ReNew



POWERING THE AI AGE

India's Next Export Opportunity

A Policy Note





Foreword



Throughout modern history, economic leadership has followed access to abundant and affordable energy. Coal powered the Industrial Revolution. Oil shaped the geopolitics of the twentieth century. In this century, electricity is becoming the foundation of another transformation. Behind every AI model, cloud platform and intelligent application sits an infrastructure stack of remarkable energy intensity, and data centres are now among the fastest growing sources of electricity demand anywhere in the world.

The scale of this shift is large, but the deeper point is strategic. AI infrastructure is no longer constrained only by capital or algorithms; it is increasingly constrained by the availability of reliable, clean and expandable power. Around the world, data centre investors are discovering that grid access, transmission readiness, equipment availability and delivery timelines can matter as much as financing. Power, not money alone, is beginning to decide where AI gets built.

This is precisely where India's opportunity lies. Few countries are trying to scale a digital economy and a clean energy system at the same time, and at this speed. India has built strengths in renewable power, transmission, digital infrastructure, manufacturing and green hydrogen that, taken together, can become a new form of national competitiveness. The task now is to convert those strengths into investible locations, bankable clean power products and export oriented industrial ecosystems.

That combination allows India to redefine what it means to export energy. In the past, energy exports meant shipping fuels or transmitting electricity across borders. In the AI era, clean power can be exported through the value it creates: as compute for global customers, as green molecules for hard to abate industries, and as the equipment and systems needed to build digital and clean energy infrastructure worldwide. The electrons may remain in India, but the economic value can travel globally.

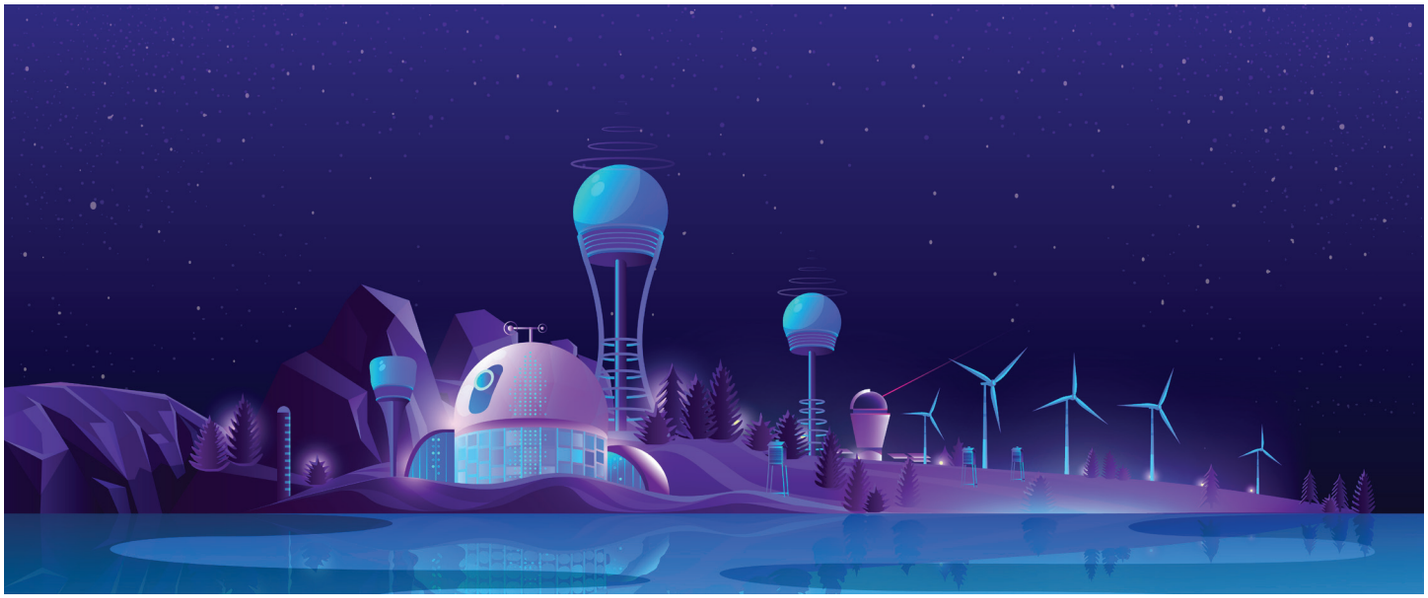
None of this is assured. India still has to move faster, reduce execution uncertainty and deepen its supply chains in critical areas. The gap is not one of resources or ambition. It is one of delivery speed, upstream depth and predictability and each of those can be closed by deliberate policy and coordinated execution.

This report sets out how India can make that shift. It argues for a strategy built around compute ready locations, clean compute clusters, firm and bankable electricity, green molecule demand, deeper manufacturing capability, skills and an export platform. The opportunity extends well beyond India's borders. As economies across the Global South seek affordable routes to digital development and decarbonisation, India can be their trusted partner. The choices made this decade will determine who powers the AI economy. India should not merely participate in that future. It should help build it.

Sumant Sinha

Founder, Chairman & CEO
ReNew

Executive Summary



India can turn the global build-out of AI into a new engine of investment, clean growth and industrial capability.

Artificial Intelligence (AI) is reshaping the global economy. But AI runs on infrastructure. The next wave of competition will be driven by access to power, land and connectivity. Across many established markets, these are becoming scarce. As a result, time-to-power is emerging as the single most important determinant of where AI infrastructure gets built. This creates a significant opportunity for India to attract globally mobile compute and position itself as a leading destination for AI investment.

The opportunity is larger than hosting domestic demand. Globally mobile AI and cloud workloads are looking for locations that can offer dependable power, fast deployment, resilient connectivity and a credible path to scale. India can compete for this investment. In this report, we estimate that exporting green compute alone could generate US$7-10 billion per year of export revenues by 2030 and US$100-140 billion per year by 2047. This opportunity is comparable in scale to some of India's major export sectors today and exceeds even the biggest sectors over the next two decades.

India also has a second opportunity. AI infrastructure and clean energy rely on many of the same upstream supply chains. Both need semiconductors, advanced electrical equipment, power electronics, batteries, critical materials, testing systems and specialist engineering skills. Planning these markets together can create a larger and more durable demand base for domestic manufacturing.

The two value chains can reinforce each other. Clean energy can make Indian data-centre locations more reliable, scalable and globally competitive. AI-led demand can strengthen the commercial case for grid expansion, storage and firm clean power. Their combined demand can anchor investments in upstream manufacturing of semiconductors, electrical equipment and grid components, that neither value chain can support as effectively on its own. In this report, we estimate the scale of export opportunity for energy transition infrastructure, comprising these components, could be US$30-35 billion by 2030 (up from US$20 billion in 2024) and US$350-400 billion by 2047.

India's Opportunity - A Simple Value Chain

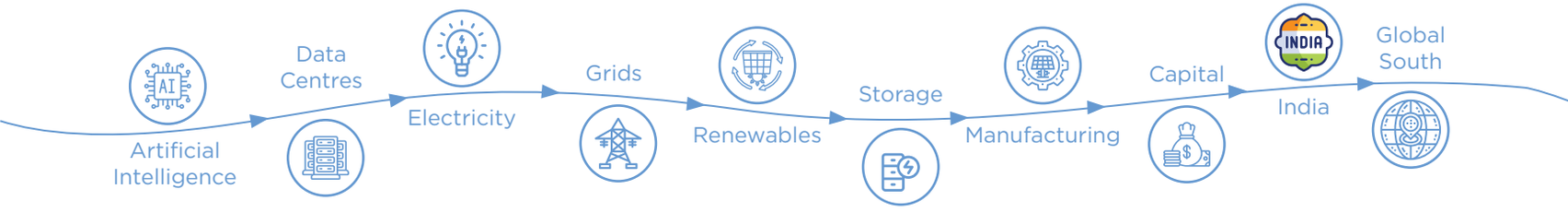


Table 1: The Prize - India's Three Energy Export Pathways under a Continued Momentum Scenario

Pathway	Today	2030	2047
1. Green Compute	~1.6 GW installed; negligible export serving	~3 GW export serving; US$7-10 bn a year	~45 GW export serving; US$100-140 bn a year
2. Green Molecules	0.3 MTPA active capacity; no exports	0.6-1.8 MTPA of exports against ~6 MTPA global import demand	A core supplier to Europe, Japan, Korea and the UK
3. Energy Transition Infrastructure	~US$20 bn a year; under 2% of global trade	US$45-55 bn a year	US$350-400 bn a year; ~8% of global trade
4. Clean generation anchored	-	~12 GW for export serving compute alone	~180 GW, consuming ~450 TWh a year

* Full scenarios detailed out in subsequent chapters

A two-pillar strategy to capture the opportunity

Pillar I: Coordinated infrastructure development for globally competitive data-centre locations

India must convert national strengths into complete, project-ready locations. Power, transmission, land, fibre, water, cooling, approvals and resilience must be planned together. As rack densities rise and hyperscalers move to hourly clean power matching,India's winning proposition is not the lowest tariff, but firm, verifiably clean, expandable power available on a committed date. The objective is predictable time-to-power, faster commissioning and confidence in future expansion.

Pillar II: Capture higher economic value by leveraging the shared upstream supply chains of AI and clean energy to accelerate industrial capability development

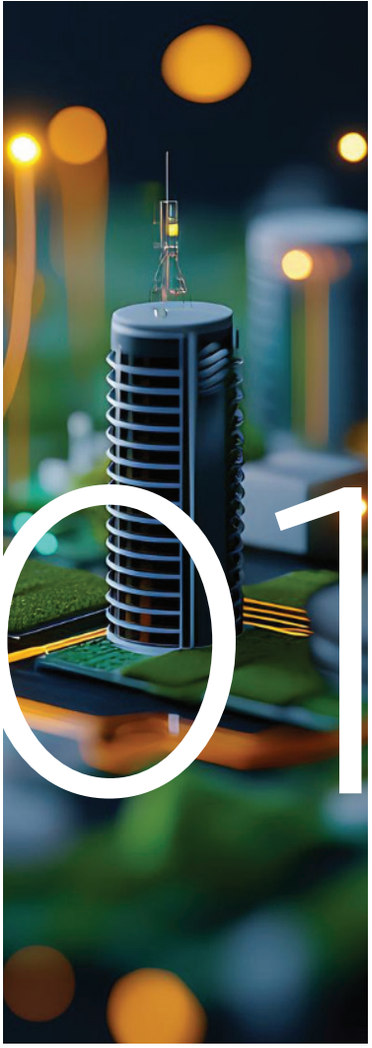
India should treat the simultaneous expansion of AI and clean energy as one strategic industrial opportunity where their supply chains overlap. Combined demand can support scale in power electronics, electrical equipment, storage, materials, testing and advanced manufacturing. Policy should move beyond final assembly and build deeper capabilities that raise domestic value addition, reduce supply risks and create export competitiveness.

Seven main recommendations

1. **Establish a National Compute Infrastructure Mission:** Create a coordinated Centre-State framework that integrates site readiness, power planning, connectivity infrastructure, approval systems and investment facilitation to accelerate large scale AI and data centre deployment.
2. **Develop Clean Compute and Industry Clusters:** Build globally competitive clusters that combine data centres, renewable energy, storage, industrial demand, green hydrogen production, international connectivity and manufacturing ecosystems.
3. **Create a Bankable Clean Compute Power Framework:** Expand access to firm clean power products, transmission readiness, storage solutions and long term investment mechanisms that provide certainty for hyperscale investors.
4. **Unlock Green Molecule Exports Through G2G Alliances and Assured Domestic Demand:** Secure government-to-government offtake alliances and green hydrogen chapters in trade agreements with Japan, the European Union, Korea, Singapore and the United Kingdom, while creating assured initial domestic demand through phased public sector offtake in refining, fertiliser, city gas distribution and steel, backed by viability gap support to bridge the cost gap with grey hydrogen.
5. **Launch an AI and Clean Energy Manufacturing Mission:** Create a coordinated strategy for semiconductors, advanced packaging, servers, batteries, electrolysers, transformers, power electronics and grid technologies, building on existing government initiatives
6. **Build Anchor Demand, Testing, Skills and Supplier Ecosystems:** Strengthen testing infrastructure, certification systems, workforce development, supplier networks and research partnerships to support large scale industrial growth.
7. **Create an India Led Export Platform for Compute, Clean Tech and Green Molecules:** Position India as a global supplier of AI infrastructure, clean energy equipment, green fuels, engineering services and project development capability, particularly across emerging markets and the Global South.

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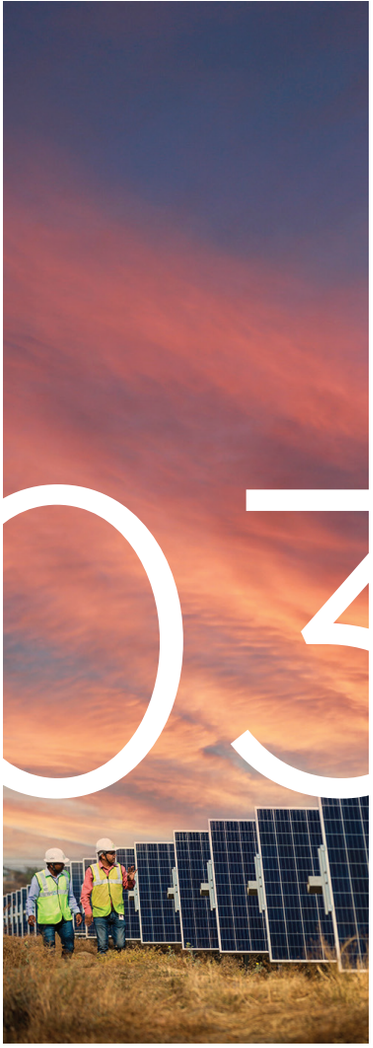
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- Export Pathway 3: Exporting Energy Infrastructure Itself



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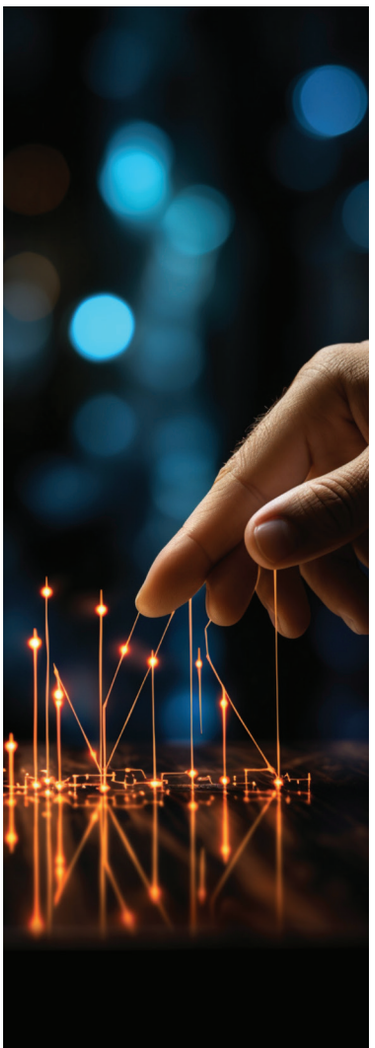
Four Strategic Recommendations for Pillar I

- Establish a National Compute Infrastructure Mission
- Develop National Clean Compute and Industry Clusters
- Create a Bankable Clean-Compute Power Framework
- Unlock Green-Molecule Exports Through G2G Alliances and Assured Domestic Demand

Pillar II: Capture higher economic value by leveraging the shared upstream supply chains of AI and clean energy 14

Three Strategic Recommendations for Pillar II

1. Launch an AI and Clean-Energy Manufacturing Mission
2. Build Anchor Demand, Skills, Testing and Supplier Ecosystems
3. Create an India-Led Export Platform for Compute, Clean Tech and Green Molecules





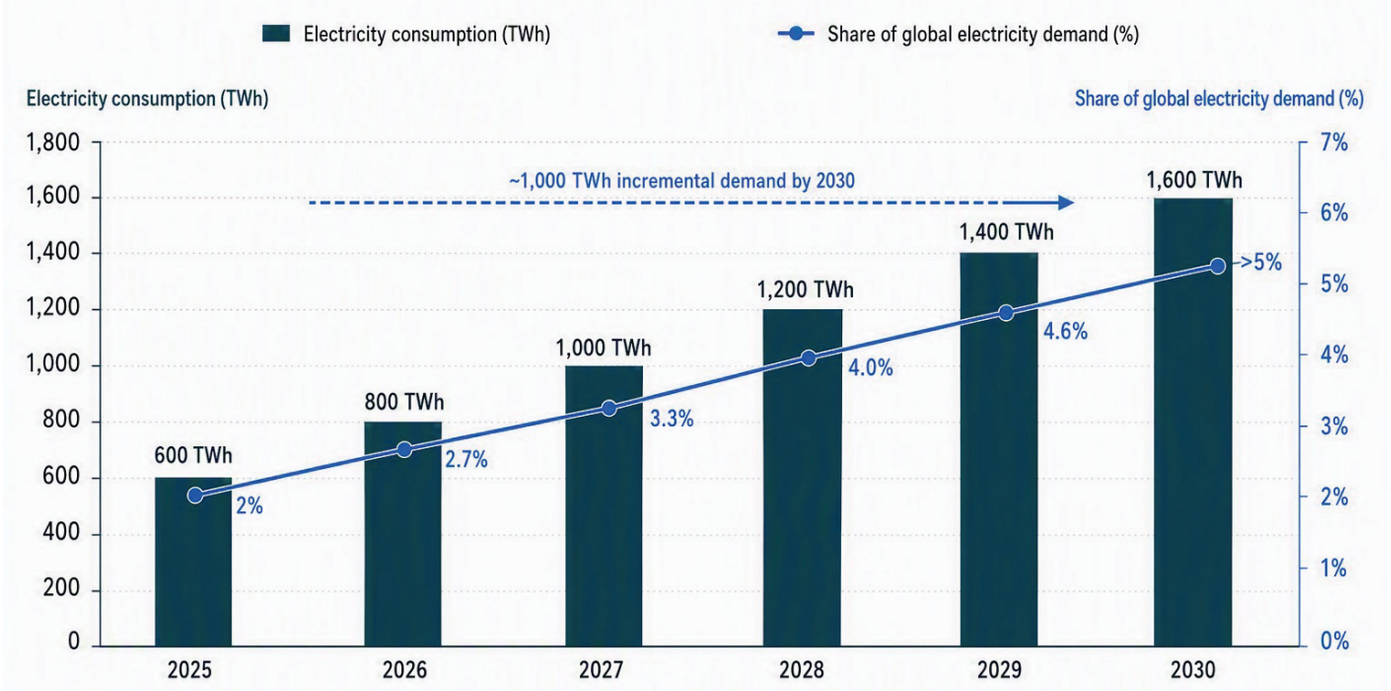
Introduction

The Global AI, Data Centre and Electricity Demand Landscape

AI is driving an unprecedented expansion of data centre infrastructure

Global technology companies are rapidly scaling AI infrastructure, with the five largest investing more than US$400 billion in AI and digital infrastructure in 2025.[9] AI workloads require far higher compute density and continuous power than earlier digital infrastructure. As a result, data centre electricity consumption is projected to rise from about 600 TWh in 2025 to roughly 1,600 TWh by 2030, increasing their share of global electricity demand from around 2 per cent to more than 5 per cent.[3] AI-optimised facilities will drive most of this growth.[1,8]

Global data centre electricity demand, 2025-2030



Note: Data-centre electricity demand includes traditional data centres and AI-optimised facilities.

Source: McKinsey analysis

The challenge is no longer finding capital. It is finding power.

The constraint has shifted from capital and connectivity to energy infrastructure. Several major data centre markets now face:

- Grid connection delays, with large load approvals taking around two years in constrained markets
- Transmission bottlenecks, as ageing networks lag demand growth
- Long lead equipment shortages, including roughly 100-week generator and 75-week chiller lead times
- Power shortfalls, with the United States alone facing a potential 25 GW supply gap by 2030
- Cooling constraints, as rising rack densities force a shift towards liquid cooling
- Skilled labour shortages, with annual gaps above 15,000 engineers and technicians in several markets
- Longer approval and site selection timelines

The scale of the build out is now measurable

Global data centre IT capacity is expected to rise from about 70 GW in 2024 to roughly 220 GW by 2030, with an accelerated case near 300 GW.[3] AI will drive most of this growth: AI workloads are projected to reach about 71 per cent of demand, generative AI about 41 per cent, and continuous inference 50-60 per cent of generative AI capacity by 2030.[3] This build out will require about US$6.7 trillion of cumulative capital by 2030, including US$5.2 trillion for AI ready capacity across land, power, networks, servers, chips and storage.[3,4] Renewables are expected to supply 45-50 per cent of the data centre energy mix by 2030, up from roughly one third today.[4,10]

Denser racks, and three routes to power

AI hardware is outpacing supporting infrastructure: GPU power draw rose from about 300 watts for an A100 in 2020 to about 1,200 watts for a GB200 in 2025, while average rack density is expected to rise from 10-12 kW today to 24-26 kW by 2028.[3] Advanced racks already reach up to 500 kW using direct liquid cooling, making reliable power, cooling and water systems central to site competitiveness. Operators are responding through three power routes: grid connected supply, grid plus behind the meter storage and flexibility, and on site generation through gas or nuclear options - all addressable through India's renewable, storage, RTC and FDRE capabilities.

Hyperscalers are reshaping clean power procurement and firm baseload demand

Hyperscaler power procurement is moving from annual renewable matching to firm, hourly and verifiable clean supply. More than 400 companies across 175 markets have committed to 100 per cent renewable power, while Google, Microsoft, Amazon and Meta are advancing 24/7 or emissions first procurement models.[5,10,11,12] If half of 2030 hyperscaler demand were served by 24/7 clean PPAs, it would require 550-750 TWh a year, 175-240 GW of solar, 145-200 GW of wind and 65-85 GW of dispatchable flexibility.[5,39] This is also pushing firm baseload back into the AI infrastructure stack. Renewables and storage will provide most energy, but AI campuses need 99.999 per cent availability, and RTC renewable solutions can carry a 30-60 per cent cost premium and larger land footprint. The emerging stack is therefore bulk renewables, short duration storage and firm low carbon baseload, including nuclear and SMRs - a shift already visible in Microsoft, Google, Meta, Amazon and Oracle's nuclear linked power deals.[13,14,15,16,17]

Capacity is already migrating to where power is available

Data centre capacity is already migrating towards markets that can offer power, land, connectivity and faster execution. The United States remains the dominant announced capacity market, but energy constraints are pushing growth into alternative hubs such as India, the UAE, Spain and Malaysia. The key policy lesson is clear: countries that can deliver power ready sites with predictable approvals will capture a larger share of the AI infrastructure build out.[3,9]

A new competition for mobile AI workloads is emerging

Not all AI workloads are tied to user proximity. Latency sensitive uses such as trading, gaming and real time applications must remain close to demand, but model training, large scale inference and cloud processing are more mobile. This is creating a new competition for locations that can offer low cost, reliable clean power, scalable land, political stability and faster execution. The digital economy moved first on connectivity, then on compute; the next phase will be shaped by energy. Countries that can deliver renewable generation, expandable grids, storage, transmission and predictable investment frameworks will capture the next wave of AI infrastructure. India's opportunity lies in converting its simultaneous build out of clean power, grids, digital infrastructure and manufacturing into credible, power ready locations for global AI demand.

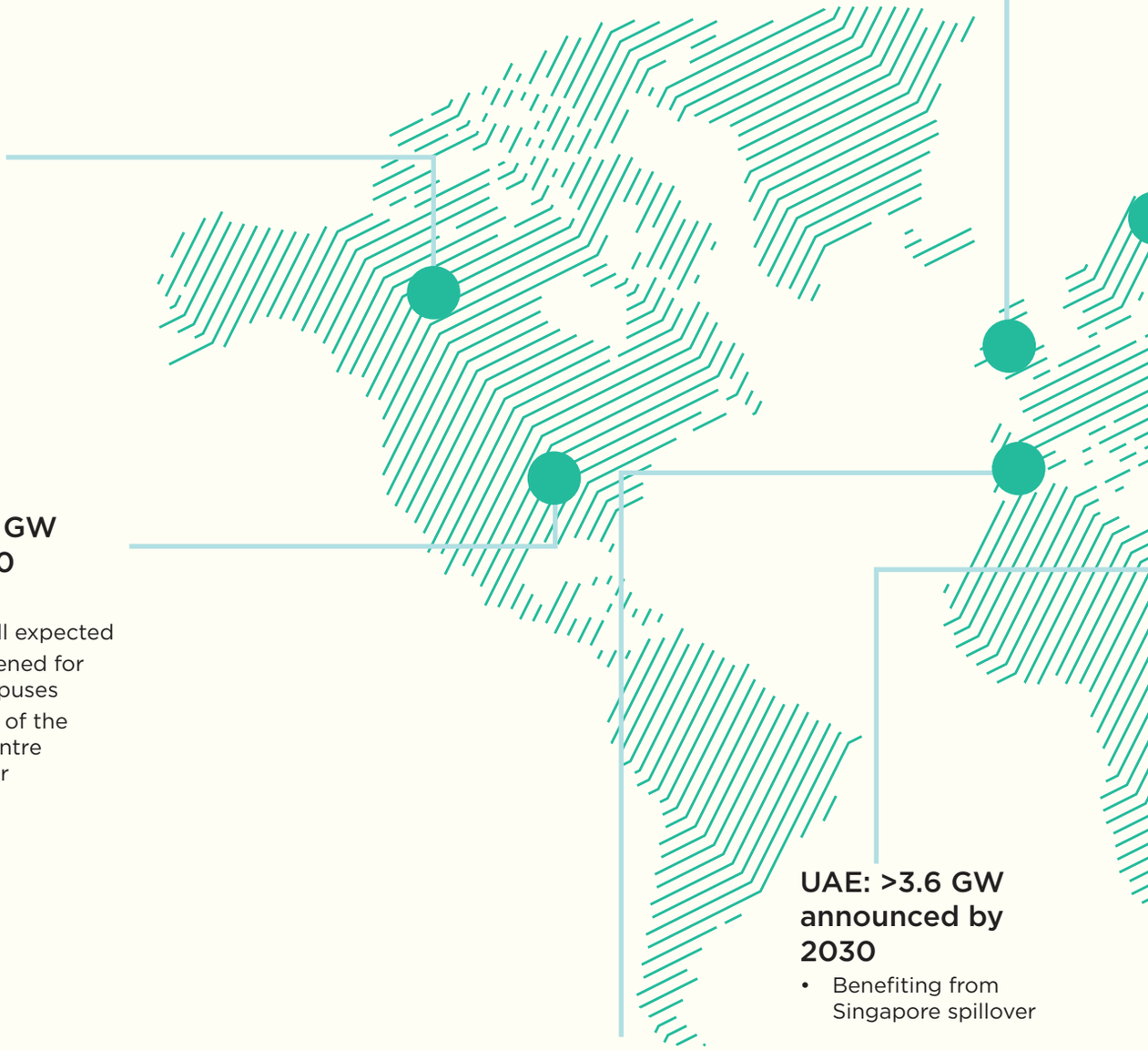
Green molecules are emerging as a major traded clean energy market

Green hydrogen and ammonia are moving from pilot markets to a sizeable traded clean energy opportunity, with import demand expected to concentrate in the European Union, Japan, Korea, Singapore and the United Kingdom. Global green hydrogen imports are projected at about 6 MTPA by 2030, enough for a 10 per cent share to represent 0.6 MTPA and a 30 per cent share to represent 1.8 MTPA of exports.[12,33] Supply momentum is also visible: India has already announced around 11.2 MTPA of green hydrogen capacity, in addition to active and under construction projects, but converting this pipeline into trade will depend on long term offtake, certification alignment and narrowing the green versus grey cost gap.[23,24]

Announced Data centre Capacity in Selected Emerging and Established Markets, 2030

United Kingdom

- Secured US$8+ billion of private investment for AI infrastructure.
- Actively competing for next-generation compute investment.



Canada >1.2 GW announced by 2030

- Competing through land availability and access to green energy.

United States: >60 GW announced by 2030

- World's largest market
- ~25 GW power shortfall expected
- Federal sites being opened for gigawatt-scale AI campuses
- Northern Virginia: One of the world's largest data centre clusters is facing power constraints

UAE: >3.6 GW announced by 2030

- Benefiting from Singapore spillover

Spain: >1.3 GW announced by 2030

- Leveraging renewable-energy resources and direct access to subsea cables.

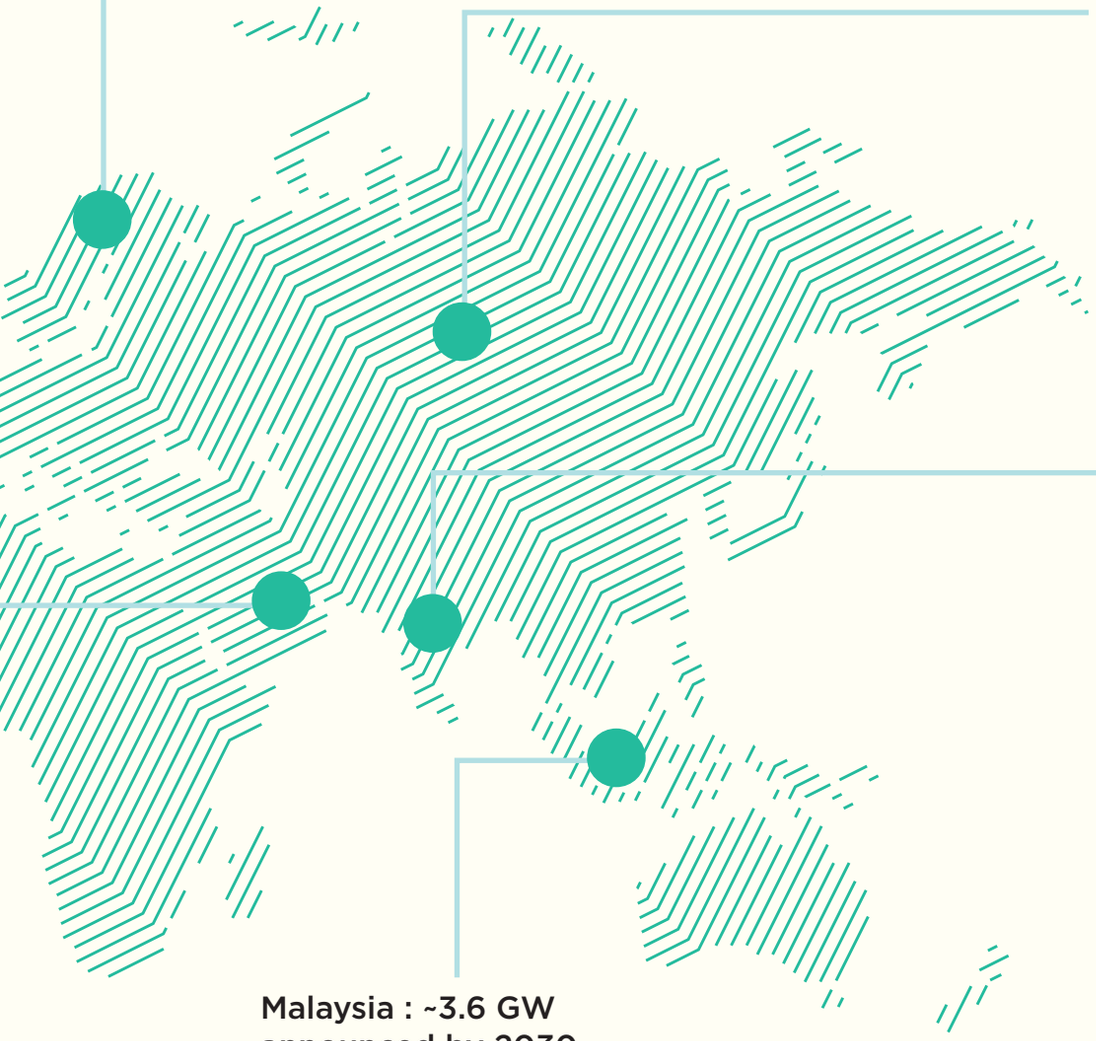
*This map is for illustrative purposes only and is not intended to represent official boundaries or territorial claims.

Nordics: >2.8 GW announced by 2030

- Emerging data centre destination.
- High land availability, access to green energy and favourable regulation.

China: US$6bn+ national compute programme

- 8 national compute hubs
- Eastern Data, Western Computing initiative
- Energy-linked compute planning



India: >4.1 GW of announced capacity by 2030

- Cost, talent and demand advantages
- Emerging AI infrastructure destination
- Competitive advantage increasingly shaped by EoDB.

Malaysia : ~3.6 GW announced by 2030

- Benefiting from Singapore spillover

A Decade of Foundation Building

Digital infrastructure is reaching an inflection point

India has already demonstrated scale in digital public infrastructure through Aadhaar, UPI, DigiLocker and CoWIN. The next wave will be driven by AI, cloud, enterprise digitisation, advanced manufacturing and digital public services, all of which require far more compute and data centre capacity. Installed data centre capacity has grown from about 375 MW in 2020 to more than 1,575 MW in 2026, while government estimates suggest power demand from data centres could reach around 17 GW by FY2031-32.[18,20]

Clean energy and grids are becoming a strategic advantage

India has moved from a relatively small renewable energy market to one of the world's largest destinations for solar and wind deployment. Competitive auctions, Green Open Access, falling technology costs and transmission expansion are helping create a cleaner and more resilient system capable of supporting large industrial and digital loads. Transmission will determine whether clean power can reach future centres of compute, industry and green fuel production. By FY2031-32, India's transmission network is planned to expand from about 5.09 lakh to 6.48 lakh circuit-km, transformation capacity from 1,478 GVA to 2,345 GVA, inter-regional transfer capacity from 120 GW to 168 GW, and transmission investment opportunities to about ₹9.15 lakh crore.

Government is beginning to reposition nuclear power for the next phase

The Government of India has begun repositioning nuclear power as a strategic source of firm, low-carbon electricity. The SHANTI Act, 2025 modernises the nuclear-governance framework, while the national target of 100 GW of nuclear capacity by 2047 signals a major scale-up ambition.[25] The ₹20,000 crore Nuclear Energy Mission further focuses on small modular reactors, including at least five indigenous SMRs by 2033 and designs such as BSMR-200 and SMR-55.[26,27]

Green-molecule policy is moving from targets to market creation

The National Green Hydrogen Mission has set the policy foundation for India to become a hub for green hydrogen and its derivatives, with ₹19,744 crore of support, the SIGHT scheme for electrolyser manufacturing and green-hydrogen production, and provisions for demand creation, certification and green-hydrogen hubs.[23] SECI has now begun translating this framework into market demand through green-ammonia tenders aggregating fertiliser-sector offtake, backed by long-term contracts, price support and payment security.[24]

Manufacturing capacity is beginning to align with the AI-energy opportunity

India's opportunity extends beyond hosting digital infrastructure. Electronics production has risen from about ₹1.9 lakh crore in FY2014-15 to over ₹11.3 lakh crore in FY2024-25, supported by PLI schemes, ECMS, export-oriented clusters and supply-chain diversification.[18,19] The India Semiconductor Mission and Semicon 2.0 are laying foundations in design, fabrication, ATMP, materials, equipment and talent.[18]

Clean-energy manufacturing is also scaling. Solar module manufacturing capacity under ALMM has surpassed 100 GW, while the National Green Hydrogen Mission is creating export opportunities across green hydrogen, electrolysers and industrial decarbonisation.[22,23,35] Together, compute exports, green-fuel exports and clean-tech manufacturing can allow India to capture more value from its clean-energy advantage.

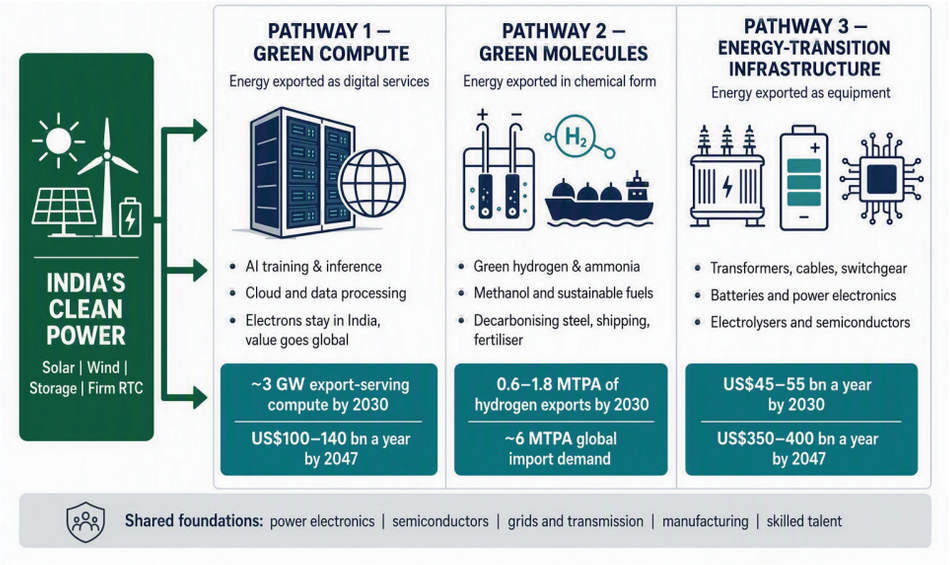




A New Model of Energy Exports

The AI era expands the meaning of energy exports. Clean electricity can now create globally traded value not only as fuels or power, but as compute, green molecules and industrial infrastructure. For India, the opportunity is to convert its clean-energy build-out into three export pathways: green compute for global AI and cloud demand, green molecules for hard-to-abate sectors, and the equipment and systems that power the AI-energy economy.

India's Three Energy-Export Pathways in the AI Era



* Report analysis

Export Pathway 1: Green Compute - Exporting Energy Through Digital Infrastructure

Green compute converts renewable electricity generated in India into globally consumed AI training, inference, cloud and enterprise computing services. The electrons remain in India, but the value is exported digitally.

Export Pathway 2: Green Molecules - Exporting Renewable Energy in Chemical Form

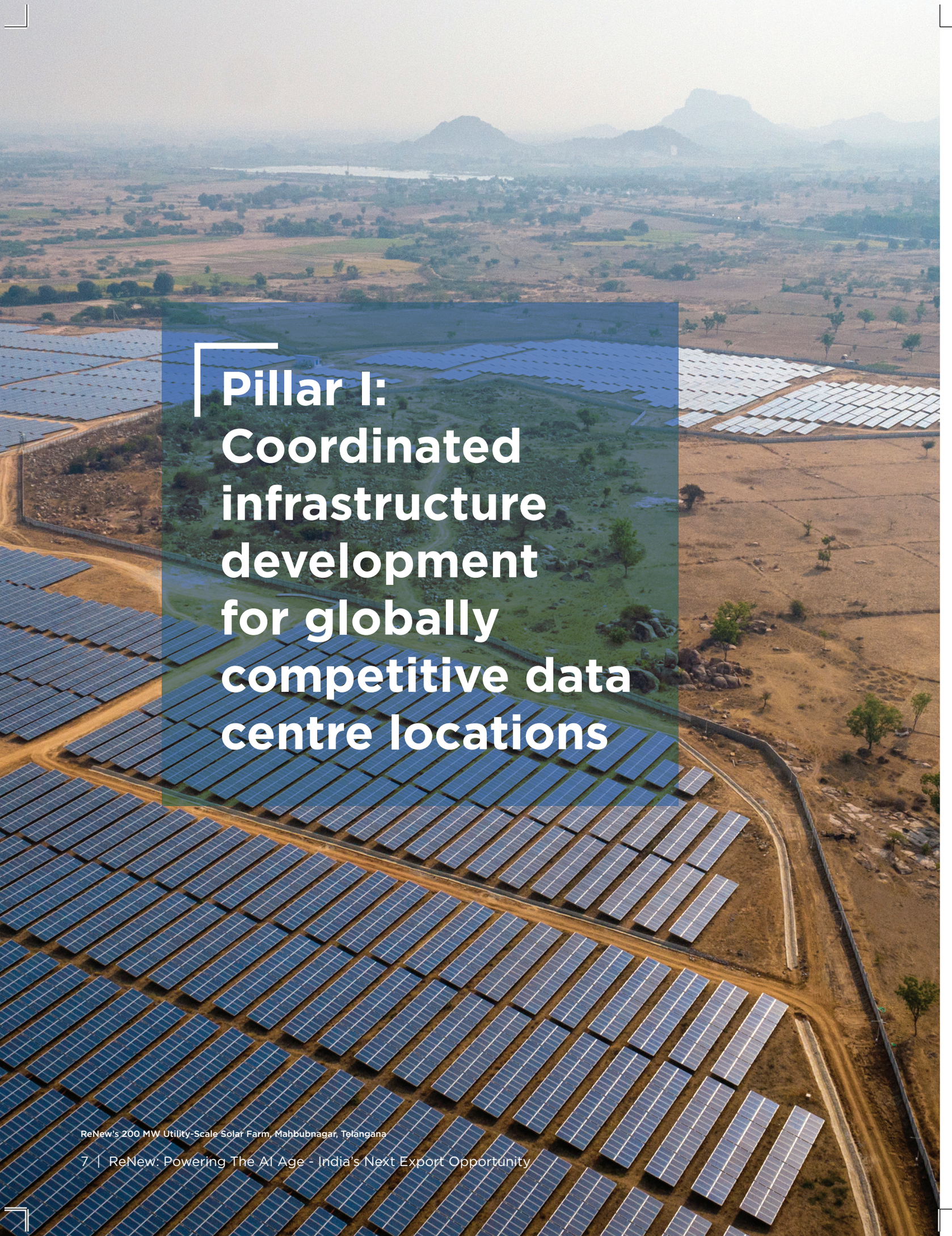
Green molecules convert renewable power into green hydrogen, ammonia, methanol, sustainable fuels and other carriers that can be exported to hard-to-abate sectors. This pathway also supports domestic demand for electrolysers, power electronics, transmission equipment and industrial engineering.

Export Pathway 3: Exporting Energy Infrastructure Itself

Energy-transition infrastructure exports the equipment and systems needed for both AI and clean energy: power electronics, semiconductors, cooling systems, batteries, transformers, cables, switchgear, electrolysers and grid technologies. The same industrial base can serve both markets.

Delivering these pathways requires two linked pillars: converting clean power into investible, compute-ready locations; and building the domestic technology and manufacturing base that captures more of the value chain:

Pillar I: Coordinated infrastructure development for globally competitive data centre locations



ReNew's 200 MW Utility-Scale Solar Farm, Mahbubnagar, Telangana



Pillar I: Coordinated infrastructure development for globally competitive data centre locations

Pillar I is about turning India's clean-power build-out into bankable locations for AI infrastructure. Globally, the constraint has shifted from capital to power-ready sites: grid connections can take around two years, key equipment carries long lead times, and the United States may face a 25 GW supply gap by 2030.[3]

Investment is therefore moving towards markets that can offer firm electricity, land, connectivity and faster approvals. India has the resources; the challenge is delivery speed and predictability. The competitive unit is now the site, not the country. India should build a portfolio of compute-ready locations that can answer investors' core question with certainty: when will reliable, clean, expandable power, connectivity and approvals be available?

The same clean power can also create near-term export value through green molecules. The four recommendations that follow therefore focus on making Indian locations compute-ready and bankable, while converting renewable power into exportable hydrogen and ammonia.

The Location Proposition: Power, Connectivity and High-Density Land

The AI economy is reshaping what makes a location attractive. Data centres were historically built close to demand, but training, large-scale inference and cloud workloads are far more mobile, and investors now weigh power availability, land, connectivity, cooling, scalability and regulatory certainty together. The physical specification is also changing quickly.

Average rack power density is expected to rise from 10-12 kW today to 24-26 kW by 2028, with advanced racks already supporting up to 500 kW on direct liquid cooling, while liquid cooling's share of data centre cooling capital expenditure rises from 12 per cent in 2024 to 23 per cent by 2028 and total cooling spend grows at about 24 per cent a year. GPU power draw has itself risen more than fourfold between 2020 and 2025.[3] A compute-ready Indian site must therefore offer more than cheap electricity: it needs reliable power, transmission headroom, high-capacity connectivity, water and cooling solutions, skilled talent and predictable approvals, designed for the hardware of 2030 rather than that of 2020.

Among these factors, power will be the decisive differentiator, and the way large digital companies buy it is changing as fast as the volumes they consume. More than 400 companies across over 175 markets, with combined annual demand exceeding 500 TWh, have committed to 100 per cent renewable power,[10] and the leaders have moved beyond annual volume matching towards hourly, time-matched supply, with Google targeting carbon-free energy around the clock on every grid where it operates by 2030 and Microsoft committing to be carbon-negative by the same date.[11,12]

Firmness carries a premium: round-the-clock clean-supply based on wind, solar and lithium-ion storage has been estimated above US$200 per MWh in most regions, falling below US$100 per MWh where long-duration storage is used.[7] India's future power mix for AI infrastructure will combine solar, wind, battery storage, pumped hydro, hydroelectricity, FDRE and RTC products, nuclear energy and, over time, hydrogen-based solutions.

The competitive position to occupy is therefore not the lowest tariff but the most bankable one - firm, verifiably clean, expandable, and available on a committed date - supplied through all three of the procurement routes hyperscalers now use: grid connection, grid connection combined with behind-the-meter storage and flexibility, and on-site generation.[3] Power alone is not enough. AI infrastructure depends equally on data flows, and connectivity is what allows an Indian site to serve a customer in Frankfurt, Singapore or Sao Paulo.

Future compute hubs will require high-capacity fibre, submarine cable access, route redundancy, cloud on-ramps and low-latency reach into global markets. Spain's emergence as a data centre hub rests as much on direct access to subsea cables such as Grace Hopper, MAREA and 2Africa as on its renewable resource, and the UAE's on connectivity to Europe, Asia and Africa. India's expanding cable landing stations, national fibre backbone and position between Europe, the Middle East, Africa and Asia are comparable assets, but they are concentrated in a small number of landing locations. Energy and data networks should therefore be planned together, and from the outset.

From Standalone Data Centres to Clean-Compute Clusters

The scale at which capacity is now being built favours clusters over standalone assets. Individual campuses of more than 500 MW are becoming routine, and single sites of 1-2 GW are under construction, with one 1.22 GW project sourcing less than 10 per cent of its power from the grid and the remainder from dedicated renewable and fission partners. Projects of that size cannot be served by incremental connections; they require infrastructure planned as a system.

A cluster-based model would combine data centres, AI campuses and edge networks with renewable generation, storage, transmission and firm clean-power assets, alongside manufacturing ecosystems spanning electronics, semiconductors and green hydrogen, and supported by high-capacity connectivity. The result is higher asset utilisation, shared infrastructure cost, and a proposition that can be marketed internationally as a single, investible location.

Several cluster archetypes could emerge across India. **Coastal Green Compute Hubs** could combine data centres, cable landing stations, renewable-energy corridors, and green-hydrogen export infrastructure. **Renewable-Rich Inland Hubs** could integrate large

renewable resources, transmission networks, industrial corridors, and AI campuses in states such as Gujarat and Rajasthan. A third model, the **Clean Compute and Industrial Cluster**, could bring together compute infrastructure, manufacturing, storage, green hydrogen, and hard-to-abate industries. Together, these models can strengthen industrial competitiveness and position India as a leading destination in the emerging AI-energy economy.

Sizing the Opportunity: India's Compute-Export Potential to 2030, 2035 and 2047

The size of this opportunity can be estimated from the top down. Global data centre capacity is projected to rise from about 70 GW of IT load in 2024 to roughly 220 GW by 2030, and to approximately 300 GW if demand accelerates.[3] India has around 1.6 GW installed today and just over 4.1 GW announced to 2030, close to 2 per cent of the global total, while government estimates place domestic data centre power demand at about 17 GW by FY2031-32.[3,18,20] Two questions therefore determine the prize: what share of the global build India attracts, and how much of that capacity serves customers outside India. The three scenarios below - constrained, continued momentum and accelerated - deliberately mirror the framing used in global demand modelling. They differ not in India's resource endowment, which is identical across all three, but in delivery: time-to-power, transmission readiness, connectivity and the predictability of approvals.

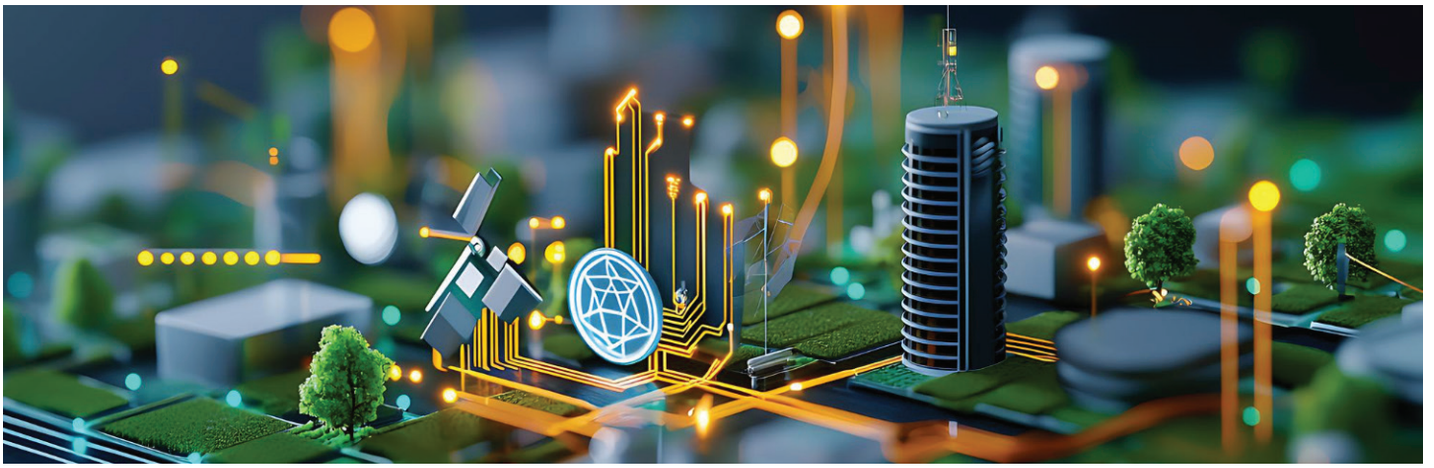
On a continued-momentum path, India reaches 8-10 GW of installed capacity by 2030, of which roughly a quarter, or about 3 GW, serves global rather than domestic workloads, generating in the order of US$7-10 billion a year in compute exports. In a constrained outcome, where connections and approvals continue to move at present speed, export-serving capacity remains closer to 1.5 GW. In an accelerated outcome, with five to seven clean-compute clusters operational and power and cable landing capacity built ahead of demand, installed capacity could reach 13-15 GW and export-serving capacity about 5 GW by 2030 - equivalent to roughly a fifth of the supply gap the United States alone is expected to face in that year.

The paths diverge sharply thereafter, because clusters, transmission and connectivity compound. By 2035, export-serving capacity ranges from about 4 GW in the constrained case to roughly 17 GW in the accelerated one. By 2047 - the horizon to which India's tax proposition for eligible foreign cloud providers already extends - the range widens from about 15 GW to roughly 85 GW. On the continued-momentum path, compute exports would be worth in the order of US$100-140 billion a year by 2047, a figure comparable to a substantial share of India's present-day software services exports, and earned from electrons that never cross a border.

The energy implications are equally material, and are where the opportunity connects back to India's clean-energy industry. Each gigawatt of IT capacity consumes roughly 10 TWh of electricity a year at typical utilisation and efficiency levels, and requires approximately 4 GW of solar and wind capacity, plus storage, to be served on a round-the-clock basis. On the continued-momentum path, export-serving compute alone would consume about 30 TWh a year by 2030 and roughly 450 TWh by 2047, anchoring in the order of 180 GW of dedicated clean generation and firming capacity. Compute is therefore not only a new export; it is among the largest sources of bankable, long-duration, high-credit-quality demand available to Indian renewable developers - the domestic analogue of the 550-750 TWh of hyperscaler demand that global 24/7 clean power agreements are expected to cover by 2030, which on its own implies 175-240 GW of new solar, 145-200 GW of new wind and 65-85 GW of dispatchable flexibility worldwide.

Table 2: India's Compute-Export Potential under Three Delivery Scenarios, 2030-2047

Indicator	Scenario	2030	2035	2047
Total installed data centre capacity (GW IT)	Constrained	5-6	12-15	50-60
	Continued momentum	8-10	25-30	100-120
	Accelerated	13-15	40-45	180-200
Export-serving compute capacity (GW IT)	Constrained	~1.5	~4	~15
	Continued momentum	~3	~9	~45
	Accelerated	~5	~17	~85
Indicative compute-export revenue (US$ bn a year)	Constrained	3-5	8-12	30-45
	Continued momentum	7-10	22-30	100-140
	Accelerated	12-15	40-55	190-270
Electricity consumed by export-serving compute (TWh a year)	Continued momentum	~30	~90	~450
Dedicated clean generation anchored (GW)	Continued momentum	~12	~35	~180



What Leading Markets Are Doing

Leading markets increasingly compete on infrastructure readiness rather than incentives alone. In **Singapore**, new capacity is allocated against efficiency and sustainability criteria and planned alongside long-term power supply, with the resulting spillover demand flowing to **Johor in Malaysia,** which has attracted more than 1.2 GW of announced capacity on the strength of low construction and workforce costs, land and active project facilitation. In **Northern Virginia**, decades of investment in connectivity and power created the world's largest concentration of digital infrastructure, and that market is now power constrained.

In **Texas and the wider US Gulf**, land, competitive power and faster approvals have drawn campuses of unprecedented size, including a roughly 2 GW site at Richland Parish, Louisiana, being developed for more than US$10 billion across nine buildings and around 4 million square feet. In **Ireland**, new compute capacity is now expected to contribute to system reliability and is planned in step with the electricity system. In the **UAE and Saudi Arabia**, coordinated land, power, connectivity and investment promotion, backed by public vehicles such as MGX and G42, have supported more than 3.6 GW of announced capacity and connectivity to three continents, while **Spain** has combined renewable resources with direct access to subsea cables to reach more than 1.3 GW.[3,9]

What these markets offer is not generosity but predictability: a single point of accountability for large loads, land and power prepared ahead of demand, published connection timelines, and planning that treats digital and electricity infrastructure as one system. Sovereign programmes in France, the UAE, Italy, the United Kingdom, China and the United States have since attached tens of billions of dollars to that same proposition. India competes well on cost, resource and talent, and its announced pipeline of more than 4.1 GW already places it among the emerging hubs; the assessed brake on its growth is regulatory and delivery complexity rather than fundamentals. Closing that gap is what determines whether India follows the constrained or the accelerated path in table 2, and it is the purpose of the four recommendations that follow.

Four Strategic Recommendations for Pillar I

Recommendation 1 : Establish a National Compute Infrastructure Mission

India should establish a **National Compute Infrastructure Mission** as the coordinating framework for converting its digital, energy, connectivity, and industrial advantages into investible locations. Led jointly by MeitY and DPIIT, the mission should bring together the Ministry of Power, CEA, MNRE, DoT, Ministry of Jal Shakti, MoEFCC, Ministry of Finance, and participating s nd Mission, state data centre policies, and national transmission-planning processes rather than create another standalone authority. The mission should undertake the following steps:
tates. It should converge existing initiatives such as the IndiaAI Mission, Digital India, PM Gati Shakti, the National Broadba

1. **Create a national compute-readiness framework and site registry** containing independently verified information on available power, connection timelines, transmission requirements, land, fibre connectivity, water and cooling conditions, climate exposure, clean-energy procurement options, and approval timelines.
2. **Establish a Centre-State operating protocol** for projects above a defined capacity or investment threshold. Designated state nodal agencies, utilities, transmission planners, and telecom authorities should jointly identify dependencies, assign responsibilities, and track project delivery through existing single-window systems.
3. **Develop a model state framework** covering approval sequencing, large-load connections, renewable-energy procurement, land allocation, infrastructure support, and common service standards, while retaining state flexibility over incentives.
4. **Operationalise the 2047 tax proposition** for eligible foreign cloud providers through clear rules on qualifying services, Indian data centre structures, safe-harbour treatment, contracting models, and documentation requirements.
5. **Link state incentives to measurable outcomes,** including timely commissioning, location within qualified hubs, clean-power procurement, energy and water efficiency, and investment in shared connectivity.

Pathway addressed: Pathway 1 - Green Compute

Action horizon: 0–2 years

Outcome horizon: 2–4 years

Recommendation 2 : Develop National Clean Compute and Industry Clusters

India should develop **5–7 flagship clusters** where digital infrastructure, clean energy, connectivity, manufacturing, and logistics are planned as an integrated system. These clusters should build on existing data centre parks, industrial corridors, semiconductor and electronics clusters, Green Energy Corridors, PM Gati Shakti, the National Industrial Corridor Development Programme, the India Semiconductor Mission, PLI schemes, and the National Green Hydrogen Mission. Implementation should include the following steps:

1. **Identify compute-ready infrastructure hubs** based on geography-specific strengths rather than applying a uniform national template. Each hub should provide power-ready land, dedicated substations, transmission access, expansion capacity, storage, high-capacity fibre, and streamlined approvals.
2. **Develop coastal clean-compute hubs** where submarine cable landing points, international fibre, renewable-energy corridors, industrial land, storage potential, ports, and green-hydrogen infrastructure coincide. These hubs could serve globally distributed AI and cloud workloads.
3. **Develop renewable-rich inland hubs** around large clean-energy resources, transmission nodes, industrial corridors, manufacturing centres, and AI campuses, particularly where land and future expansion capacity are available.
4. **Anchor selected hubs with firm baseload power** by using nuclear and SMRs where feasible, including 200–300 MW pilot anchors in southern and western corridors, backed by long-term PPAs, tariff certainty and coordination across MeitY, the Ministry of Power, DAE and NPCIL.[25,26,27]
5. **Integrate submarine cables and terrestrial backhaul into cluster planning,** with priority given to route diversity, latency, network resilience, and reduced dependence on a limited number of existing landing locations.
6. **Build resource resilience into site qualification** by assessing water stress, treated-water availability, cooling options, heat exposure, flooding, cyclones, and other climate risks before large campuses are approved.

Pathways addressed: Pathways 1, 2 and 3 - Green Compute, Green Molecules and Energy-Transition Infrastructure

Action horizon: 1–3 years

Outcome horizon: 3–7 years

Recommendation 3 : Create a Bankable Clean-Compute Power Framework

India should create a Bankable Clean-Compute Power Framework that offers predictable access to reliable, scalable, and verifiably clean electricity. The framework should converge the Green Open Access Rules, Green Energy Corridors, the National Electricity Plan, ISTS-related provisions, battery-storage programmes, and emerging Round-the-Clock and Firm and Dispatchable Renewable Energy products. The framework should include the following steps:

1. Introduce a time-to-power protocol for large digital loads. Developers should receive early visibility on initial sanctioned load, grid-connection dates, redundancy, required network upgrades, and capacity available for future expansion. In return, developers should submit phased and regularly updated demand forecasts.
2. Establish pre-planned connection pathways through dedicated substations, reserved transmission capacity, coordinated CTUIL-STU-DISCOM planning, and standardised grid-connection procedures.
3. Enable long-term clean-power procurement through open access, renewable PPAs, storage, pumped hydro, FDRE, RTC products, and other firming arrangements that can support continuous compute loads.
4. Create a clean-compute attribution framework through which data centres can voluntarily report the source, contractual basis, and time profile of their electricity consumption. The framework should recognise PPAs, open-access procurement, storage, and firming while remaining compatible with existing electricity-market rules.
5. Align generation, transmission, and storage planning with credible compute-demand forecasts so that infrastructure investment is based on committed projects rather than preliminary enquiries.

Pathways addressed: Pathway 1 - Green Compute (with direct read-across to Pathway 2, Green Molecules)

Action horizon: 0–2 years

Outcome horizon: 2–5 years

Recommendation 4 : Unlock Green-Molecule Exports Through G2G Alliances and Assured Domestic Demand

Green molecules can scale faster than compute exports, but India must secure both international offtake and assured domestic demand. Against a 5 MMTPA green-hydrogen target by 2030, India has about 0.3 MTPA active, 0.4 MTPA under construction and 11.2 MTPA announced, while projected domestic and export demand is only 1.2-3.4 MTPA.[23,24,31,33] The priority is therefore to close the offtake and cost gap, with green hydrogen still at US$3.5-5 per kg versus grey hydrogen at US$2.3-2.5 per kg.[33,39]

1. Secure G2G offtake alliances with target import markets. Global green-hydrogen imports are expected to reach about 6 MTPA by 2030, concentrated in the EU, Japan, Korea, Singapore and the UK.[12,33] India should target long-term intergovernmental offtake commitments, supported by joint investment platforms and concessional capital from partner DFIs.
2. Embed green-molecule chapters in trade agreements. FTAs and CEPAs with the EU, UK



and other partners should cover tariff treatment, certification equivalence, carbon-intensity methodologies, RFNBO and CBAM alignment, and treatment of green steel, ammonia and fertiliser made with Indian green hydrogen.

3. Create assured initial domestic demand through
4. PSUs. Refining, fertiliser, city gas and steel can anchor first projects while exports mature. Refiners above 50 KTPA of hydrogen use should adopt phased green-hydrogen blending, green-ammonia tendering should expand beyond the 724 KTPA already awarded, and public steel and CGD demand should be brought under clear purchase obligations.[24,31,33]
5. Bridge the cost gap with VGF and contracted offtake. Targeted support of about ₹7,800 crore to 2030, structured as VGF or a contract-for-difference against grey hydrogen, could reduce delivered green-hydrogen costs by about 38 per cent. The 2025 green-ammonia tenders, backed by ₹1,500 crore of support and guaranteed offtake, show the instrument works and should taper as costs fall.[24,33]
6. Scale SECI's green-ammonia aggregation model across green molecules. SECI's tenders have shown how aggregated fertiliser demand, assured offtake and price support can make first projects bankable. The model should now extend to refining, steel, CGD and export-linked offtake, alongside hydrogen/ammonia corridors and port-side storage, handling and bunkering infrastructure.

Pathways addressed: Pathway 2 - Green Molecules (with direct read-across to Pathway 3, Energy-Transition Infrastructure, since assured demand also builds the electrolyser and balance-of-plant manufacturing base)

Action horizon: 0–2 years

Outcome horizon: 2–5 years



Pillar II: Capture higher economic value by leveraging the shared upstream supply chains of AI and clean energy



ReNew's 2.5 GW solar cell manufacturing facility at Dholera

Pillar II: Capture higher economic value by leveraging the shared upstream supply chains of AI and clean energy to accelerate industrial capability development

If Pillar I is about attracting investment, Pillar II is about capturing value: building the manufacturing and technology capabilities behind the AI and clean-energy transitions, and selling them globally. The market is already vast - global energy investment reached US$3.3 trillion in 2025, including US$2.2 trillion for clean technologies, while grid investment must rise from about US$400 billion to over US$600 billion a year by 2030.[10,11] Data centres add another US$6.7 trillion of capital expenditure to 2030, buying transformers, switchgear, cables, power electronics, cells, electrolysers, cooling systems and chips; the global electrical-equipment market alone is projected to grow from roughly US$1.75 trillion to US$2.34 trillion by 2030.[4,37]

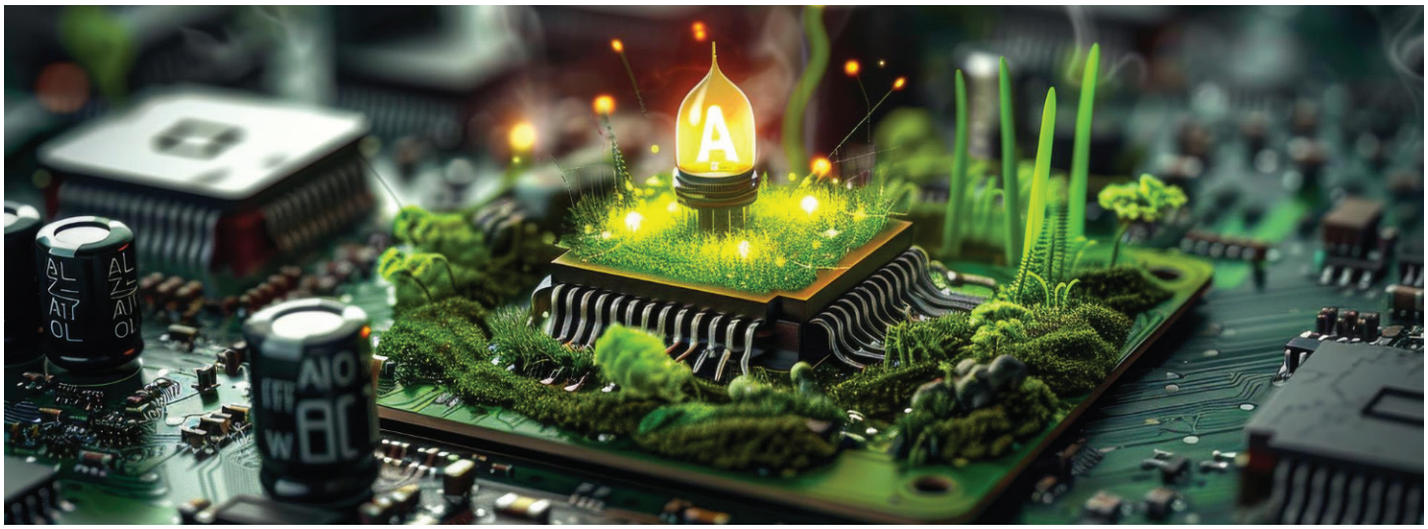
Shared Foundations

AI infrastructure and clean-energy systems increasingly depend on the same industrial base: semiconductors, power electronics, transformers, batteries, cooling systems, grid equipment, electrolysers and industrial automation. The overlap is commercial, not just conceptual — the same suppliers and components can serve data centre substations, renewable grids, storage systems and power-conversion equipment. Building these capabilities once, and selling them into both markets, is what turns India's domestic build-out into an export industry.

Table 3: The Shared Industrial Base and the Size of the Global Market

Shared Capability	AI Infrastructure	Clean-Energy Ecosystem	Global Market Signal
Power Electronics	Servers, UPS, data centres	Inverters, storage, grid systems	~20% of the ~US$1.5-1.75 trn electrical equipment market; silicon-carbide power devices the fastest-growing segment
Advanced Electrical Equipment	Transformers, switchgear	Transmission and distribution	Transformer market ~US$65 bn (2025) to ~US$88 bn (2030) and ~US$132 bn (2035); grid spend to double to >US$600 bn a year by 2030
Batteries	Backup and ride-through systems	Grid-scale storage	Global battery demand ~4.2 TWh by 2030 and ~6.8 TWh by 2035; grid-scale storage market ~US$83 bn (2025) to ~US$364 bn (2035)
Semiconductors	Chips, processors	Power semiconductors	~US$4.4 trn of global data centre spend on chips, servers and storage to 2030; India targets US$500 bn of electronics and semiconductor output by 2030
Electrolysers and Green-Fuel Systems	Fuel cells and long-duration backup	Green hydrogen, ammonia and methanol	Announced global electrolyser capacity of 230-520 GW by 2030 against ~5 GW installed in 2024; electrolyser market ~US$2 bn (2025) to ~US$14.5 bn (2031)
Automation & Control Systems	AI infrastructure	Renewable-energy systems	Smart-grid and digital solutions are ~15% of the electrical equipment market and among its fastest-growing segments
Precision Manufacturing	Electronics	Batteries and electrolysers	India recorded US$38.6 bn of electronics exports in FY2024-25, up 32.6%, and is now the third-largest smartphone exporter
Testing & Certification	Hardware validation	Equipment qualification	Qualification time is a binding export constraint; global generator and chiller lead times of ~100 and ~75 weeks favour pre-qualified suppliers

*Source: IEA, World Energy Investment 2025, Building the Future Transmission Grid and Global Hydrogen Review; industry analysis based on published data centre infrastructure estimates; MarketsandMarkets and Precedence Research equipment forecasts; MeitY, DPIIT and Ministry of Commerce data.



Semiconductors: The Foundation of the AI Economy

At the centre of this opportunity are semiconductors, which underpin modern AI systems, data centres, industrial automation, consumer electronics, and increasingly, advanced energy infrastructure. Recognising their strategic importance, India has launched initiatives such as the India Semiconductor Mission, semiconductor fabrication programmes, ATMP facilities, and the Electronics Components Manufacturing Scheme.

India's objective need not be to replicate the entire global semiconductor value chain. Greater value can be created by focusing on areas where competitive advantages are emerging, including chip design, packaging and testing, power semiconductors, compound semiconductors, advanced electronics manufacturing, and specialised materials and services. The direction of travel is already visible in the numbers: electronics exports reached US$38.6 billion in FY2024-25, up 32.6 per cent year on year, and grew a further 41.9 per cent to US$22.2 billion in the first half of FY2025-26, making India the world's third-largest smartphone exporter.[19,29]

The stated ambition is to raise annual electronics and semiconductor production from about US$330 billion today to US$500 billion by 2030, and to between US$5.3 trillion and US$8 trillion by 2047.[41] These capabilities matter equally to the energy transition, as renewable plants, battery installations and modern grids become more digitally managed and power-electronics intensive - which is precisely why the same investment can be sold into two markets rather than one.

Batteries and Power Electronics: The Common Choke Point

Among all shared capabilities, power electronics and the electrical equipment that surrounds them may represent India's largest and most immediate industrial opportunity. Whether powering a utility-scale battery project, a renewable-energy plant, an electric vehicle or a hyperscale AI campus, these are the systems that convert, regulate and manage electricity. The demand signal is unambiguous. The global transformer market is projected to grow from about US$65 billion in 2025 to roughly US$88 billion by 2030 and about US$132 billion by 2035, with India identified as the second-fastest-growing market.[37] India is already the world's tenth-largest exporter of electrical transformers, shipping US$3.33 billion in 2024, of which US$1.03 billion went to the United States, and Indian cable exports to the United States grew at a 44 per cent compound annual rate between FY2017 and FY2024.[29,30] Engineering exports as a whole reached a record US$116.67 billion in FY2024-25 against a stated target of US$300 billion by 2030.[30]

The constraint sits upstream. India consumes an estimated 400,000-450,000 tonnes of cold-rolled grain-oriented electrical steel a year, the irreplaceable magnetic core material in every transformer, while domestic production is only 40,000-50,000 tonnes - close to 90 per cent import dependence, with demand growing 10-12 per cent a year and meaningful new domestic capacity unlikely before FY2028.[34]

The same pattern holds in storage: against a 50 GWh target under the Advanced Chemistry Cell scheme, 40 GWh has been awarded but only about 1.4 GWh commissioned as of late 2025,[36] even as global battery demand is projected to reach 4.2 TWh by 2030 and 6.8 TWh by 2035, and the grid-scale storage market grows from roughly US$83 billion to about US$364 billion between 2025 and 2035.[38] India's transformer, motor and battery export potential is therefore capped less by assembly capacity than by access to electrical steel, cells, power devices and qualified components - which is where the next phase of industrial policy must concentrate.

Electrolysers and the Green-Molecule Opportunity

Electrolysers are to the green-hydrogen economy what semiconductors are to AI: the foundational



technology that determines where value is captured. India's National Green Hydrogen Mission, with an outlay of ₹19,744 crore, targets 5 MMTPA of green hydrogen by 2030, supported by about 125 GW of dedicated renewable capacity and more than ₹8 lakh crore of expected investment.[23] Globally, announced electrolyser capacity has risen to 230-520 GW by 2030, against only about 5 GW installed in 2024, while the electrolyser equipment market is projected to grow from roughly US$2 billion in 2025 to about US$14.5 billion by 2031.[12,39] Capturing this opportunity requires capability across stacks, membranes, catalysts, power electronics, compression, storage, pipelines, ports and downstream hydrogen, ammonia, methanol and sustainable fuels.

The immediate gap is upstream. Domestic value addition in alkaline and PEM electrolysers is about 36 per cent, but can rise to around 59 per cent by 2030 through indigenisation of stack components and balance of plant, especially bipolar plates, porous transport layers and membranes.[32] This would require roughly ₹8,400 crore of government support and ₹12,100 crore of capital investment, but could deliver import-bill savings of ₹9,000-27,000 crore, a domestic electrolyser market of up to ₹99,000 crore, exports of up to ₹20,000 crore a year and up to 92,000 direct jobs.[32,33] Green hydrogen and ammonia exports could add 0.6-1.8 MTPA by 2030 against global import demand of about 6 MTPA, making trade agreements and export corridors as important as manufacturing incentives.[12,33]

India's industrial policy has spent the past decade reducing import dependence and building domestic manufacturing depth. The next phase should add export competitiveness: not self-sufficiency in every technology, but leadership in fast-growing segments where India can build scale, integrate into global value chains and retain strategic domestic capabilities. This is the model India should apply to AI and clean-energy manufacturing.

Sizing the Opportunity: India's Energy-Infrastructure Exports to 2030, 2035 and 2047

The size of this third export pathway can be estimated from the top down. The addressable market is the traded portion of the world's energy-transition and AI-infrastructure equipment: an electrical equipment market of roughly US$1.75 trillion today rising to about US$2.34 trillion by 2030; grid investment doubling to more than US$600 billion a year by 2030; some US$4.4 trillion of global data centre spending on servers, chips and storage to 2030; and a battery market moving from 4.2 TWh in 2030 to 6.8 TWh in 2035.[4,10,11,37,38]

India's present position within that market is modest but no longer marginal. Engineering exports stood at a record US$116.67 billion in FY2024-25 and electronics exports at US$38.6 billion, but the specifically energy-transition slice - solar modules, wind components, transformers and power electronics, cables, switchgear, conductors, motors and generating sets, transmission structures, batteries and electrolysers - is estimated at closer to US$20 billion a year (report analysis, based on DGCI&S trade data).[19,29,30,42]

The three scenarios below - constrained, continued momentum and accelerated - differ not in India's resource endowment or its labour cost advantage, both of which are constant, but in whether the upstream and enabling gaps are closed. The decisive variables are electrical steel and cell availability, domestic value addition in strategic components, testing and certification throughput, and whether Indian products can be qualified quickly in overseas markets.

On a continued-momentum path, energy-transition infrastructure exports rise from about US$20 billion today to roughly US$50 billion a year by 2030, US$120 billion by 2035 and US$375 billion by 2047 - implying that India's share of global energy-transition equipment trade moves from under 2 per cent to roughly 8 per cent over two decades.

The spread between the scenarios is wide, and it widens with time. In a constrained outcome, where CRGO import dependence persists, cell commissioning continues to lag its targets, and localisation is confined to final assembly, exports reach only about US$30 billion by 2030 and US$150 billion by 2047. In an accelerated outcome, where electrical steel and cell capacity come online at scale, electrolyser domestic value addition reaches the assessed 59 per cent, and shared testing infrastructure shortens qualification cycles, exports could reach roughly US$75 billion by 2030 and US$650 billion by 2047. The gap between the constrained and accelerated paths in 2047 - ~US$500 billion a year - is larger than India's entire merchandise export base today, and it is determined almost entirely by decisions taken in the current decade.

Two further observations follow. First, the export opportunity is not evenly distributed across the value chain. Grid and power equipment offers the most immediate returns, because India already holds a position and the global market is supply constrained; AI and data centre hardware offers the largest long-run pool but requires semiconductor and packaging depth; green-molecule equipment is the smallest but fastest growing. Second, this pathway is what converts domestic overcapacity into an asset. India's solar module capacity has reached roughly 233 GW against factory utilisation of just 35-40 per cent, with a further 135 GW planned; domestic data centres, green hydrogen and exports together are expected to add only 17-22 GW of additional demand by 2030.[35] Exports are not a residual market for that capacity. They are the only market large enough to absorb it.

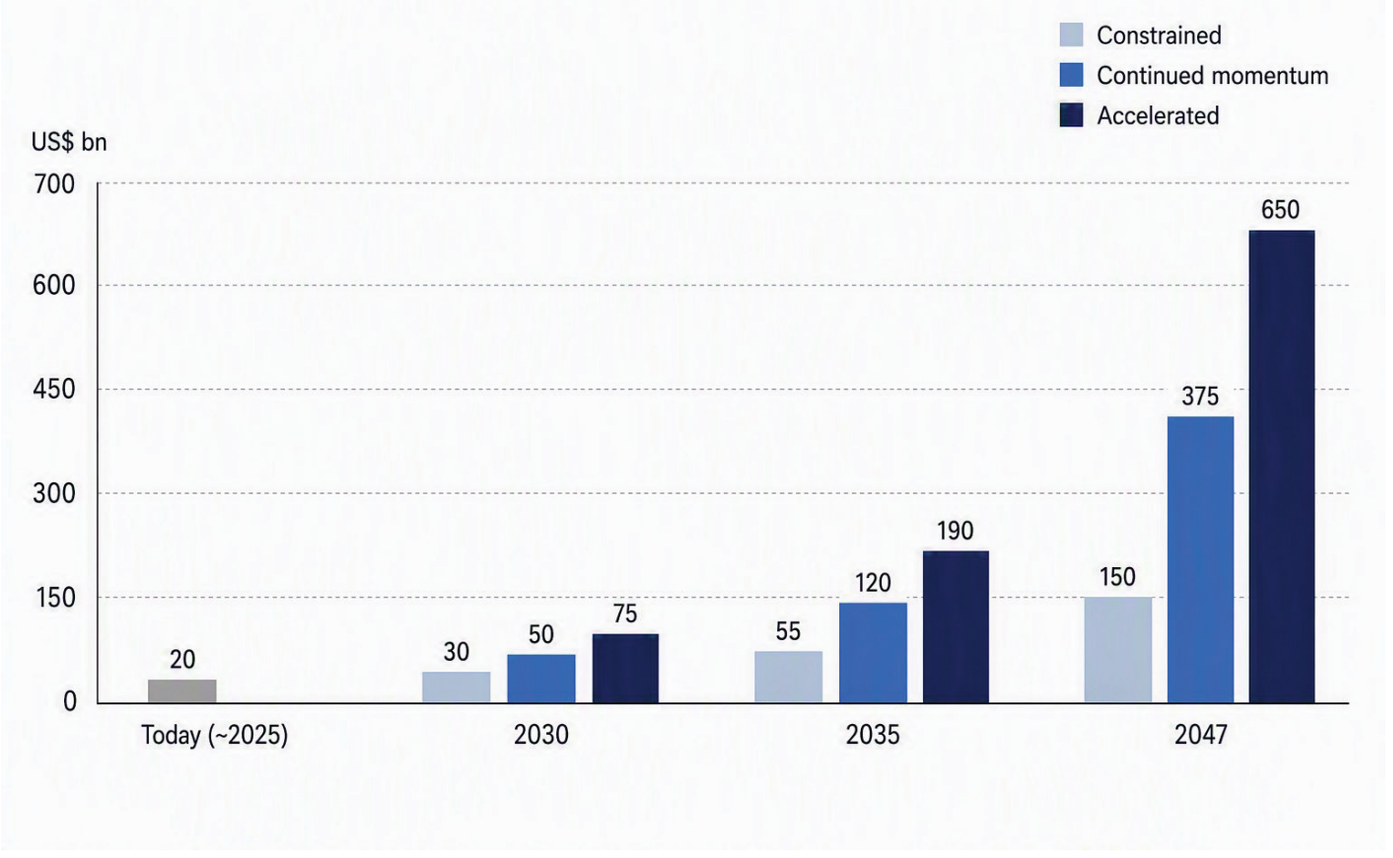


Table 4: India's Energy-Infrastructure Export Potential under Three Scenarios, 2030-2047

Indicator	Scenario	2030	2035	2047
Energy-transition infrastructure exports (US$ bn a year)	Constrained	28-32	50-60	140-160
	Continued momentum	45-55	110-130	350-400
	Accelerated	70-80	180-200	600-700
Share of global energy-transition equipment trade (%)	Continued momentum	~2.5-3%	~4-5%	~8%
Of which: grid and power equipment (US$ bn)	Continued momentum	~14	~32	~95
Of which: clean-energy equipment - solar, wind, batteries (US$ bn)	Continued momentum	~18	~40	~110
Of which: AI and data centre hardware (US$ bn)	Continued momentum	~12	~33	~130
Of which: green-molecule equipment - electrolysers and BoP (US$ bn)	Continued momentum	~6	~15	~40
Domestic value addition in electrolyser manufacturing (%)	Continued momentum	~59% (from 36% today)	~64%	75-80%
Direct manufacturing jobs in the shared industrial base (million)	Continued momentum	~1.5	~3.5	~9

*Source: Report analysis

India's Energy-Transition Infrastructure Exports under Three Scenarios, US$ Billion a Year



*Source: Report analysis



Lessons from Global Industrial Leaders

Across leading industrial economies, success has been driven not by individual factories but by the development of integrated industrial ecosystems. In the United States, semiconductor competitiveness is supported through a combination of manufacturing incentives, research and development, talent creation, and commercialisation. Japan has built domestic capabilities through long-term industrial partnerships while maintaining deep integration with global technology networks. South Korea and Taiwan have benefited from geographic clustering, dense supplier networks, and specialised manufacturing ecosystems centred on semiconductors and advanced electronics.

In China, long-term policy consistency, industrial scale and coordinated supply-chain development have produced leadership across solar, batteries and clean technologies, and roughly 60 per cent of global electrolyser manufacturing capacity. Singapore and Malaysia have linked advanced manufacturing, semiconductor packaging and digital infrastructure, while Saudi Arabia and the UAE are integrating clean energy, hydrogen, logistics, ports and industrial infrastructure into export-oriented ecosystems.

A smaller but instructive case is Belgium, where a single firm repurposed decades of roll-to-roll photographic film coating expertise, supported by an €11 million EU Innovation Fund grant, into a facility now producing a million square metres of electrolyser membrane a year - enough for 20 GW of alkaline electrolysers. The lesson is that adjacency, not greenfield ambition, is often the fastest route into a strategic component.

The common thread is that sustainable industrial leadership emerges from interconnected ecosystems, secure supply chains, skilled talent and long-term strategic coordination rather than isolated investments. India has the demand, the policy architecture and increasingly the scale. What it has not yet built is depth in the upstream inputs, shared testing and qualification infrastructure, and export-facing commercial machinery that would move it from the constrained to the accelerated path. That is the purpose of the three recommendations that follow.

Three Strategic Recommendations for Pillar II

Recommendation 1: Launch an AI and Clean-Energy Manufacturing Mission

India should launch an AI and Clean-Energy Manufacturing Mission to coordinate the shared technologies, equipment, and materials required by AI infrastructure and clean-energy systems. Rather than introducing another standalone subsidy framework, the mission should apply a common industrial-capability lens across existing programmes, including the I**ndia Semiconductor Mission and Semicon 2.0, Electronics Components Manufacturing Scheme, Solar PV Module PLI, ALMM, ACC Battery PLI, National Green Hydrogen Mission, National Critical Mineral Mission**, and relevant programmes for telecom, electronics, and grid equipment.

The mission should be jointly steered by **DPIIT and NITI Aayog**, with MeitY, MNRE, the Ministry of Power, Ministry of Heavy Industries, Ministry of Steel, and Ministry of Mines. It should focus on power semiconductors, advanced packaging, servers, networking equipment, batteries, electrolysers, power electronics, transformers, switchgear, cables, and grid-management technologies. The mission should include the following steps:

1. **Publish an annual consolidated equipment-demand outlook** covering forecast requirements from data centres, transmission expansion, renewable energy, battery storage, and green hydrogen. Demand for transformers, Cold Rolled Grain Oriented (CRGO) electrical steel, switchgear, cables, power electronics, cells, and related equipment should be expressed in physical units and linked to credible project pipelines.
2. **Establish a standing inter-ministerial scheme review** to map existing manufacturing programmes against shared capabilities. The schemes need not be merged, but future tranches should address gaps in components, materials, manufacturing equipment, and process capabilities rather than supporting final assembly alone.
3. **Launch a national power-electronics programme** spanning semiconductor devices, advanced packaging, converters, inverters, power conversion systems, and UPS equipment. This should connect compound-semiconductor and packaging capacity

supported under Semicon 2.0 with downstream products used across data centres, storage systems, renewable plants, and electricity grids.

4. **Develop a phased CRGO localisation roadmap** aligned with transmission and transformer demand. Trade measures, BIS requirements, domestic production milestones, and long-term offtake arrangements should be sequenced carefully so that localisation strengthens supply security without constraining transformer availability.
5. **Deepen selected upstream capabilities** in battery materials, polysilicon, specialty gases, catalysts, membranes, critical minerals, and manufacturing equipment. Domestic production should be prioritised where combined demand and processing feasibility justify scale, while diversified international sourcing should continue where localisation is not yet commercially viable.

Pathways addressed: Pathway 3 - Energy-Transition Infrastructure (enabling Pathways 1 and 2)

Action horizon: 0–3 years

Outcome horizon: 3–7 years

Recommendation 2: Build Anchor Demand, Skills, Testing and Supplier Ecosystems

India should complement manufacturing incentives with the enabling ecosystem required to translate investment announcements into globally competitive operating capacity. This should bring together **public procurement, testing and certification, shared R&D, skills development, supplier upgrading, and technology demonstration**. Existing platforms such as Skill India, PMKVY, the National Apprenticeship Promotion Scheme, IndiaAI Centres of Excellence, CPRI facilities, semiconductor research initiatives, and sector skill councils should be aligned around the shared industrial base. Implementation should include the following steps:

1. **Use public and regulated procurement as an anchor market.** CTUIL, STUs, DISCOMs, SECI, public data infrastructure, IndiaAI compute facilities, and government-supported storage and renewable projects could adopt multi-year procurement frameworks with standardised specifications for transformers, substations, storage systems, power electronics, and other strategic equipment.
2. **Provide predictable localisation pathways.** Domestic value-addition requirements should increase through a published and realistic schedule, remain consistent with India's trade commitments, and reward genuine manufacturing capability rather than basic assembly.
3. **Expand shared testing and certification infrastructure** for high-voltage transformers, battery cells and systems, power-electronics reliability, semiconductors, electrolysers, AI hardware, and grid equipment. CPRI, BIS, MeitY, MNRE, and the India Semiconductor Mission should jointly develop facilities that qualify products for multiple end uses.
4. **Locate testing and demonstration facilities near the Clean Compute and Industry Clusters proposed under Pillar I.** Co-location would reduce qualification times, connect manufacturers with anchor customers, and allow shared infrastructure to support grid, storage, data centre, and hydrogen applications.
5. **Create a joint skills map and qualification framework** covering cleanroom operations, thermal and vacuum processing, metrology, power-



electronics design, industrial automation, battery and electrolyser manufacturing, and high-voltage testing. MSDE, MeitY, MNRE, and the relevant sector skill councils should develop common modules that allow workers to move across industries.

6. **Establish supplier-development platforms** linking MSMEs and start-ups with semiconductor fabs, ATMP and OSAT facilities, battery manufacturers, renewable-energy developers, utilities, data centre operators, and electrolyser producers. These platforms should provide access to shared R&D, prototyping, testing, quality-improvement support, and long-term procurement opportunities.

Pathways addressed: Pathway 3 - Energy-Transition Infrastructure (supporting Pathways 1 and 2)

Action horizon: 0–3 years

Outcome horizon: 2–6 years

Recommendation 3: Create an India-Led Export Platform for Compute, Clean Tech and Green Molecules

India should convert the capabilities created for its domestic AI and clean-energy build-out into an integrated **export platform** covering green compute, semiconductor services, power and grid equipment, storage systems, green hydrogen, green ammonia, and engineering expertise. This platform should converge **Make in India, Digital India, the IndiaAI Mission, National Green Hydrogen Mission, National Logistics Policy, export-promotion programmes, EXIM Bank financing, Invest India facilitation**, and India's trade and investment partnerships. Priority markets should include **Southeast Asia, South Asia, Africa, the Middle East, and Latin America**, where demand for data centres, reliable grids, renewable energy, storage, and industrial decarbonisation is expected to grow. It can pursued along the following steps:

1. **Develop integrated export propositions** combining Indian equipment, engineering, project development, financing, digital services, and operational expertise. These could cover complete data centre power systems, renewable-plus-storage solutions, transmission packages, and green-hydrogen or ammonia projects.
2. **Structure bilateral industrial partnerships** around shared supply-chain requirements. Partnerships with Japan and other technology leaders should combine technology transfer, critical inputs, joint ventures, equipment manufacturing, R&D, testing, and talent development across semiconductors, electrical steel, power electronics, batteries, and hydrogen technologies.
3. **Align products with international standards and certification requirements** so that Indian transformers, batteries, electrolysers, power electronics, and grid equipment can qualify more quickly in overseas markets.
4. **Strengthen export finance and risk mitigation** through EXIM Bank credit, project-finance facilities, guarantees, and buyer-credit mechanisms for Indian companies delivering digital and clean-energy infrastructure abroad.
5. **Explicitly include clean compute, grid technologies, storage, power electronics, and green molecules in trade and investment agreements**, supported by targeted market development and investment facilitation.

Pathways addressed: Pathways 1, 2 and 3 - Green Compute, Green Molecules and Energy-Transition Infrastructure.



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Disclaimer & Acknowledgements

The views expressed in this report are those of the authors and do not necessarily reflect the views and policies of ReNew.

Guidance from **Vaishali Nigam Sinha** is acknowledged as instrumental in the making of this report. The support and collective efforts of **Udit Mathur, Harshit Mittal** and **Shireen Bhariok** are recognized for bringing this policy brief to life. Through their dedication and insights, the narrative is shaped- transforming a compilation of facts and figures into a policy report that charts how India powers the global AI economy by not merely participating in but helping build it. Contributions by **Vinay Mehra** are appreciated for steering the design of the brief, enhancing its impact and accessibility.



ReNew's state of the art RPDC facility at Gurugram


RPDC
ReNew's
Power Diagnostics Centre
SOLAR | CBMC OVERVIEW
811
88%
99%
100%
Unified SCADA
WWIL Windfarm Monitoring
11:54

ReNew

ReNew is a leading decarbonisation solutions company listed on Nasdaq (Nasdaq: RNW, RNWWW). ReNew's clean energy portfolio of ~20.0 GW (including 1.7 GW of BESS) on a gross basis as of March 31, 2026, is one of the largest globally. In addition to being a major independent power producer in India, ReNew provides end-to-end solutions in a just and inclusive manner in the areas of clean energy, value-added energy offerings through digitalisation, storage, and carbon markets that are increasingly integral to addressing climate change. In addition, ReNew has 6.5 GW of solar module and 2.5 GW of solar cell manufacturing capacity and is expanding its solar cell manufacturing by 4 GW.

ReNew stepped into its 15th year of operations in 2025, marking a significant milestone in its journey toward sustainable energy leadership. ReNew's MSCI rating is 'AAA', placing the company among the Industry Leaders category. ReNew achieved an 'A' rating in the CDP Climate Change assessment for 2024-25, placing it in the top 4% globally. The company was also included in S&P Global's Sustainability Yearbook 2025-the only Indian company in the electric utility sector to feature on this list.

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