence while continuing high **carbon emissions**.

Steps to Take

- **Strengthening Policy and Infrastructure**
 - Several policy measures are essential for a sustainable EV transition. EV demand projections must become central to national capacity planning.
 - Smart-charging standards should be mandatory for all new charging infrastructure.
 - Important freight corridors such as the Golden Quadrilateral and Dedicated Freight Corridors require coordinated power planning before electric trucking expands commercially.
- **Institutional Coordination and Financial Reforms**
 - Strong coordination between ministries responsible for transport, power, and finance is necessary for effective implementation.
 - Financial reforms under the Revamped Distribution Sector Scheme (RDSS) can strengthen discoms and improve last-mile electricity delivery.

Conclusion

- India's EV transition is inevitable, but its long-term success depends on whether the country can build a **resilient, clean**, and technologically advanced power system.
- Electric scooters may symbolize the beginning of change, but the future of sustainable mobility will ultimately depend on the strength of the grid powering India's roads, industries, and freight networks.
- Electrification is therefore not merely a transportation reform; it is **a complete transformation of India's energy and infrastructure systems**.

India's EV Ambition Needs a Grid Strategy to Match FAQs

Q1. Why are electric two-wheelers becoming popular in India?

Ans. Electric two-wheelers are becoming popular because they reduce fuel expenses and are suitable for short-distance travel.

Q2. What is the biggest challenge in India's EV transition?

Ans. The biggest challenge is building a strong and reliable electricity grid to support large-scale electrification.

Q3. Why does freight transport require more electricity than two-wheelers?

Ans. Freight vehicles consume more electricity because they travel long distances and have higher energy intensity.

Q4. How can peak electricity demand be reduced?

Ans. Peak electricity demand can be reduced through smart charging, time-of-use pricing, and energy storage systems.

Q5. Why is battery recycling important for India's EV future?

Ans. Battery recycling is important because millions of EV batteries will eventually become waste and require proper disposal and reuse.

Source: **The Hindu**

Strategic Spark in India-South Korea Defence Ties

Context

- The recent high-level visits between India and South Korea highlight the growing strategic importance of their bilateral partnership.
- What started as limited defence cooperation has expanded into a broader partnership covering defence manufacturing, technology transfer, and military modernisation.
- A key symbol of this collaboration is the **K9 Vajra-T artillery programme**, developed under the Make in India initiative, which has emerged as the flagship project and opened the door for deeper defence cooperation between the two countries.
- This article highlights the rapid transformation of **India-South Korea defence relations** from limited defence engagement into a broader strategic partnership encompassing defence manufacturing, technology transfer, military modernisation, and Indo-Pacific security cooperation.

Expanding India-South Korea Defence Cooperation

- India-South Korea defence ties are expanding rapidly, with several new strategic projects under discussion.
- **Submarine Cooperation**
 - Submarine collaboration has become a major focus area, leveraging South Korea's strengths in: Conventional submarines; Lithium-ion battery systems; Air-independent propulsion (AIP) technologies.
 - Companies such as Hanwha Ocean are central to this potential partnership.
- **Aerospace Collaboration**

- South Korea's growing aerospace capabilities, including the KF-21 fighter programme and FA-50 light combat aircraft, have opened possibilities for cooperation in: Fighter aircraft technologies; Engines; Avionics etc.

- **Maritime and Naval Cooperation**

- As a global shipbuilding leader, South Korea can support India's maritime ambitions in the Indo-Pacific through collaboration in: Destroyers; Logistics vessels; Submarine support systems; Smart shipyards.

- **Expanding Defence Industrial Partnerships**

- Discussions are progressing in several defence sectors, including: Light tanks; Utility helicopters; Future-ready combat vehicles; Military lithium batteries, etc.
- Defence firms from both countries are exploring joint ventures and industrial partnerships.
- The partnership is moving beyond conventional arms collaboration toward defence innovation.
- The proposed **Korea-India Defence Accelerator (KIND-X)** reflects this forward-looking approach.

Strategic and Military Engagement

- Military exchanges and strategic cooperation are also deepening through:

- Naval exercises
- Coast guard cooperation
- Defence dialogues
- Interoperability-building measures

- **Mutual Strategic Benefits**

- **For India:** Access to advanced technology, manufacturing expertise, and defence modernisation support
- **For South Korea:** Access to India's large market, strategic location, and long-term industrial opportunities

- **Beyond Defence Industry**

- While defence industrial cooperation reflects growing strategic maturity, limiting the partnership only to defence production would be a strategic mistake, given the broader potential of bilateral ties.

India-South Korea Defence Ties in a Changing Indo-Pacific

- The rapidly changing **Indo-Pacific geopolitical environment** requires India and South Korea to expand defence cooperation beyond industrial collaboration into a broader strategic partnership focused on regional stability, shared security, and resilience.
- The next phase of engagement should involve a formal, forward-looking defence framework that addresses emerging security challenges across the wider Indo-Pacific.
- This partnership must move beyond its current defence-manufacturing emphasis and evolve into a multidimensional strategic relationship grounded in common security interests.

Security Challenges Around the Korean Peninsula

- **North Korean Threat** – North Korea's expanding missile and nuclear capabilities continue to pose a major security threat to South Korea.

- **Russia-North Korea Cooperation** – Growing military cooperation between Russia and North Korea is reshaping the security architecture of Northeast Asia, adding to regional uncertainty.
- **China's Strategic Assertiveness** – China's increasing naval presence around the Korean Peninsula has created new strategic concerns for South Korea. Its expanding influence in the South China Sea is also significant, as a large share of South Korea's **energy imports and maritime trade** passes through these waters.

South Korea's Internal Strategic Challenges

- **Demographic Decline** – South Korea's **falling population** and shrinking pool of military recruits are weakening the long-term sustainability of its conventional defence capabilities.
- **Strategic Vulnerability** – These internal pressures, combined with a rapidly evolving external threat environment, create a complex security situation that demands deeper long-term strategic cooperation with trusted partners like India.

Need for India-South Korea Strategic Convergence

- India's strategic planners and defence thinkers need to closely monitor the changing geopolitical situation in South Korea, as ignoring these shifts could affect both South Korea's security and India's wider Indo-Pacific interests.
- If India aims to significantly deepen defence-industrial cooperation with South Korea, it must recognise that such cooperation depends on South Korea's strategic stability, security, and resilience.
- Strengthening Seoul's ability to manage emerging security challenges should therefore become an important component of the bilateral partnership.
- The Indian Defence Minister's visit to Seoul should mark the beginning of a new phase in India-South Korea relations, moving beyond defence manufacturing cooperation toward a broader strategic partnership based on shared security interests and Indo-Pacific stability.

Source: **TH**

India-Italy Relations – From Cordial Ties to a Transformative Strategic Partnership

Context:

- India and Italy are witnessing a major transformation in bilateral relations, with both countries elevating their engagement into a **Special Strategic Partnership**.
- Against the backdrop of geopolitical flux, technological disruption, energy transition, and supply chain restructuring, the partnership reflects a **convergence** of democratic values, economic priorities, and strategic interests.

A Partnership Shaped by a Changing Global Order:

- The prosperity and security in the 21st century will increasingly depend upon **innovation**, resilient supply chains, technological leadership, and sustainable development.
- India and Italy view each other as **reliable democratic partners** capable of contributing to a more stable and multipolar world order amid the contemporary international system of geopolitical rivalries.

Expanding Economic Cooperation:

- A key pillar of the partnership is economic **integration** driven by **complementarities** between:
 - Italy's industrial and manufacturing expertise, and
 - India's scale, skilled workforce, digital ecosystem, and entrepreneurial dynamism.
- Italy is recognised globally for high-quality manufacturing, design, machinery, and engineering capabilities under the globally respected "**Made in Italy**" brand.
- **India**, on the other hand, offers rapid economic growth, expanding domestic market, strong start-up ecosystem, competitive engineering talent, more than 100 unicorns and nearly 200,000 start-ups.
- The partnership is not a simple trade relationship, but a process of **co-creation of value**, where the industrial strengths of both nations amplify each other.

EU-India Free Trade Agreement (FTA):

- The proposed European Union (EU)-India FTA is expected to significantly deepen trade and investment flows.
- Italy and India aim to surpass the **target** of €20 billion bilateral trade by 2029. Priority sectors include –
 - Defence and aerospace,
 - Clean technologies,
 - Machinery and automotive components,
 - Chemicals and pharmaceuticals,
 - Textiles,
 - Agri-food sector,
 - Tourism and hospitality.
- The growing presence of over 1,000 Indian and Italian companies in each other's markets reflects increasing supply chain integration and **mutual confidence**.

Technology and Innovation at the Core:

- **Technological transformation:**

- It is the **defining feature** of future global politics and economics. India and Italy seek cooperation in strategic and emerging technologies such as:
 - AI and quantum computing,
 - Advanced manufacturing,
 - Critical minerals,
 - Digital infrastructure

- **Synergy in innovation ecosystems:**

- India's strength lies in digital public infrastructure (**DPI**), large-scale digital adoption, skilled IT workforce, and innovation-driven entrepreneurship.
- Italy contributes advanced industrial capabilities, research excellence, precision manufacturing, and **ethical** technological frameworks.
- **Collaboration** between universities, research institutions, and innovation centres is expected to further institutionalise this technological partnership.

Advocates of Ethical and Inclusive AI Governance:

- India and Italy advocate a human-centred approach to AI, combining –
 - India's vision of **MANAV** (technology centred on human welfare), and
 - Italy's concept of "**algor-ethics**", rooted in European humanist traditions.
- The partnership seeks to ensure that AI –
 - Promotes social empowerment,
 - Protects human dignity,
 - Does not undermine democratic institutions,
 - Avoids manipulation of public opinion,
 - Bridges digital divides instead of deepening inequalities.
- This approach assumes special relevance for –
 - The **Global South**, where accessible and multilingual digital technologies can accelerate inclusive development.
 - Italy's leadership during the **G7** Presidency, and the outcomes of the **AI Impact Summit 2026** held in New Delhi.

Cooperation in High-Technology Strategic Sectors:

- **Space:**

- India's achievements in satellite technology, space exploration, and cost-effective space missions, complement Italy's strengths in aerospace engineering, precision technologies, etc.

- This opens opportunities for joint missions, satellite applications, and next-generation aerospace technologies.

- **Security and defence cooperation:**

- Both nations recognise that economic prosperity depends on security and stability.
- Therefore, cooperation is increasing in defence manufacturing, maritime security, cybersecurity, counter-terrorism, and combating organised crime.
- The focus on **securing critical maritime routes** is especially important in the context of growing geopolitical contestation in the Indo-Pacific and adjoining regions.

Energy Transition and Green Partnership - A Strategic Pillar:

- India and Italy are collaborating in renewable energy, green hydrogen, **smart grids**, sustainable infrastructure, and energy diversification.
- India's ambition to emerge as a **global hub** for green hydrogen exports aligns with Italy's expertise in renewable technologies and Europe's energy requirements.
- This highlights cooperation under major India-led global initiatives such as International Solar Alliance, **CDRI** and Global Biofuels Alliance.
- These initiatives demonstrate India's growing role in global **climate governance** and sustainable development diplomacy.

“Indo-Mediterranean” Geopolitical Space:

- The Indo-Pacific regions are no longer separate geopolitical theatres but interconnected corridors of trade, technology, energy, data flows, and supply chains.
- **India-Middle East-Europe Economic Corridor (IMEC):** The proposed corridor is aimed at:
 - Enhancing transport connectivity,
 - Building resilient supply chains,
 - Strengthening digital and energy networks,
 - Promoting economic integration across continents.
- **For India**, IMEC serves as both a strategic alternative to existing connectivity architectures, and a platform to deepen engagement with Europe and West Asia. **Italy's participation** adds strategic depth to this initiative.

Civilisational Values as the Foundation of Partnership:

- India's philosophical concepts such as **Dharma** (responsibility and ethical conduct), and **Vasudhaiva Kutumbakam** (“the world is one family”), and Italy's renaissance-inspired humanist traditions emphasise:

- Human dignity,
- Cultural dialogue,
- Social harmony.
- Thus, the India-Italy partnership is envisioned not merely as a transactional arrangement, but as a people-centric and values-based relationship.

Conclusion:

- If nurtured with sustained political commitment, institutional cooperation, and people-to-people engagement, this partnership can become **a model** of constructive collaboration between Europe and the Indo-Pacific.
- This combines economic ambition with ethical responsibility and strategic vision with human-centred development.

India-Italy Relations FAQs

Q1. How does the India-Italy partnership reflect emerging trends in global strategic alignments?

Ans. It reflects a shift towards issue-based strategic cooperation centred on technology, connectivity, energy security, in a multipolar world.

Q2. What is the significance of the IMEC for India-Italy relations?

Ans. It enhances Indo-Mediterranean connectivity through transport, energy, digital networks, linking India with Europe.

Q3. Why is technological cooperation becoming central to India-Italy relations?

Ans. Due to complementarities between India's digital innovation ecosystem and Italy's advanced industrial capabilities.

Q4. What is the importance of a human-centric approach to AI in India-Italy cooperation?

Ans. It seeks to ensure ethical, inclusive, and democratic use of technology while safeguarding human dignity.

Q5. How can energy cooperation strengthen the India-Italy strategic partnership?

Ans. It can enhance energy security and support global climate transition goals.

Source: **IE**

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