

Government of Rajasthan  
Energy Department

# **Rajasthan Energy Policy 2050 (Draft)**

Version: August 2023

(Comments on the draft policy are invited by the public and all stakeholders. The same should be submitted on the email id - [urjaniti.2050@gmail.com](mailto:urjaniti.2050@gmail.com) by 6 September 2023)

# Contents

I. Shaping Rajasthan’s clean energy transition.....	3
II. Vision and objectives of the Energy Policy 2050 .....	6
III. Sectoral transition pathways.....	11
1. Power.....	11
2. Natural gas and refined liquids.....	19
3. Industry.....	23
4. Transport .....	26
5. Buildings .....	28
6. Agriculture .....	32
IV. Transition enablers: The four Ms .....	35
1. Money   Mobilising sustainable finance .....	35
2. Manpower   Skilling and training of youth .....	36
3. Machinery   Strengthening the clean energy R&D and manufacturing infrastructure .....	37
4. Materials   Building a circular economy ecosystem for energy technologies and products .....	38
V. References.....	40

# I. Shaping Rajasthan’s clean energy transition

**Improving access to energy has fuelled socio-economic growth in Rajasthan.** Rajasthan’s economy (gross state domestic product (GSDP) has grown at a compound annual growth rate (CAGR) of 9.68% between the fiscal year 2011–12 (FY12) and FY20. Power availability has been a key catalyst in fuelling economic growth, with electricity supply growing at a CAGR of 5.66% during the same period (1). As a result, the per-capita power availability in the state touched 1,241 kWh in FY21, a 72% increase over 721 kWh in FY12 (2).

**Figure 1: Rajasthan’s economy and energy sector at a glance**

<p><b>A booming economy</b></p> <p>GSDP of INR 11.96 lakh crore (USD 152 million) at current prices 5.15% share in India’s GDP 7<sup>th</sup> largest state economy</p>	<p><b>A growing workforce</b></p> <p>Population – 7.92 crore in FY 2021 projected Workforce – 43.6% (2011 Census)</p>	<p><b>Diverse economic sectors</b></p> <table border="0"> <tr> <td>Agriculture</td> <td>30.23%</td> </tr> <tr> <td>Industry</td> <td>24.67%</td> </tr> <tr> <td>Services</td> <td>45.10%</td> </tr> </table>	Agriculture	30.23%	Industry	24.67%	Services	45.10%
Agriculture	30.23%							
Industry	24.67%							
Services	45.10%							
<p><b>A growing energy sector catalysing economic growth</b></p> <p>Energy intensity of the state economy is 6.61 MJ per dollar of the GDP</p> <p><b>The current energy portfolio is carbon intensive (FY 20)</b></p> <p>Electricity – 29% (70% from coal) Refined liquids – 37% Coal – 16% Gas – 8% Traditional biomass – 10%</p>	<p><b>High potential of renewable energy in the state</b></p> <p>High average solar insolation of 5.2 to 5.7 kWh/sq. m/day across districts<sup>a</sup></p> <p>Abundant usable wasteland – 41,949 sq. km (3) (12% of Rajasthan’s total geographical area and 7.5% of India’s total wasteland area)</p>	<p><b>High renewable energy capacity</b></p> <p>17.18 GW grid-connected solar capacity (25% of India’s total installed solar capacity – highest among states)</p> <p>5.19 GW installed wind capacity (12% of India’s installed wind capacity)</p> <p>(as of March 2023)</p>						

Sources: (1,3–7)

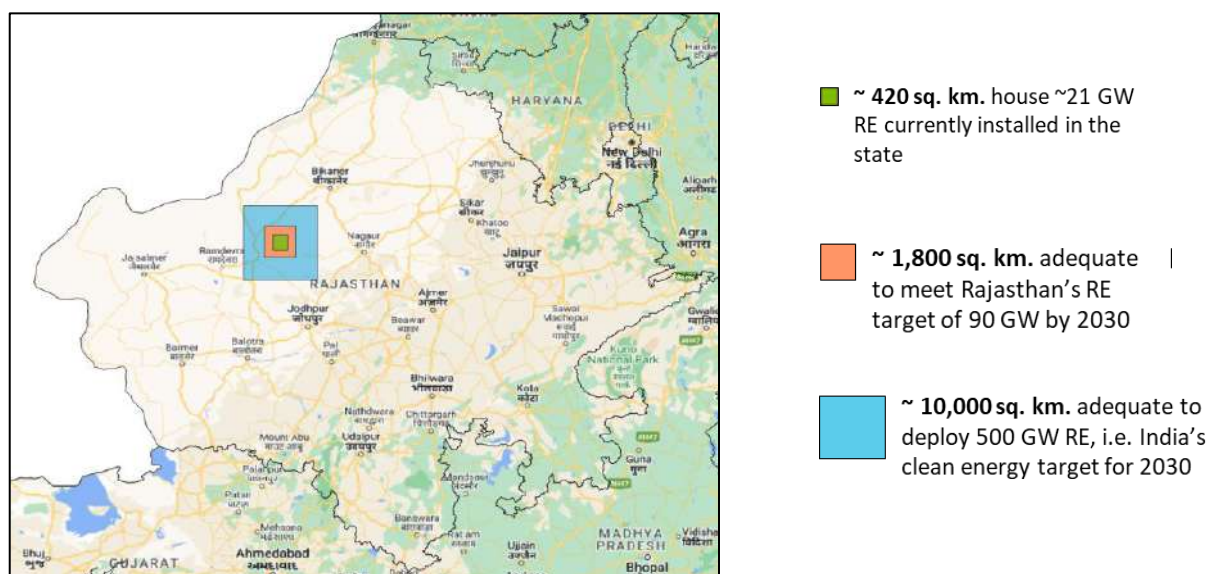
**Going forward, Rajasthan aims to strategically pivot to a development pathway that provides a better future to its people** in terms of development that translates to more jobs, a cleaner environment, and an improved quality of life in the form of access to quality education, healthcare, housing, and infrastructure; development that is participative, empowers citizens, and enhances individual capability and agency; development that is aligned with the national vision of building a clean and sustainable economy; development that is resilient to diverse disruptions and risks, be that of energy supply and price shocks, supply-chain disruptions, or cyber threats.

<sup>a</sup> Analysis using System Advisory Model (SAM).

Rajasthan is well-positioned to pursue a sustainable development pathway given the abundance of renewable energy and wasteland available within the state. The state is blessed with high solar insolation levels of 5.2 to 5.7 KWh/sq. m./day, with maximum levels observed in the western parts.<sup>b</sup> In fact, the four western districts – Barmer, Bikaner, Jaisalmer and Jodhpur – account for nearly half of the 41,949 sq. km. total wasteland area suitable for renewables deployment (8).<sup>c</sup> As Figure 2 shows, just a fraction (0.5 per cent) of state’s land area will be adequate to achieve the 90 GW target by 2030 towards meeting the state’s own electricity requirement and export to other states.

As a result, Rajasthan is the home to some of India’s cheapest renewable electricity. Between November 2020 and December 2021, the weighted average tariffs of solar PV projects awarded in the state ranged from INR 2.00 to 2.25 per unit (9). The state’s wind-power potential is also high. According to India’s latest wind atlas at 150 m, Rajasthan can deploy 284 GW of wind capacity, of which 45 GW can be developed in high wind-speed sites with a capacity factor between 30-32%.

**Figure 2: Rajasthan is well-endowed with renewable energy resources and land to meet ambitious clean energy targets**



Source: Analysis using India wasteland atlas 2019 and the System Advisory Model (SAM)

Note: Calculations assume land requirement of 20 sq. km. for 1 GW of RE capacity to be deployed.

In line with Rajasthan’s growth and development aspirations, the primary energy demand is expected to more than triple by 2050 (14). The abundant renewable energy potential equips Rajasthan to meet its

<sup>b</sup> National Solar Radiation Database (NSRDB), Typical Meteorological Year data, System Advisor Model, Last accessed on 28th November 2022, available online at - <https://nsrdb.nrel.gov/data-viewer>

<sup>c</sup> 5 out of 23 wasteland categories as per India Wasteland Atlas 2019 considered suitable for solar deployment: (i) Land with Dense Scrub, (ii) Land with Open Scrub, (iii) Land affected by salinity/alkalinity (Medium), (iv) Land affected by salinity/alkalinity (Strong), (v) Sands-Desertic and Barren Rocky/Stony wasteland

future demand through cost-effective clean energy. Accordingly, the state's energy sector needs to evolve to provide a secure, clean, affordable, and reliable energy supply while being resilient to diverse exogenous factors. This needs a bold vision and leadership, a problem-solving approach, and an amalgamation of technology, finance, and institutions. The future energy system will look very different from today: a system that is decarbonised, decentralised yet integrated, market-driven, and technology-enabled.

**The Energy Policy 2050 aims to guide the state's transition to a secure and clean energy future.** The Government of Rajasthan has envisioned the Energy Policy 2050 to set out a clear, comprehensive, and long-term vision for the state's energy-sector transformation. First of its kind in the country, the Energy Policy 2050 is a powerful tool that is designed to:

- anticipate the changes that the energy sector is bound to go through,
- acknowledge the risks and opportunities that this transition entails, and
- guide capacity development and decision-making across the energy-sector value chain to mitigate the risks and unlock the massive opportunities that the transition presents.

This integrated document intends to provide policy clarity and coherence and the much-needed alignment in the roles and responsibilities of actors as they spearhead the energy transition. The policy also aims to provide a clear and strong signal to investors regarding the state's vision for growth and attract investment in sunrise sectors focused on sustainability. Further, it will bring new sectors into the integrated vision, such as the clean energy prospects in the industry, transport, buildings and agriculture sectors, and ensure that they receive adequate policy attention. Lastly, it aims to guide state policymakers to develop specific programmes, schemes, and frameworks that will take the state closer to Vision 2050.

**In drafting the Energy Policy 2050, the state leveraged the diverse and rich experiences of all key stakeholders.** Six sectoral sub-groups on power, natural gas and refined liquids, industry, transport, buildings, and agriculture, comprising government and external experts deliberated on sectoral vision, milestones and critical levers for change required to achieve the 2050 Vision. The state undertook a scientific and rigorous energy-modelling exercise to inform the 2050 Vision and set the goals under this policy. The modelling exercise was conducted using the Global Change Analysis Model (GCAM), an energy sector-focused model used extensively for energy and climate policy analysis (details covered in Annexure I). With this stakeholder-driven process, it was possible to bolster the vision and articulate measurable goals and targets in the near term and guideposts for the longer term that will inform the actions of the government, regulators, private-sector players, and consumers.

## II. Vision and objectives of the Energy Policy 2050

The Energy Policy 2050 envisions:

**‘A low-carbon, integrated, and resilient energy system to provide secure, reliable, affordable, and clean energy for inclusive and sustainable development of Rajasthan’**

The proposed vision encapsulates the key goals of the energy sector, which is to support the sustainable and inclusive development of the state by ensuring the security and reliability of energy supply, shifting to clean and efficient energy sources and technologies, and cost-effectively providing affordable energy services to people, institutions, and businesses. The policy aims to pursue these goals by transitioning to a low-carbon, integrated, and resilient energy system by 2050.

- **Low-carbon:** Decarbonising the state’s energy mix would be central to achieving multiple energy policy goals. Rajasthan is endowed with abundant renewable energy and low-carbon resources, along with vast wasteland areas. Tapping these locally available resources and using them efficiently would help not only the state but also the country in reducing dependence on imported energy fuels and strengthening the security and affordability of energy supply. With factors favouring cost-effective renewable energy (RE) deployment in the state, an accelerated shift away from fossil fuels assumes importance. This shift will also help mitigate the state’s carbon emissions and alleviate the associated environmental, public health, and climate risks. For instance, as per the climate vulnerability index, Rajasthan is the seventh most-vulnerable state in India, with 90 per cent of districts exposed to drought risks (10). Similarly, the state also has five non-attainment cities with lower-than-prescribed air-quality parameters (11). The energy policy would drive the transition to a low-carbon energy system by unlocking new energy technologies and finance.
- **Integrated:** The future energy system will comprise a multitude of decentralised energy-generation and -consumption technologies along with a high share of variable RE. An integrated energy system with greater coordination across different energy production, delivery, and demand centres at the local, state, and national levels will be essential to meet the Energy Policy 2050 goals in a cost-effective and resource-efficient manner. The digitalisation of energy systems and recalibration of institutions and market structures would underpin this transition.
- **Resilient:** The pathway to a clean energy future will also be subject to rising risks and uncertainties. Risks may be financial (of stranded assets, price fluctuations, and payment defaults), supply chain-related (geopolitical headwinds restricting movement and trade of minerals, machinery, and fuels), or

those caused by rising digitalisation (cyber-security threats), social inequity, and global warming. Pre-empting and preparing for such risks through long-term planning and a systemic implementation approach will be critical to building a resilient energy system.

Realising the Energy Policy 2050 vision and goals will need an integrated transition approach for all key supply and demand sectors. Section III presents these sectoral transition pathways comprising near-term and long-term sectoral targets and levers for change. The drafting of these transition pathways has benefitted from stakeholder consultation and a long-term modelling exercise. It will be equally important to unlock the four key enablers of sectoral transitions – money, manpower, machinery, and materials – as discussed in section IV.

Overall, the policy proposes 2 economy-wide and 14 sectoral milestones to be achieved by 2050.

### ***Economy-wide milestones 2050***

1. 60% reduction in energy intensity of the state's economy over 2020 levels.
2. 700 million tonnes reduction in total projected carbon emissions during 2020–50.

### ***Key sectoral milestones 2050***

#### Power

- Non-fossil energy sources comprise 70% of electricity generation, up from 20% in 2020.
- Sub-10% aggregate technical and commercial losses in the distribution sector, down from 26.22% in 2020.

#### Natural gas and refined liquids

- Double the share of natural gas in final energy use from 2020 levels

#### Transport

- Maintain a healthy modal share (at least 25%) of non-motorised and public transport.
- More than 80% share of electric vehicles in new vehicle registrations (2-W, 3-W, and 4-W).
- Universal electrification of passenger buses and taxi fleets.

#### Industry

- 50% share of grid electricity in the industrial energy mix, up from 32% in 2020.
- Achieve global best benchmarks in energy efficiency in key sectors like cement, lime, and textile, among others.
- Act as a hub for green hydrogen (GH<sub>2</sub>) production in India and cater to demand from other states.

## Buildings

- 100% of the new building stock is covered by and compliant with the prevailing minimum standards of energy efficiency and thermal comfort.
- 50% of new and Energy Conservation Building Code (ECBC)-eligible buildings compliant with ECBC+ or its equivalent standard.
- Increase the stock of net-zero energy commercial and residential buildings.
- Ensure that urban forests and green spaces are above the prevailing global benchmark of green space per city dweller.

## Agriculture

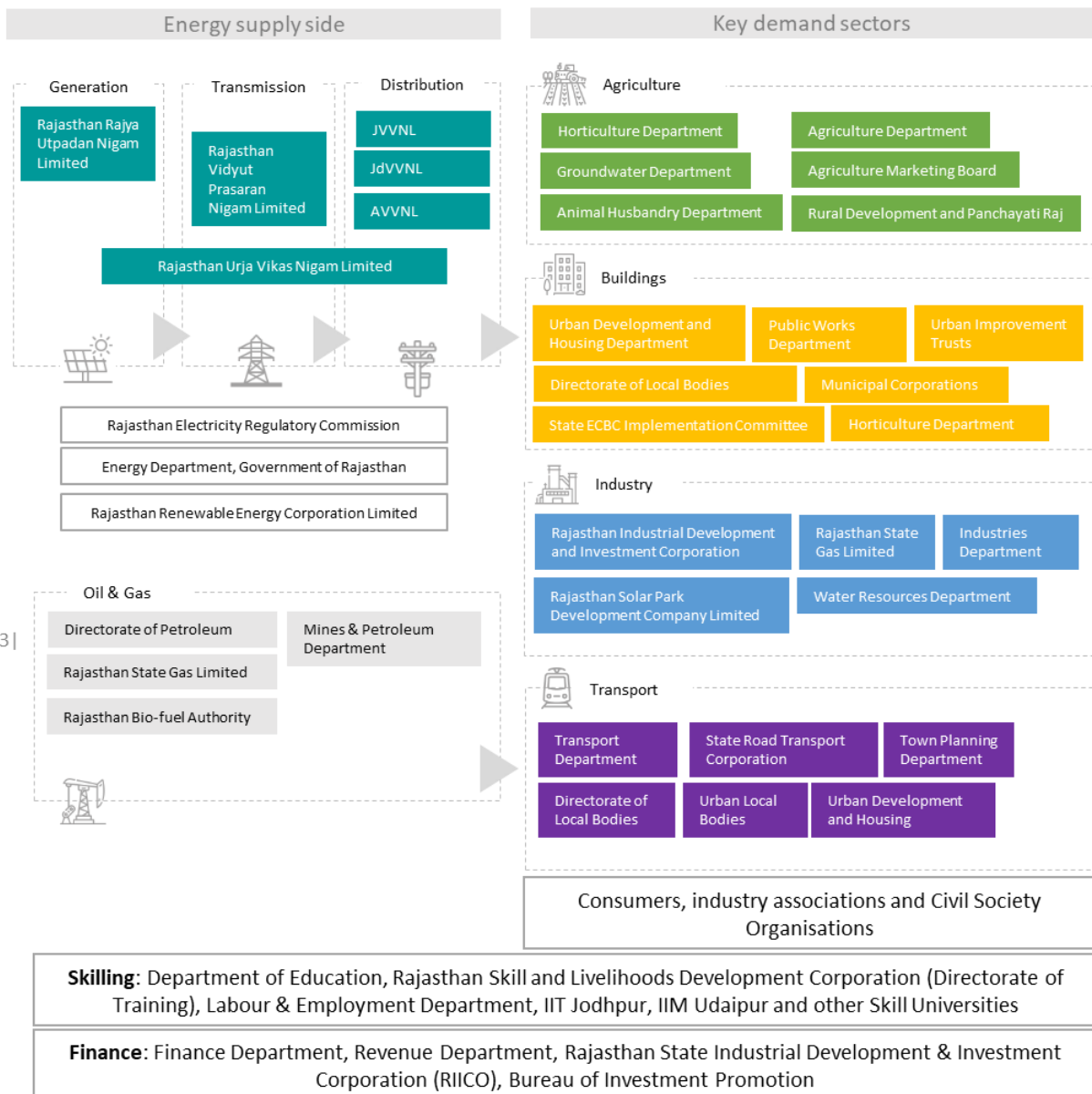
- 75% of the agriculture power demand to be met by renewable sources (grid and off-grid).
- On-farm irrigation efficiency increases to 70%, up from the current 27% level.

Attaining these milestones will need close coordination and collaboration between all public and private institutions, associations, and actors, as illustrated in Figure 3. An 'Energy Transition Committee' chaired by the chief secretary and comprising secretaries from all relevant departments as members would steer the implementation of the Energy Policy 2050.



**Figure 3: Key actors in meeting the goals of the Rajasthan Energy Policy 2050**

**Key actors in realising Rajasthan’s Energy Policy 2050**



## **Energy Policy 2050 aims to fuel jobs, inclusive growth, and sustainable development**

The Energy Policy 2050 establishes the intent of the state to drive growth and employment through multiple transitions. These include transitions to sustained energy access, clean electricity sources, modern energy services, efficient homes and commercial spaces, sustainable mobility, sustainable agricultural practices, and most importantly, to enhance the state's role and influence in national and global energy markets. All these transitions have the potential to shape a citizen-centric future with quality jobs, thriving businesses, and resilient livelihoods, as illustrated here:

- Deployment of a total of 90 GW solar and wind capacity by 2030 will employ a workforce of 110,000 people with varying skill requirements for business development, project design, construction and commissioning, and operations and maintenance (12).<sup>d</sup>
- Public transport systems will employ many workers in infrastructure creation, operations, and maintenance, and provide better market linkages to rural and urban businesses.
- Managing the water–energy–food nexus will create manufacturers, suppliers, and installers of micro-irrigation systems and solar pumps.
- Use of decentralised renewables will power rural enterprises, enable the rise of women entrepreneurs, and lead to the education and wellness of the younger generations.
- Sustainable cooling solutions would help farmers prosper by increasing the shelf-life of their produce and boosting incomes.
- A multi-fold increase in jobs is possible in the servicing of clean energy technologies, products, and energy-efficient appliances.

**Through this policy, the state aims to start its journey towards becoming a net-zero economy.** In this journey, it will utilise all the aforementioned opportunities and exponentially more to deliver on its vision for inclusive and sustainable growth.

---

<sup>d</sup> Employment potential estimated assuming (i) 75 GW solar and 15 GW wind deployment, (ii) a 10% share of decentralised solar in total solar capacity, and (iii) suitable employment factors for utility-scale PV, onshore wind, and rooftop solar.