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# STRENGTHENING INDIA'S RENEWABLE ENERGY DEVELOPMENT AGENCIES

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| | |
|---|---|
| AREAS | Association of Renewable Energy Agencies of States |
| BEE | Bureau of Energy Efficiency |
| BREDA | Bihar Renewable Energy Development Agency |
| DDUGJY | Deen Dayal Upadhyaya Gram Jyoti Yojana |
| DRE | Distributed Renewable Energy |
| EV | Electric Vehicle |
| GEDA | Gujarat Energy Development Agency |
| GRIDCO | Grid Corporation of Odisha |
| GUVNL | Gujarat Urja Vikas Nigam Limited |
| GW | Giga Watt |
| JREDA | Jharkhand Renewable Energy Development Agency |
| KREDL | Karnataka Renewable Energy Development Limited |
| KREDA | Kargil Renewable Energy Development Agency |
| KSPDCL | Karnataka Solar Park Development Corporation Limited |
| MNRE | Ministry of New and Renewable Energy |
| MoP | Ministry of Power |
| NBMMP | National Biogas and Manure Management Programme |
| NHPC | National Hydro Power Corporation |
| NISE | National Institute of Solar Energy |
| NIWE | National Institute of Wind Energy |
| NOC | No Objection Certificate |
| NTPC | National Thermal Power Corporation |
| O&M | Operations and Maintenance |
| PM-KUSUM | Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan |
| PMU | Project Management Unit |
| RE | Renewable Energy |
| REIA | Renewable Energy Implementing Agency |
| RfP | Request for Proposal |
| RSDCL | Rajasthan Solar Park Development Corporation Limited |
| REDA | Renewable Energy Development Agency |
| RPO | Renewable Purchase Obligation |
| SECI | Solar Energy Corporation of India |
| SERC | State Electricity Regulation Commission |
| SNA | State Nodal Agency |
| SPV | Solar Photovoltaic |
| TEDA | Tamil Nadu Energy Development Agency |
| TSREDCO | Telangana State Renewable Energy Development Corporation |
| UREDA | Uttarakhand Renewable Energy Development Agency |

# Executive summary

**The next** phase of India's renewable energy (RE) growth must be defined by new trends and technologies, given the magnitude of the country's climate action commitments over the immediate and long term. Not only is the pace of growth required to be accelerated significantly, but new forms of clean energy technologies (besides solar) are also required to play a prominent role. States and state-level agencies will be vital in enabling and facilitating this transition.

Currently, only a limited number of states are actively contributing to the country's RE growth. Seven states collectively account for 84 per cent of the 144.75 GW of RE capacity (non-hydro) installed in the country as of April 2024. Rajasthan, Gujarat, Tamil Nadu and Karnataka are the most significant contributors with respective shares of 19 per cent, 18 per cent, 14 per cent and 13 per cent, followed by Maharashtra, Andhra Pradesh and Madhya Pradesh with 10 per cent to 5 per cent share each. Meanwhile, the RE sector growth in the other states remains largely muted.

The concentration of RE capacities in a handful of states is concerning and requires course correction. Achieving the national net zero ambitions requires installing 2,500 GW to 3,000 GW of RE capacity across the country, which would need contributions from all states. Further, the current growth pattern is unsustainable due to the massive investments in transmission infrastructure needed to connect high- and low-RE regions. Given the modular nature of RE and the adequacy of RE potential across the country, the transmission investments and losses can be minimized.

From the perspective of low RE states, this growth disparity significantly impacts their energy security, considering the substantially increased Renewable Purchase Obligation (RPO) trajectory. Finally, there are serious energy transition-related concerns for low-RE states as green growth and green industry are seen to be following regions where RE capacity is being set up.

This lopsided growth pattern can be partly rectified through revision in central policies and support schemes; however, the states must take the lead in this context. States are in the best position to assess their respective strengths, understand specific constraints, and identify policy and implementation-level solutions to create a conducive ecosystem for investments. The capacity and capability of state-level institutions need to be adequately built to roll out this responsibility.

Under the current institutional set-up at the state level, this role has been assigned to renewable energy development agencies (REDAs). However, their limited institutional capacity and organisational vision have emerged as a major bottleneck. So much so that, in some of the states that are making earnest attempts at stimulating RE growth (like Odisha and Assam), the responsibility of fostering RE growth has been assigned to other state utilities.

The institutional strength of a REDA is, therefore, fundamental for state action. While state-level policies can equip REDAs with the necessary tools for investment facilitation, implementation efficiency can only be ensured by a strong institution. This is evidenced by the fact that states have failed to meet RE goals despite excellent and detailed policy declarations due to their nodal agencies' limited capacity or capability (such as in Jharkhand). At the same time, some states have excelled in RE deployments despite minimal policy declarations due to the proactive role played by REDAs (such as in Chhattisgarh).

At present, REDAs exist across two types of institutional structures – centralised institutions with strong head offices (often corporatised) in states focusing on utility-scale RE projects and decentralised institutions (mostly societies) with prominent district-level presence, which are more suited for supporting DRE deployments. However, even within the two structures, there are wide variations across REDAs, both in terms of the responsibilities assigned to them and their institutional capacity to deliver on the assigned tasks.

The present study has been designed to understand the differentiating factors among REDAs operating in high- and low-RE states and identify potential success factors. This study aims to provide insights into the institutional structure for implementing RE growth at the state level.

For this, a total of eight REDAs have been identified and studied. The five REDAs are from leading states, including Rajasthan Renewable Energy Corporation Limited (RRECL), Karnataka Renewable Energy Development Limited (KREDL), Maharashtra Energy Development Agency (MEDA), Telangana State Renewable Energy Development Corporation Limited (TSREDCO) and Chhattisgarh State Renewable Energy Development Agency (CREDA). Meanwhile, the remaining three REDAs are from low RE states, including Jharkhand Renewable Energy Development Agency (JREDA), West Bengal Renewable Energy Development Agency (WBREDA) and Odisha Renewable Energy Development Agency (OREDA).

The inquiry focused on mapping the role of these institutions in enabling the RE growth in their respective states and their institutional capacity. This entailed collecting primary data and supporting documents from REDAs and referring to secondary sources like state government reports and news articles. In addition, inputs were collected during a high-level meeting of representatives from REDAs of eight states held in Bhubaneswar in August 2023.

The key findings and recommendations from the study are summarised below across critical themes of expanding traditional roles and building institutional capacity:

## A. Expanding the traditional role to focus on facilitating RE investments:

The traditional set of responsibilities of REDAs were largely limited, setting up pilot and demonstration projects for new and innovative DRE applications, and ensuring effective implementation of central and state DRE schemes. While these responsibilities remain relevant, the focus of REDA operations now need to be on creating an enabling ecosystem for sustainable investments, both for utility-scale projects and for DRE deployments. REDAs must, thus emerge, as anchors for RE growth at the state level.

Key elements of a REDA's transformation into an ecosystem enabler are identified below:

- Identifying RE investment opportunities in the state, across utility-scale and DRE domains, through field studies.
- Building the investment case for RE projects through a comprehensive set of activities – developing suitable business models, engaging with decision-makers to create a conducive policy, regulatory and incentive environment, implementing pilots for new technologies or business models, coordinate with relevant stakeholders including Renewable Energy Implementing Agencies (REIAs), and funding agencies.
- Creating ease of investment to developers by support in identification of land parcels/sites for project development, facilitating developers in securing the required approvals, and planning for and ensuring development of the required support infrastructure.
- Nurturing the vendor/ developer ecosystem through structured and sustained engagement.
- Identifying and fostering new avenues of growth through collaborations in technology and policy tools.

## B. Building institutional capacity and capabilities of REDAs to deliver on the identified roles and responsibilities.

As evidenced by sectoral growth trends, most REDAs in the country have achieved limited success in delivering even traditional roles due to institutional capacity gaps. Typically, REDAs in leading states have specialized in key RE domains and have developed greater capacity as measured across four domains of organizational structure (governance and systems and structures), human resources, finances and asset/programme management.

The key best practices emerging from the mapping exercise are summarized as follows:

- A strong and dedicated leadership is crucial. Heading a REDA should not be viewed as an 'additional appointment' but as a core responsibility. The REDAs' CEO/MD must be given adequate autonomy to innovate and act on time.
- The board of directors/trustees of REDAs must be strengthened through representation of a mix of relevant stakeholders (from agencies that have a bearing on RE growth). There should be set practices of regular board review of performance.
- Divisional clarity and target setting is important. A logical division of verticals can be based on RE technologies, given the dedicated and customized attention needed for each. There should be clarity with respect to task allocations for each division, followed by structured review processes.
- Adequate staffing is crucial for performance of REDAs. The role and responsibility assigned to the REDA must be closely assessed, to identify the division-wise staffing requirement.
- Structured training and capacity building programme needs to be institutionalized for technical as well as non-technical subjects, to build awareness, knowledge and efficiency.
- Financial self-reliance should be the prioritized as an objective of operations, as it drives efficiency as well as performance. While this is an outcome of corporatization, even society based REDAs should aim to reduce budgetary dependence.
- Adopt and integrate digital tools for ensuring sustainability of installed assets, particularly for DRE segments, as well as for investment promotion and programme implementation.

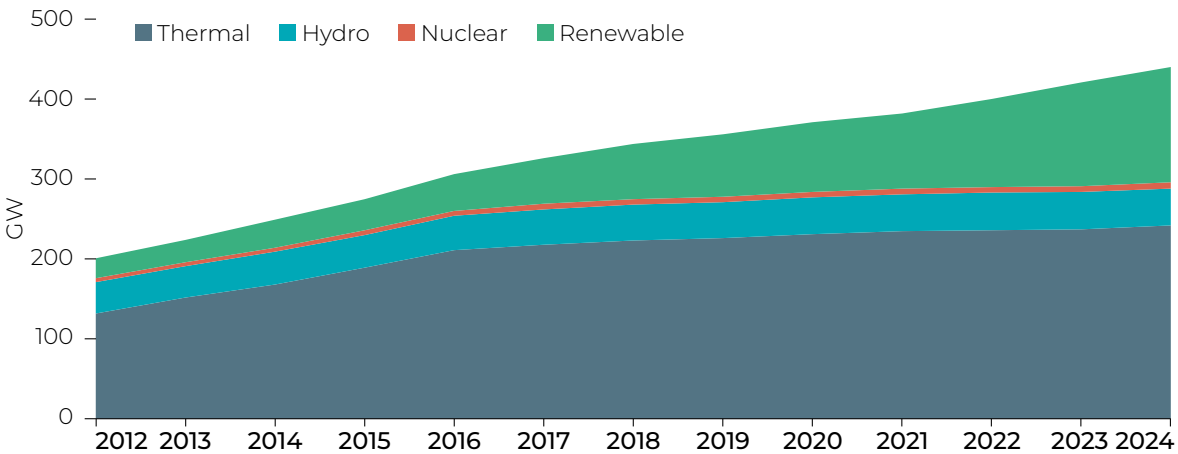
CHAPTER 1

# Introduction

**According to** the International Renewable Energy Agency (IRENA), India has the fifth largest renewable energy (RE) capacity (including large hydropower) in the world[1]. As of April 2024, 191.6 GW of RE capacity has been installed across the country, including 82.6 GW from solar, 46.1 GW wind, 10.9 GW biopower, and 5 GW from small hydro[2].

RE has emerged as the prime driver for national capacity growth in recent years. While nearly 100 GW of RE and thermal capacity has been added since 2012, the pace of RE growth in recent years has surpassed thermal growth. Between 2012 and 2017, the RE capacity addition was 32 GW, against a thermal capacity addition of 90 GW. In comparison, since 2017, nearly 87 GW of RE capacity was added in India against 24 GW of thermal capacity[3].

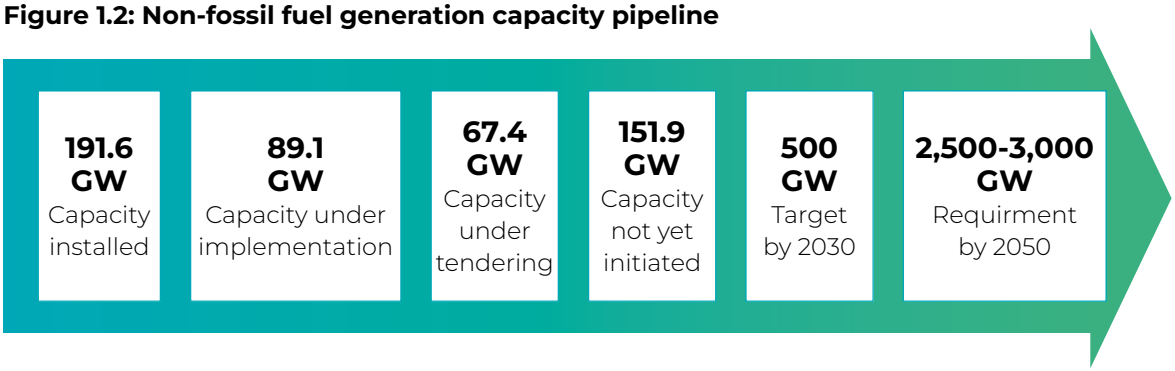
**Figure 1.1: India's installed capacity growth**




Source: CEA

While this RE growth has been commendable, there is a demanding path to reach the RE ambitions of an India of the future. Not only is there the announced target of installing 500 GW of non-fossil fuel capacity by 2030 but there is also an estimated need of installing 2,500 to 3,000 GW of RE capacity by 2050 to achieve net zero ambitions. Currently, 89.1 GW of new RE capacity is under construction, with another 67.4 GW under various stages of development (as of April 2024)[4]. Given the significant immediate target and massive long-term need, success hinges on addressing barriers to growth in a timely manner.

**Figure 1.2: Non-fossil fuel generation capacity pipeline**

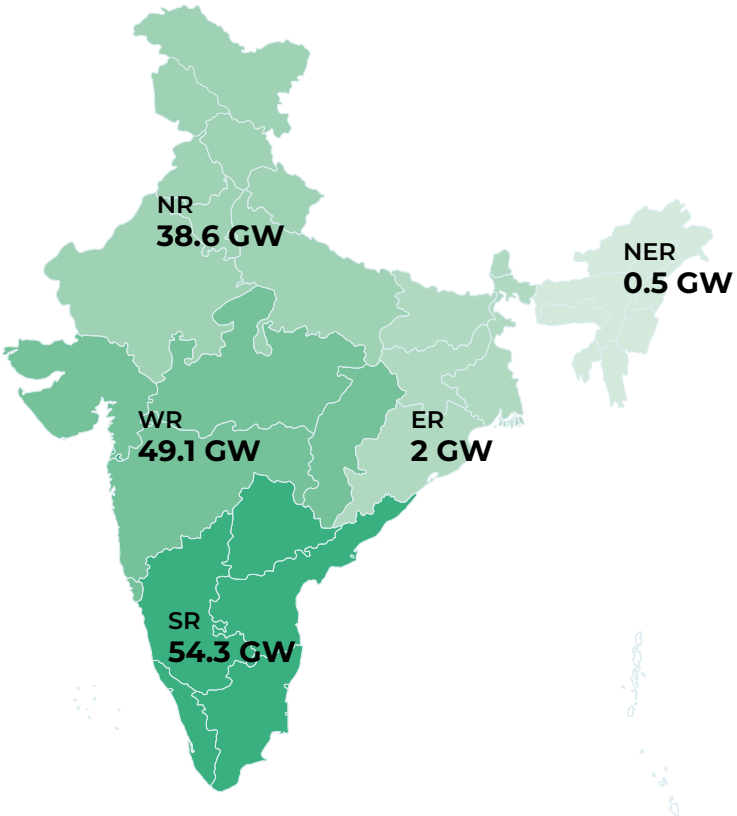



Source: CEA, April 2024

Substantially accelerating the RE growth to achieve long-term goals requires the participation of more actors, more states and more technologies. At present, India's installed RE capacity remains highly localized, with only seven states accounting for over 80 per cent of the installed RE capacity. As of April 2024, Gujarat and Rajasthan lead the pack with 27.7 GW and 27.2 GW installed RE capacity,

respectively (roughly 18 per cent each). They are followed by Tamil Nadu and Karnataka with 22.2 GW and 21.8 GW each (about 15 per cent share each), and Maharashtra with 17.5 GW (12 per cent) installed capacity. Lastly, Andhra Pradesh and Telangana account for 11 GW and 7.6 GW respectively (collectively accounting for 13 per cent share)[5].

**Map 1.1: Grid-wise RE installed capacity in India**



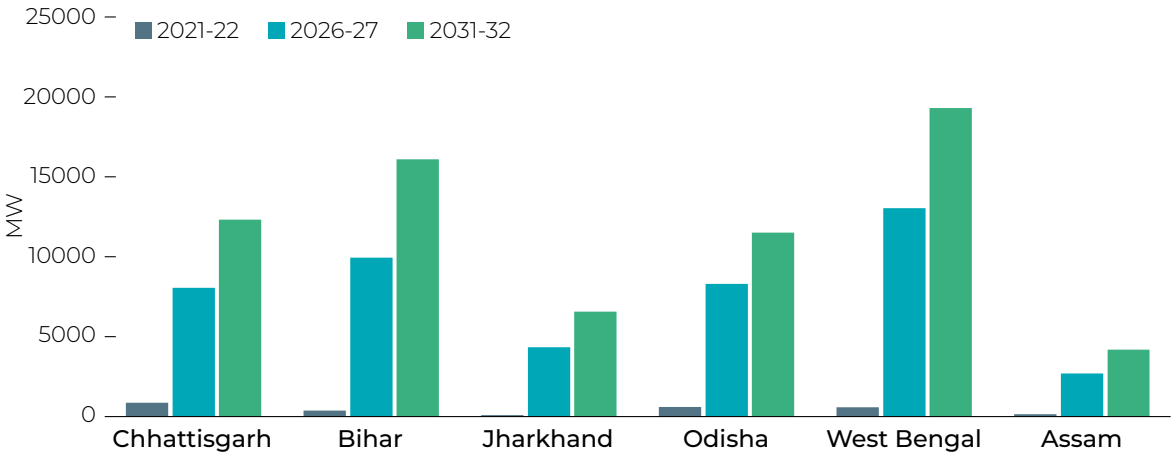

Note: Regions are categorized as per the grids; Data as of April 2024
Source: CEA

The techno-economic reasons for the current distribution of RE capacity are well understood as the primary objective was to add capacity at an accelerated pace from the cheapest possible resources. However, over time the uneven distribution of RE generation can prove to be inefficient. As clean energy requirements increase, substantial transmission charges and losses will have to be borne by the system to supply power to low-RE states.

The lopsided RE growth also has strong implications for the energy security of low-RE states. The 2023 notification by the Ministry of Power has increased the renewable purchase obligation (RPO) trajectory substantially, to reach 29.9 percent in 2024-25 and gradually increase to 43.3 percent in 2029-30[6]. To meet this target, eastern and northeastern states will have to increase RE procurement substantially.

In Odisha and Chhattisgarh, RE procurement will have to grow by nine times from 2021-22 levels to meet the RPO for 2026-27 and 14 times to meet requirements for 2031-32 *(Figure 1.2)*. Meanwhile, the RE procurement of West Bengal will have to grow 22 times from 2020-21 levels to meet the RPO requirement in 2026-27, and 32 times to meet the requirement in 2031-32.

**Figure 1.3: Projected RE procurement demand for eastern states to meet new RPO**

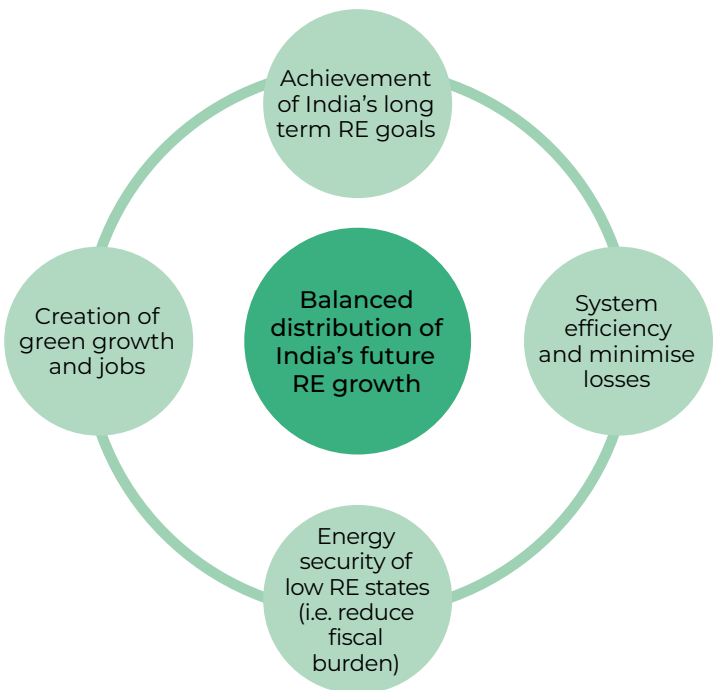



Note: Projections for 2031-32 are based on the notified non-hydro RPO requirement for 2029-30; RE procurement figures for 2021-22 are as per respective SERCs; Projected demand is based on CEA's 20th Electric Power Survey of India
Source: iFOREST Estimates

The cost of importing RE power to meet the new obligations will have a significant impact on the fiscal deficits of these low-RE states.[7] Over the long term, the fiscal impact will be most pronounced for the coal-producing states in the eastern region as they would also face a decreasing revenue from existing assets.

Stimulating green growth and green jobs is thus a crucial concern, particularly in states with high transition vulnerability. It is an observed trend that new green industrial ecosystems, including PV manufacturing, battery manufacturing, green hydrogen production projects, electric vehicle manufacturing etc., are also emerging in states leading RE installations. This creates significant concerns from the perspective of ensuring that India's overall energy transition is also just and equitable.

**Figure 1.4: The case for regionally balanced RE growth in India**



## The evolving role of REDAs

Going forward, to ensure exponential growth in the country's RE capacity in a regionally equitable manner, multiple interventions at policy, regulatory, and institutional levels are essential. There is a fundamental need for bottom-up planning and strategizing, which understands and acknowledges the state's characteristics and addresses its requirements. Policy and regulatory environments can then be built at national and state levels to support this.

Strong institutions at the state level are thus required that can take up this role of stimulating, facilitating, driving, and sustaining RE growth. This is particularly crucial when the industry is introductory, pre-takeoff growth stage.

REDAs, as state agencies instituted for promoting RE, are optimally placed to take up this role. However, currently, there are only a handful of REDAs delivering on this efficiently. There are wide variations across REDAs both in terms of the responsibilities assigned to them and their institutional capacity to deliver on the assigned tasks. Across states, their assigned roles vary from being responsible for investment promotion to merely coordinating for implementing government schemes. Similarly, their institutional strengths also vary significantly, from under 10 employees in a few cases to over 200 employees in others.

Overall, the performance of REDAs coincides with the uneven distribution of RE capacity in the country. Thus, the role, capacity, and contribution of REDAs in low RE states need to be enhanced substantially to achieve national energy transition ambitions.

CHAPTER 2

# Role of REDAs

**The role** of Renewable Energy Development Agencies (REDAs) is best understood in the context of the changing focus of the renewable energy (RE) sector. As RE has gone from being a fringe technology to a key component of the energy mix, the national and state governments have reassessed their policies and implementation practices.

REDAs are typically the implementers of RE policies, as state nodal agencies (SNAs), in their respective states. When the clean energy technologies were still in their infancy, these organisations were established within the science and technology departments of respective states. However, as the RE sector matured, most REDAs were brought under the ambit of state energy departments.

The change has also been marked by a reorganisation of the responsibilities of REDAs, where the traditional role of setting up pilots and implementing government schemes has been shrinking. In contrast, the responsibility of investment promotion and facilitation has been expanding.

At present, there are 37 REDAs in India (one for each state and union territory), of which 32 are SNAs for the state RE policies, while the remaining five either share responsibilities with another utility from the electricity department or are relegated to a supporting role *(see Annexure 1 for a complete list)*.

## 2.1 Organisational structures & areas of operation

When REDAs were established (during the 1980s) they were registered as societies under the Society Registration Act, 1860. Currently, 31 agencies continue to operate as societies, while six have been set up as public limited corporations under the Companies Act, 1956. This includes REDAs of Karnataka and Rajasthan – two of the leading states in installed RE capacity.

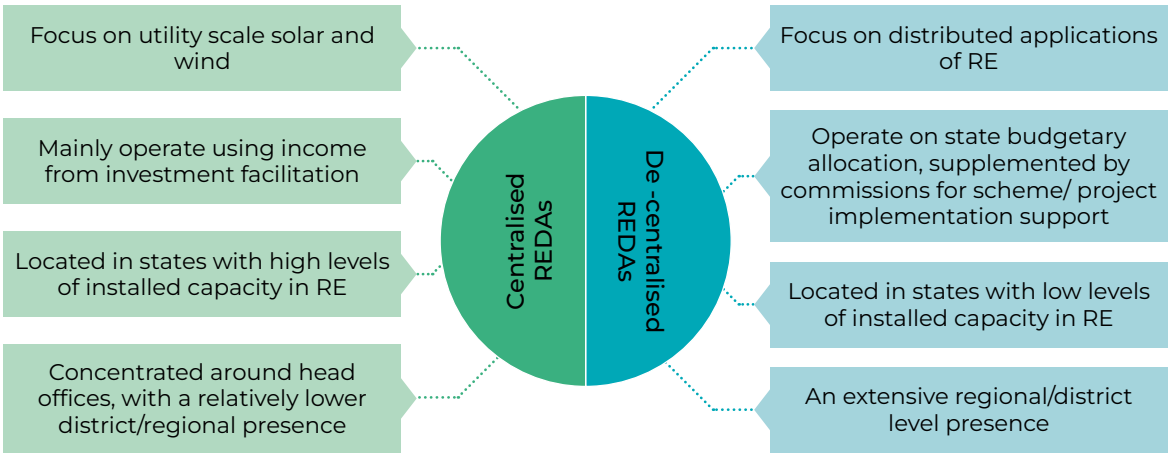
The organisational structure of these REDAs is seen to be closely tied to their areas of operation. Broadly, these agencies operate across several RE domains, including ground-mounted solar, rooftop solar, floating solar, wind, solar-wind hybrid, small hydro, biomass, etc. The projects can also vary in scale, ranging from the deployment of small distributed RE (DRE) applications to the development of solar parks. Over time, some REDAs have specialised in either the utility-scale or DRE domains, while others struggle with both.

Typically, REDAs in states with higher concentrations of utility-scale RE projects have been corporatized and exhibit centralised structures, with a strong head office and limited district office presence. For instance, Rajasthan Renewable Energy Corporation Limited (RRECL) employs only 14 officers across its nine district cells, while its head office at Jaipur has separate technical divisions for facilitating utility-scale solar projects and for park infrastructural development[1].

On the other hand, REDAs that are more active in the DRE segment, remain established as societies. They have a decentralised structure, with district-level implementation cells and regional branches. Chhattisgarh State Renewable Energy Development Agency (CREDA), which is a prime example of the decentralised model, has 33 cells at the district level, and seven regional branches overseen by five zonal heads at the head office[2].

With incorporation, REDAs have developed new sources of funding (driven by a need to replace state government grants), largely by charging fees for the facilitation of investments. The most recent annual report of Karnataka Renewable Energy Development Limited (KREDL) for 2021-22 states that the total revenue from operations was ₹10.3 billion. Roughly ₹7.5 billion of this was accrued through facilitation fees for solar, wind, and small hydro projects. Revenue from power generation at their solar (Pavagada) and wind projects (Mavinahunda and Sogi) accounted for the remainder, while nothing was drawn as budgetary support from the state government[3].

**Figure 2.1: Centralised and decentralised REDAs**




On the other hand, REDAs established as societies rely mostly on state budgetary support as well as facilitation fees from implementing state and central schemes. Here, CREDA stands as perhaps the only exception, as the agency has managed to raise substantial funds from projects undertaken on a commission basis. For instance, in 2021-22, CREDA had a turnover of ₹12.1 billion. Of this, ₹7.1 billion was provided by the Government of Chhattisgarh, with the agency raising the remaining ₹5 billion through commissions and schemes[4].

Meanwhile, aside from serving as SNAs for RE implementation, REDAs are also designated agencies for energy efficiency and conservation in most states. These REDAs are involved in implementing programmes and schemes of the Bureau of Energy Efficiency (BEE) at the state level, encouraging responsible use of energy, promoting energy-efficient appliances, and more. Meanwhile, in some states like Telangana, REDAs also support the adoption of electric vehicles (EVs) and investments in EV infrastructure, depending on the state policy. Mostly, energy efficiency and electric vehicle adoption remain fringe areas of activity for REDAs, and the focus is on RE project development and programme implementation.

## 2.2 Traditional vs new roles

Over time, as RE technologies have become viable at scale, the activities carried out by REDAs have also changed. While the traditional role of promoting DRE solutions continues to remain significant for expanding energy access and improving livelihoods in several states, the role of facilitating RE investments has become increasingly important.

**Traditional role:** As implementing agencies, REDAs operationalise state-level RE schemes and programmes for DRE application. The typical set of activities associated with the traditional role of DRE promotion are mapped as follows:

1. **Setting up of pilot or demonstration projects:** For decades, REDAs have been designing and setting up pilot or demonstration installations for DRE technologies, to build beneficiary confidence or to test business models. These projects have been set up on behalf of the state governments with state funding. A number of these assets, especially mini-grids deployed in the initial years, continue to be owned and managed by REDAs. Currently, the Punjab Energy Development Agency (PEDA) is playing a key role in developing compressed biogas (CBG) in the state, through pilot projects developed with GAIL (India) Limited[5] and Hindustan Petroleum Company Limited (HPCL)[6].

2. **Implementation of central DRE schemes:** REDAs carry out the implementation of schemes designed by the MNRE and MoP. Some of the recent schemes include *Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan* (PM-KUSUM), *Deen Dayal Upadhyaya Gram Jyoti Yojana* (DDUGJY), *Pradhan Mantri Sahaj Bijli Har Ghar Yojana* (SAUBHAGYA) and the National Biogas and Manure Management Programme (NBMMP). Here, REDAs facilitate the implementation of these centre-designed and funded schemes on the ground, including identification of beneficiaries, floating of tenders for identification of developers/vendors, monitoring and reporting of implementation progress, disbursement of subsidy etc.[7,8]

3. **Design and implementation of state-sponsored DRE schemes:** REDAs also act as implementers of RE schemes devised at the state level. For instance, the Tamil Nadu Energy Development Agency (TEDA) has installed solar lighting systems under the Chief Minister's Solar Powered Green House Scheme[9]. Similarly, the Uttarakhand Renewable Energy Development Agency (UREDA) has been offering loans to permanent residents to establish 20-200 kW solar plants under the *Mukhyamantri Saur Swarojgar Yojana*[10].

   As in the case of central scheme implementation, here too, REDAs are involved in a comprehensive set of activities from beneficiary identification to tendering to monitoring and subsidy disbursement. However, in this case, REDAs are often additionally involved in the scheme designing stage, either entirely or substantially, through input support provided to the relevant department. For instance, the Chhattisgarh State Renewable Energy Development Agency (CREDA) was actively involved in developing *Saur Sujala Yojana*, the state's solar irrigation scheme, for which the funding was secured from the National Bank for Agriculture and Rural Development (NABARD)[11].

4. **Facilitation of DRE installations for government schemes and buildings:** REDAs are often the go-to agency to support other government departments/agencies in integrating RE with various applications. For instance, in Jharkhand, DRE has been a widely implemented solution for overcoming the energy access gap in rural areas. These have been mobilized by various government bodies such as district governments and panchayats, but the tendering support has been mostly provided by Jharkhand Renewable Energy Development Agency (JREDA). In Chhattisgarh, CREDA is working with the Public Health Engineering Department to provide safe drinking water to rural households through decentralized solutions under the *Jal Jeevan* Mission[12].

5. **Inter-department coordination:** Deployment of RE projects necessarily involves the interaction of several government departments. In the case of DRE programmes, which often target rural areas, government departments and agencies like agriculture, rural development, irrigation, water and sanitation, public health, livelihood missions, etc. become important not just for inputs on scheme design but also for providing implementation support. Here, REDAs take up the role of a coordinator.

**New Role:** Meanwhile, in the past decade, with the mainstreaming of RE technologies, REDAs have emerged as SNAs for RE promotion policy. In that, all RE projects being developed under the state are to be registered with the REDAs to receive subsidy or incentive benefits, which entails a review of the detailed project report (DPR). In addition to vetting and registration, facilitation of investments has emerged as a key ask from REDAs. Under this, REDAs are expected to carry out a wide range of activities, including:

1. **Assessment of state RE potential:** To build a foundation for project development. REDAs often coordinate with agencies like the National Institute of Wind Energy (NIWE), the National Institute of Solar Energy (NISE), and other agencies to assess the RE potential of the state. This has been crucial for investor interest mobilization as well as for the identification of locations for specific project development.

2. **Identification of suitable land/location:** Given the critical role of land in project development, some REDAs have been assigned an explicit duty to identify suitable land parcels for the benefit of developers. Bihar Renewable Energy Development Agency (BREDA), for instance, has been

directed by the state policy to create a land information bank by collating information from district land officers in the state[13]. In some states, REDAs also receive possession of land and enter into rental agreements with investors. For instance, the New and Renewable Energy Development Corporation of Andhra Pradesh (NREDCAP) obtains advance possession of land from District Collectors and leases it out to developers of RE projects[14].

3. **Coordination with REIAs for project development:** REDAs also work closely with renewable energy implementing agencies (REIAs) of the central government, including Solar Energy Corporation of India (SECI), NTPC Limited, NHPC Limited, and SJVN Limited, to develop the RE projects. For instance, KREDL had set up Karnataka Solar Park Development Corporation Limited (KSPDCL) in a joint venture with SECI to develop the Pavagada solar power park[15]. Similarly, RRECL has signed a memorandum of understanding (MoU) with NTPC and SECI for the setting up of an 8,000 MW RE park along the India-Pakistan border in Rajasthan[16].
4. **Project infrastructure development:** REDAs in 'high RE states' have been actively involved in the development of support infrastructure for solar power parks. For instance, RRECL has set up Rajasthan Solarpark Development Corporation Limited (RSDCL) as a special purpose vehicle (SPV) for the development of solar park infrastructure in the state[17].
5. **Supporting statuary project clearances:** Some REDAs have also been assisting developers in obtaining permissions and clearances for projects. For instance, KREDL facilitates developers in obtaining statutory clearances and consents by writing letters of recommendation to the relevant authorities[18]. Maharashtra Energy Development Agency (MEDA) has set up a single window clearance portal for RE projects that enables developers to apply for approvals from various departments through the online system.
6. **Setting up pilot projects or making early investments:** In addition to facilitating project development, REDAs also develop projects directly. This has often been done to build investor confidence. For example, KREDL owns and operates 50 MW of solar capacity at the 2,000 MW Pavagada Solar Park in Karnataka[19].
7. **Contribution to state policy and RE promotion design:** Several REDAs in the progressive RE states continuously engage with a wide network of stakeholders and experts to propose the design of state policies and programmes and to refine relevant state regulations. Often, this responsibility is explicitly assigned to REDA by the concerned department. For instance, in the case of Rajasthan, RRECL was actively involved in drafting two key policy documents released by the state government – Urja Niti, 2050 and RE Vision 2030.

   *(See Annexure 2 for REDA-wise mapping of areas of operations)*

## 2.3 Implementation gaps and implications

While the ask from a REDA has steadily grown with the sectoral expansion, the institutional capacity of most REDAs has not been adequate to deliver on, both traditional and new roles.

At present, most state policies envision a strong growth in RE capacity. However, the majority of REDAs have not built their institutional capacity to deliver on the new role of investment promotion. This is evidenced by both the limited spread of large RE capacity across states, as well as the gaps between targets set by state policies and the actual achievement on the ground.

Even within the ambit of the traditional role of implementing pre-designed schemes, the capacity of most REDAs in implementation has been limited. This can be witnessed in the under-achievements reported in most states, across most schemes. This has even led to assigned implementation duties being taken away from REDAs and awarded to other government utilities. This was the case with MNRE's Grid Connected Rooftop Solar (GCRTS) Programme, where after the failure of phase I, phase II relied on discoms to achieve success.

The institutional capacity gap has also led to the reorganisation of responsibilities aligned with the new investment promotion role. For instance, in the case of Odisha, the responsibility of implementing the Odisha Renewable Energy Policy (OREP), 2022 has been assigned to the state's bulk energy purchaser GRIDCO Limited, instead of OREDA[20]. To execute this responsibility, GRIDCO has set up a specific wing called the Renewable Energy Nodal Agency (RENA). Meanwhile, OREDA has been assigned very limited role by the policy, such as solarization of government buildings and supporting GRIDCO[21]. The state government's decision has primarily been driven by the apparent lack of institutional capacity in OREDA, against the state's envisioned RE capacity addition goals.

Similarly in Assam, the Assam Power Distribution Corporation Limited (APDCL) has been given the role of implementing the Assam Renewable Energy Policy (AREP), 2022[22]. In this case, the state REDA – the Assam Energy Development Agency (AEDA) – has not been given any clear responsibility as the agency remains nested within the Department of Science, Technology and Climate Change.

Theoretically, a technology-based split or a scale-based split across two or more organisations can work for a state, as long as the responsibilities are clearly defined and the institutions have adequate capacity. In Gujarat, the responsibility for the development of RE was originally shared between the Gujarat Power Corporation Limited (GPCL) and the Gujarat Energy Development Agency (GEDA) in the Gujarat Solar Power Policy, 2015[23]. Subsequently, the role of facilitation (played by GPCL) was entrusted to the Gujarat Urja Vikas Nigam Limited (GUVNL) in 2021[24]. In Tamil Nadu, a similar division of responsibilities was carried out between the Tamil Nadu Generation and Distribution Company (TANGEDCO) and the Tamil Nadu Energy Development Agency (TEDA) under the Tamil Nadu Solar Energy Policy, 2019[25].

## 2.4 Conclusion

REDAs have a crucial role to play in supporting and facilitating the growth of RE technologies in respective states. The traditional set of responsibilities of these agencies was largely limited to setting up pilot and demonstration projects for new and innovative DRE applications and ensuring effective implementation of central and state DRE schemes and programmes. In addition to these responsibilities continuing, particularly in states with rural energy access challenges and high diesel dependence, new responsibilities are emerging for RE investment promotion. As evidenced by the sectoral growth trends, most REDAs in the country have achieved limited success in delivering these traditional and new roles, primarily because of institutional capacity gaps. As a consequence, there is an emerging trend towards these responsibilities being assigned to other government utilities. This highlights the urgent and immediate need for capacity building and institutional strengthening, both for the achievement of state and national RE growth targets as well as for the survival of REDAs in the next phase of RE growth.

CHAPTER 3

# Strengthening Institutional Capacity

**Renewable Energy** Development Agencies (REDAs) are vital organisations responsible for expanding renewable energy (RE) growth in respective states. Given the nature of the sector, initial support to industry is required for the sector to reach a self-sustaining take-off stage. Currently, the roles and responsibilities assigned to REDAs cut across traditional themes of setting up pilots and implementing pre-designed schemes to new requirements of facilitating investments. However, the limited institutional capacity of REDAs has emerged as a critical bottleneck in ensuring impact across both traditional and new roles.

In this context, the state-level RE policies play a crucial role. These policies equip REDAs with the necessary tools (implantation frameworks, subsidies, facilitation mechanisms, etc.) required to respond to the emerging needs of investment facilitation.

However, the existence of a strong nodal agency is fundamental. There have been instances where even with the best policy declarations (for instance, in Jharkhand), states are struggling to achieve stated goals due to the limited capacity/capability of nodal agencies. Meanwhile, there are other examples (such as in Chhattisgarh) where REDAs have managed to deliver good outcomes by demonstrating leadership in identifying and implementing solutions despite a limited policy declaration.

At present, there is a wide disparity in the performance of REDAs across India, mainly reflecting the priority assigned to the RE sector in their respective state governments. The present inquiry is designed to explore the performance of REDAs and to identify the institution-level factors responsible for variation among the cohort.

## 3.1 Study methodology

To identify factors responsible for REDAs' efficient and effective operations, a comparative analysis of agencies belonging to states leading and lagging in RE deployment has been undertaken.

The literature on organisational capacity and its enhancement highlights the role played by context in determining performance[1]. Then, even when a structure or practice is identified to be better than its alternate, the returns from applying it remain context specific. For this reason, comparative analysis (or relative measures of capacity) is more suited for identifying effective institutional practices and structures. In the context of our study, REDAs operate within the same national context (typified by the 500 GW goal) and have similar responsibilities (to expand RE within their respective state); they constitute a broadly comparable set. Even so, the variation in state-level outcomes suggests that some agencies have succeeded while others have not. It follows then: among REDAs, there is a small group of high-performing agencies and a large majority of low-performing ones.

The institutional capacity of REDAs, measured across multiple dimensions, has been mapped using publicly available official data, and primary information has been gathered through senior management interviews. High-level inputs have also been collected through a two-day workshop on 'Enhancing the Role of REDAs in the Next Phase of RE Growth', which was organised in Bhuvneshwar with the participation of eight states – Bihar, Chhattisgarh, Karnataka, Maharashtra, Odisha, Rajasthan, Telangana and West Bengal. *(Refer to Annexure 3 for the workshop details).*

For primary data collection from the identified REDAs, a structured questionnaire was designed based on a detailed literature review focusing on measuring institutional capacity. Two key inferences emerged from this. First, the most valued capacity measurement tools require participation from all levels of an organisation. While studies recommend that employees across levels be consulted for this, for the purpose of this study, questionnaire responses were gathered through senior management representatives. Second, institutional capacity is best understood alongside the specific environment within which the organisation is operating.

For measuring institutional capacity, the United States Agency for International Development's public resource, *Performance Monitoring and Evaluation Tips* summarises commonly used

methods. It covers tools such as Participatory Results Oriented Self Evaluation, Organisational Capacity Assessment Tool (OCAT), the Institutional Development Framework, and others[2]. For the present study, the questionnaire was based on the broad guidance provided by OCAT. This was mainly due to the flexibility it provides researchers with studying various organisations ranging from commercial firms to government agencies to non-profits. This is further illustrated by the extensive literature utilising the tool, such as Management Sciences for Health's OCAT questionnaire[3], which served as a critical input for survey design.

The final questionnaire covered 49 questions across nine dimensions ranging from human resources to finance to external partnerships. These questions were also answered by the wider literature, such as the impact of clarity of targets at the divisional level on performance[4] and the importance of developing institutional leadership in energy efficiency agencies[5]. *(See Annexure 4 for the complete questionnaire)*

**Figure 3.1: Key areas of inquiry in mapping REDA performance**


## 3.2 Mapping of REDAs

REDAs of two groups have been sampled in this study. For determining leaders and laggers, the key criterion was the outcome at the state level in terms of the actual installed RE capacity. Secondly, among leading REDAs, there was consideration of the segments in which the agency operates to ensure diversity. As discussed, while REDAs typically have a broad mandate to promote all forms of RE, some have invariably focused more on utility-scale projects, while others have focused on more DRE. This is seen to have implications for their structure, activities, and funding. Thus, a mix of REDAs across the areas of operation was important to ensure diversity.

Given these considerations, leading REDAs from the following five states have been assessed in detail in this inquiry:

1. **Rajasthan** is the national leader in RE implementation, accounting for an 18 per cent share in the total installed capacity. The state has managed to achieve a balanced growth in ground-mounted (27 per cent of the national total) and off-grid installations (22 per cent).
2. **Karnataka** has the fourth highest installed RE capacity in the country, with a 14 per cent share in the total, driven largely by utility-scale solar and wind installations and solar rooftop capacity.
3. **Maharashtra**, with a 10 per cent share in the national RE capacity, ranks fifth highest in RE development. While its share in the ground-mounted solar capacity is limited to 5 per cent of the national total, it accounts for substantially higher capacities in rooftop and off-grid segments at 15 per cent and 11 per cent, respectively.
4. **Telangana** has the eighth highest RE installed capacity in India with a share of 4 per cent in the total. However, despite being moderately endowed with solar generation potential, the state has installed 8 per cent of the national ground-mounted capacity. Interestingly, most of this capacity (aside from two projects) has been developed through small-scale solar PV plants between 5 and 50 MW.

5. **Chhattisgarh** ranks fourteenth in overall RE development in India, with only a 1 per cent share in total installed capacity. However, the state has managed to excel in implementation of off-grid solar capacity, accounting for the third-highest share of 14 per cent of the total.

From the set of low-performing REDAs or REDAs of 'low-RE states', three agencies have been considered. The states are Odisha, Jharkhand and West Bengal. While the MNRE assessed potential of these sates remains moderate, these states have only managed to develop a small fraction of their potential – Odisha has developed only 2 per cent of its RE potential and Jharkhand has developed 1 per cent, while West Bengal has developed 7.7 per cent[6].

**Table 3.1: Installed RE capacity in focus states (MW)**

| State | Rajasthan | Karnataka | Maharashtra | Telangana | Chhattisgarh | Odisha | Jharkhand | West Bengal |
|---|---|---|---|---|---|---|---|---|
| REDA | RRECL | KREDL | MEDA | TSREDCO | CREDA | OREDA | JREDA | WBREDA |
| Solar power (ground-mounted) | 17,633 | 8,087 | 3,848 | 4,360 | 747 | 419 | 21 | 113 |
| Solar rooftop | 1,191 | 593 | 2,071 | 388 | 75 | 48 | 91 | 67 |
| Solar hybrid | 1,980 | - | - | - | - | - | - | - |
| Off-grid solar | 663 | 36 | 388 | 8 | 390 | 28 | 50 | 13 |
| Small hydropower | 23 | 1,280 | 384 | 90 | 76 | 115 | 4 | 98 |
| Wind power | 5,195 | 6,224 | 5,212 | 128 | - | - | - | - |
| Biopower | 121 | 1,887 | 2,584 | 161 | 274 | 58 | 19 | 343 |
| Waste to Energy | 4 | 20 | 58 | 59 | 0.4 | - | - | 4 |
| **Total** | **26,814** | **18,131** | **14,548** | **5,198** | **1,565** | **670** | **186** | **640** |

Note: Data as of April 2024
Source: MNRE

## 3.2.1 REDAs in high RE states

### Rajasthan Renewable Energy Corporation Limited

Given Rajasthan's leadership in the RE sector, Rajasthan Renewable Energy Corporation Limited (RRECL) has a pre-eminent position among state-level RE facilitators. RRECL was set up in August 2002 by merging the erstwhile Rajasthan Energy Development Agency (REDA) and the Rajasthan State Power Corporation Limited (RSPCL). RRECL is the state nodal agency for RE as well as energy efficiency, responsible for implementing all government schemes. The organization plays an important and active role in the state's RE growth by facilitating RE developers in securing land allotments, power evacuation approval, and various other clearances under state policies and rules.

Overall, the operations at RRECL come under the ambit of three senior officers – the directors of finance and technical, and the general manager cum OSD - which oversee teams specialising in specific segments. The technical director and general manager cum OSD oversee the following teams – solar, wind & hybrid, biomass, KUSUM-A, energy conservation, captive, regulatory matters. Meanwhile the finance division oversees investments and joint ventures (JVs). These three divisions are supported by the general administration, and accounts departments.

Structurally, RRECL is highly centralised. There are 66 staff members employed at the Jaipur head office, of which 22 hold technical positions. Its nine district cells employ 14 people. There is also a three-member Project Management Unit (PMU) embedded in the head office, to help adopt best practices in various fields as per national and international trends.

For funding, the agency relies entirely on self-generated income. RRECL's main funding sources are fees for registration of projects, accreditation of RE developers, and sale of electricity from capacity directly installed by the firm[7].

### DRIVING RE GROWTH BY INVESTMENT FACILITATION

**Digitisation of processes:** A dedicated web portal has been set up for the registration and management of all RE projects in Rajasthan. RRECL has identified new land banks and potential sites for development. Facilitation is being provided to RE developers in securing land allotments, power evacuation approval, and various other clearances under state policies and rules. Regular stakeholder meetings are organized to resolve challenges and monitor the progress of project development.

**Directly engaging for project development:** Rajasthan Solarpark Development Company Limited (RSDCL) was set in 2011 up as a fully owned subsidiary for the development of infrastructure, formulation of guidelines, and management of solar parks. It presently manages Bhadla-I, Bhadla-II, and Nokh solar parks. TREDCO Rajasthan Limited has now been set up in a joint venture with THDC India Limited to develop, operate, and maintain ultra-mega solar power parks of 10,000 MW capacity.

**Leading reforms for investment support:** RRECL has been playing a central role in drafting and revising the state's RE policies and supporting STU in network planning. Urja Niti, 2050, and RE Vision 2030 have been recently released to provide long-term guidance to state actors. RRECL has been making representations to state regulators to address major regulatory hurdles in RE adoption.

## Karnataka Renewable Energy Development Limited

Karnataka Renewable Energy Development Limited (KREDL) was established in 1996 to facilitate the development of non-conventional energy sources and energy efficiency practices in Karnataka. Its key areas of responsibility and institutional structure are very similar to RRECL. KREDL undertakes a comprehensive set of activities to promote and support RE investments in the state. Key activities include:

- Investigation of the potential of RE sources in the state.
- Developing parks and projects (leveraging central government schemes) and undertaking tariff-based competitive bidding.
- Scrutinizing applications and identification of suitable developers for allocation of capacity, assisting developers with detailed project report (DPR) preparation (if needed).
- Facilitating the developers in obtaining statutory clearances through letter of recommendations.
- Monitoring projects through review and site inspections during and after implementation.
- Compiling information on the performance of ongoing and completed projects.
- Advising the state government on policies and regulatory matters for RE investment support.

KREDL is also a highly centralised organisation with one head office in Bengaluru and two regional offices in Dharwad and Kalaburagi. Their newly established head office employs 90 staff members in technical and support positions, while the two regional offices are staffed by five employees, each. Structurally, there are five different divisions in KREDL – solar grid, wind, solar off-grid, waste-to-

energy/biomass, and small hydro. The main sources of revenue for the agency are facilitation fees and the sale of electricity from self-developed projects.

Going forward, KREDL is focusing on building a complete RE ecosystem in Karnataka. To address the need for qualified personnel in the sector, it is developing a Skill Development Centre in collaboration with the Karnataka Skill Development Authority. KREDL has also institutionalized a professional internship programme for university students, by building collaborations with industry. Further, an incubation centre is being set up with the Indian Institute of Science (IISc) to enable entrepreneurship in the RE sector.

## DIRECTLY ENGAGING IN PROJECT DEVELOPMENT

KREDL has been actively involved in developing projects, not only to bid out (to developers) but also to own and operate. The company had set up Karnataka Solar Park Development Corporation Limited (KSPDCL) in a joint venture with SECI to develop the Pavagada solar power park. At present, it owns and operates 50 MW capacity at Pavagada Solar Park and wind-energy projects at Mavinahunda and Sogi[8]. Key projects currently being developed by KREDL include:

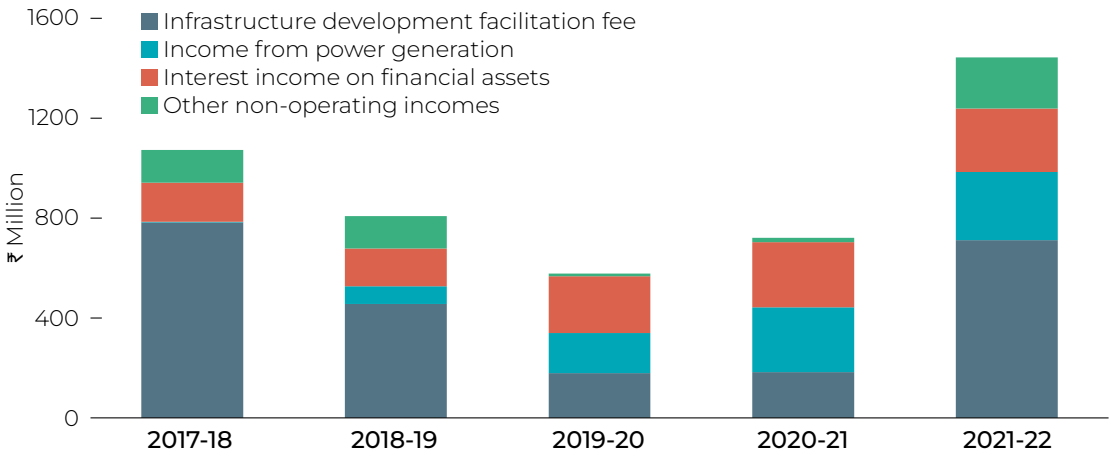
- 500 MW solar park at Aurad taluk in Bidar district under mode 8 of MNRE solar park scheme (in public-private partnership mode).
- Pilot 1 MW floating solar and 500 MW Kalaburagi solar power project.
- 1 MW floating solar power project at Gubbi taluk in Tumkur district.
- Pilot 2 MW solar power project with a 4.5 MWh battery storage system in Pavagada Solar Park.
- A pilot green hydrogen facility.

## DIVERSIFYING REVENUE STREAMS

KREDL does not receive budgetary support from the overseeing department. Over time, the company has developed multiple sources of income to sustain itself and carry out its operations efficiently. Over the past five years, the income of KREDL has accrued to four major heads[9]:

1. **Infrastructure development facilitation -** These incomes are associated with the central mandate of KREDL i.e., driving investment to increase installed capacity. Under this head are items such as application fees, detailed project report (DPR) fees, and time extension fees, all of which are received from developers of RE projects.
2. **Income from power generation -** These incomes are associated with the installed capacity owned by the agency directly, specifically wind projects at Mavinhunda and Sogi, and solar plants at Pavagada.
3. **Income from financial assets –** This head covers interest from bank deposits and other financial assets such as loans to other government undertakings such as Hubli Electrical Supply Company Limited (HESCOM).
4. **Other non-operating incomes –** This mainly comprises items such as service charges received from MNRE for carrying out central schemes, dividends from KSPDCL, and other miscellaneous incomes.

**Figure 3.2: KREDL's sources of revenue over the past five years**




Source: KREDL Annual Reports

Investment facilitation has generated ₹2.3 billion cumulatively during the period. However, this amount has ranged between ₹179 million in 2019-20 to ₹782 million in 2017-18, with a variance of 810 million over the past five years. In comparison, incomes from the three other heads have generated ₹2.4 billion with a significantly lower variance of 520 million during the period. The experience of KREDL illustrates the usefulness of diversifying income streams.

## Maharashtra Energy Development Agency

Maharashtra Energy Development Agency (MEDA) was set up in 1987 as a society to to promote and develop renewable energy sources and implement energy conservation in the state. The agency has a three-tiered organisational structure. At the district-level, MEDA has 12 offices staffed with five to seven employees each. Above these in the hierarchy are eight regional offices that supervise the O&M activities of district-level cells. At the apex of the hierarchy is the Pune head office which employs 180 support and technical staff[10].

The head office is also home to the seven divisions of the organisation, coinciding with the different segments in which MEDA works. Solar is the largest division, carrying out installations of solar irrigation pumps and rural electrification. The new and renewable energy division meanwhile focuses on emerging RE technologies such as geothermal.

MEDA funds its activities through a wide range of sources, including grants from the state and central governments, funds from district-level planning and development councils (DPDCs), and fees for facilitating investments. The largest contributions are of state- and central-government grants. In 2019-20, MEDA received ₹407 million from the Government of Maharashtra (for programme implementation and as budgetary support), and ₹789 million from the central government (for implementing PM-KUSUM, DDUGJY, and other schemes)[11]. In 2021-22, MEDA was sanctioned roughly ₹610 million from the state government, of which ₹500 million was for rural electrification and solar DRE[12].

### FOCUS ON RESOURCE ASSESSMENT AND SINGLE WINDOW CLEARANCE SYSTEM

To facilitate RE projects and developers, the following two measures of MEDA have been crucial:

**Resource assessment:** MEDA was the first REDA in the country to set up Solar Radiation Resource Assessment (SRRA) Stations on its own to generate accurate and investment-grade solar radiation data. Besides MEDA, only Kerala's Agency for New and Renewable Energy Research and Technology (ANERT) owns two solar assessment stations. So far, 17 SRRA stations have been set up in Maharashtra, of which eight stations are owned by MEDA and the rest by the National Institute of Wind Energy (NIWE).[13] These stations are being operated and maintained by NIWE, and the data is transmitted to both MEDA and NIWE centres.

**Single window portal for clearances:** MEDA is also among the few REDAs in the country to have launched a Single Window Portal for RE projects.[14] It has been introduced to streamline the approval process and reduce approval timelines for developers/investors/bid winners. The online system allows stakeholders to apply for approvals from various concerned departments and agencies, including MEDA, MSEDCL, MSETCL, Chief Electrical Inspector, SLDC, etc., as well as make all statutory payments. It identifies a clear timeline for clearance of applications for all crucial stages including – grid connectivity (30 days), project registration (15 days), Electrical inspection plan approval (7 days), metering specification approval (13 days), start-up power approval (15 days), charging permission (7 days), NoC for SEM charging (7 days), installation of SEM meter (7 days), final grid connectivity approval (7 days), synchronization permission (7 days), permission to commission (7 days), and project commissioning (3 days).

## Telangana State Renewable Energy Development Corporation Limited

Telangana State Renewable Energy Development Corporation Limited (TSREDCO) was set up as a state-owned company in 2014 to implement renewable energy, energy conservation, and electric vehicle programmes in Telangana.

The role of TSREDCO in utility solar development has been limited to investment facilitation, where the company has been supporting the developers in obtaining clearances and for tendering and implementing. Their focus has mainly been on DRE scheme implementation and promotion.

TSREDCO is a mid-sized REDA with a reasonable district-level presence. There are 85 employees working from the head office at Hyderabad, while its 11 district cells are being staffed by three to five employees each.

At the headquarters, the organization has four key divisions besides general administration and finance. These are solar; wind, energy conservation and other RE; project and electric vehicles; and planning. TSREDCO is among the few REDAs in the country that have been assigned responsibilities related to electric vehicles, including the establishment of charging infrastructure, setting of guidelines for public and private charging, and ensuring provisions of RE charging stations[15].

TSREDCO's main source of funding is through the facilitation of investments, such as fees charged from developers for applications, administration, registration, empanelment, sale of tender, etc., as well as from state government grants.

## Chhattisgarh State Renewable Energy Development Agency

Chhattisgarh State Renewable Energy Development Agency (CREDA) is the state nodal agency for harnessing RE sources and for propagating energy conservation in Chhattisgarh. In RE, the focus of CREDA has been on the implementation of DRE applications and programmes to address the energy access gap in rural areas.

CREDA operates through five divisions – RE-I to RE-V. Each division is associated with different programmes ranging from grid-connected solar to *Saur Sujala Yojana* (solar irrigation pumps) to biogas. Additionally, the RE-V division dedicatedly handles maintenance of assets.

Structurally, CREDA is a highly decentralised organisation. The agency has 33 district cells comprising 162 staff members. Above these in the hierarchy are five regional offices operated by 24 officers. The head office at Raipur has 150 employees, including the chief engineer and zonal heads, and various support staff. Aside from this, CREDA also employs nearly 600 skilled technicians at the cluster level (100 plants make one cluster) to attend to complaints, perform regular maintenance, and carry out other operations and maintenance (O&M) duties. In 2022, CREDA employed 840 staff members across regular, contractual, and outsource categories[16].

CREDA's main source of funds is the commissions made from the implementation of state government schemes, such as *Saur Sujala Yojana*. In addition, it also generates income by carrying out projects on a commission basis in DRE and RTS segments, and the funding from the MNRE for central schemes (excluding PM-KUSUM).

## DEVELOPING A COMPREHENSIVE ECOSYSTEM FOR DRE GROWTH

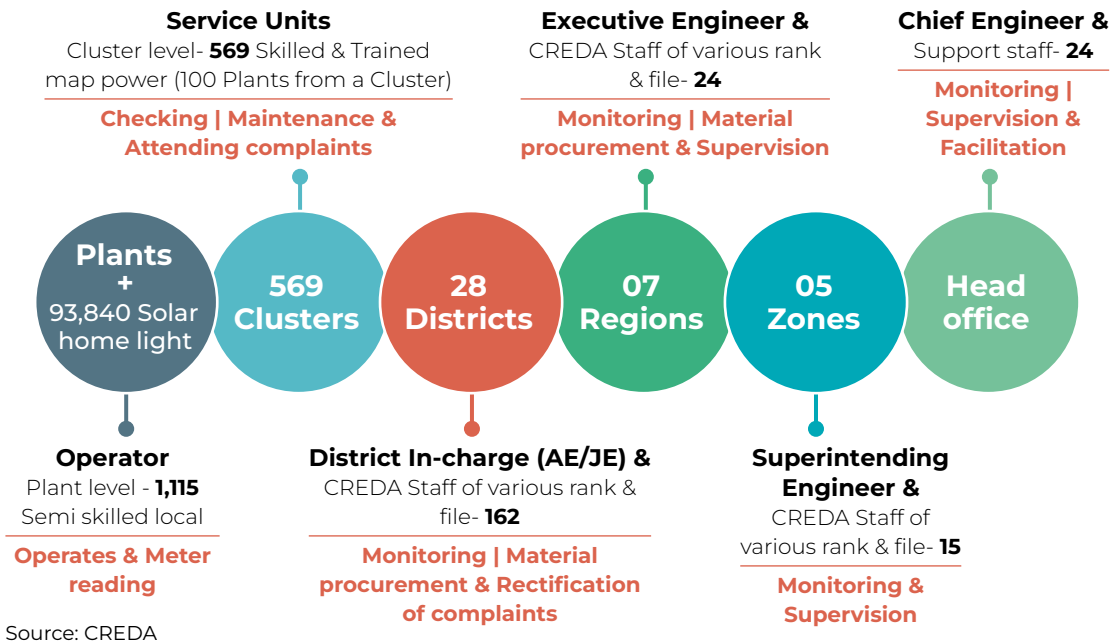
A precondition to CREDA's success in the DRE segment has been its approach to developing a complete ecosystem for DRE assets to grow and sustain.

CREDA has made dedicated efforts to build the vendor base in the state through constant engagement and capacity building. This has been crucial in establishing accountability for the quality and longevity of installations. At present, there are 113 system integrators, 55 vendors, and 4 contractors operational in the state (which was even higher in the pre-pandemic phase).

Further, CREDA has developed and implemented pioneering measures for ensuring the smooth operation of its widely spread-out solar installations. This has been achieved both through a wide human resource base and through the use of technology:

- CREDA has developed a vast, multi-tiered network of human resources to ensure proper O&M of installed assets. To manage its network of 31,665 DRE solar plants and 93,840 solar home lighting systems, over a thousand semi-skilled plant-level operators have been employed to operate the systems and read meters. These operators are supervised by 569 trained employees (service units) at the cluster level (100 plants = 1 cluster). Up in the value chain are 28 district-level offices, employing an aggregate staff of 162 employees and responsible for monitoring, material procurement, and reconciliation of complaints.

**Figure 3.3: CREDA's human capital for O&M of DRE assets**



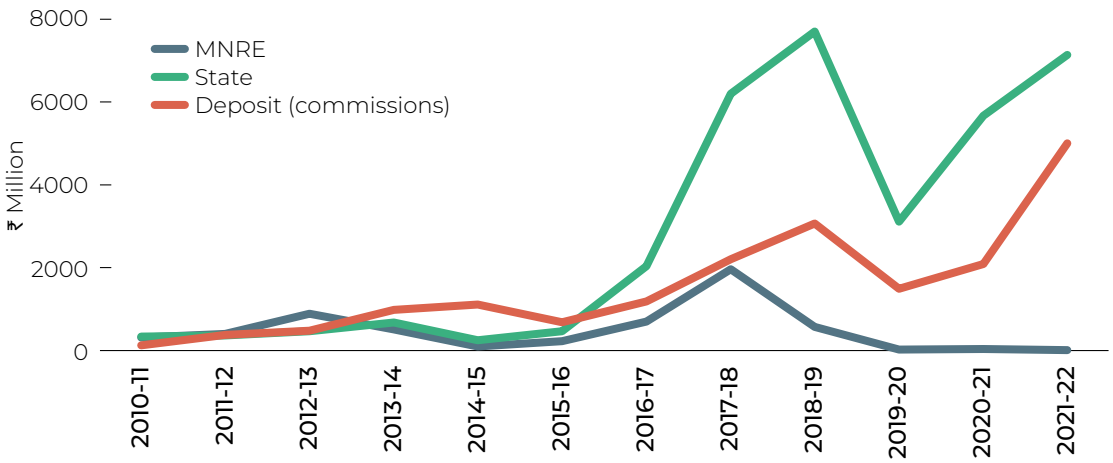

Source: CREDA

- CREDA's spending on O&M has been continuously increasing for the past years, due to the expanding network of assets and their increasing age. At present, the operation expenditure stands equal to the material expenditure at about ₹400 million (in 2022-23)[17].
- CREDA has built an online infrastructure for monitoring and reporting activities. Irrigation pumps, on-grid solar plants, and some off-grid plants of the agency have been equipped with remote monitoring systems. Two dedicated portals have been created for monitoring the operations of solar water pumps (www.creda.in) and for monitoring other solar plants (www.credaom.com). The community is also encouraged to report about asset health through a widely advertised toll-free number.

### IDENTIFYING NEW AVENUES FOR REVENUE

CREDA is perhaps the only non-corporatised REDA in the country that has managed to completely phase out its dependence on central funds. While till about 2015-16, central funds, state funds and deposit funds (commission from other self-generated works undertaken) accounted for a similar share in CREDA's annual revenues, while the share of central funds reduced to zero by 2019-20 as the other two kept increasing[18].

**Figure 3.4: CREDA's funding sources over the past decade**




Source: CREDA

CREDA's recent innovation for raising funds includes carbon markets. The agency has submitted a proposal for carbon credit/financing for 81,000 solar irrigation pumps to the Global Carbon Council and expects to receive from it about 400,000 annual carbon credits over the next decade. Going forward, CREDA plans to submit proposals for an additional 55,000 solar irrigation pumps, electrification-related systems, solar power drinking systems, and solar high masts for carbon financing to the various carbon offset platforms[19].

## 3.2.2 REDAs in low RE states

### Jharkhand Renewable Energy Development Agency

Jharkhand Renewable Energy Development Agency (JREDA) was established in 2001 under the Department of Energy, Government of Jharkhand. In addition to being the state nodal agency for the state RE policy, JREDA is also the state-designated agency for energy efficiency[20].

The main areas of operation of JREDA are utility-scale solar (including floating solar) and solar water pumps. Under the Girdih Solar City project, JREDA is facilitating the development of 18 MW ground-mounted solar systems and 22 MW rooftop solar systems for commercial and institutional (C&I) and residential consumers (RTS for the residential sector is now assigned to discoms)[21]. The agency has also installed roughly 13,000 solar water pumps under component B of PM-KUSUM[22].

Unlike better-performing REDAs, JREDA has no divisions among its staff. Instead, there are 40 technical employees and 10 support employees, constituting the entirety of the organisation. There are also no district offices of the agency[23]. In this manner, JREDA resembles the centralised model of organisation, albeit without any specialised divisions. To finance its operations, the JREDA relies on grants from the state and central governments, with the former providing most of the funding.

## West Bengal Renewable Energy Development Agency

West Bengal Renewable Energy Development Agency (WBREDA) was established in 1993 under the aegis of the Department of Science and Technology, Government of West Bengal. In 2019, the Department of Non-Conventional and Renewable Energy Sources was formed, and WBREDA was assigned to it[24].

WBREDA has a joint venture with the West Bengal Power Development Corporation Limited (WBPDCL) and the West Bengal State Electricity Distribution Company Limited (WBSEDCL), called the West Bengal Green Energy Development Corporation Limited (WBGEDCL)[25]. According to the state policy on Cogeneration and Generation of Electricity from Renewable Sources of Energy, 2012, WBGEDCL is responsible for facilitating utility-scale RE projects in the state, while WBREDA is responsible for development of off-grid solar and biopower projects and demo installations[26]. However, WBGEDCL has so far only managed to install rooftop and solar streetlight projects.

For WBREDA, the main areas of operation are biopower and rural electrification. The agency has installed 47.7 MW of biomass co-generation plants and nearly 488,000 home lighting systems across the state. In addition, it has also carried out RTS installations on a commission basis and facilitated the development of a 2 MW canal-top solar plant[27].

WBREDA has two technical divisions which facilitate the development of RE and rural electrification. However, unlike better-performing REDAs, these divisions carry out projects related to the same sources of energy rather than specialising. Despite the mandate to develop DRE, WBREDA has a limited district-level presence with only one field office in the state[28].

WBREDA relies on two main sources of funds to carry out its operations - state government grants and commissions from RTS installations. Most of the agency's funds are in the form of grants, making it dependent on the state government to carry out operations[29].

## Odisha Renewable Energy Development Agency

Odisha Renewable Energy Development Agency (OREDA) was established in 1984 under the ambit of the Department of Science and Technology, Government of Odisha. In 2020, it came under the administrative control of the Department of Energy[30].

OREDA has recently reorganized its RE agencies, with notification of the Odisha Renewable Energy Policy, 2022 (See figure 3.3). GRIDCO Limited, the state's bulk power producers have been assigned the duly of implementing the policy and meeting the state's growth targets across technologies, OREDA has only been assigned a support.

Historically, the main areas of operation at OREDA have been rural electrification, rooftop, and DRE. The agency has electrified roughly 29,000 households under state and central government schemes and installed 17.5 MW of rooftop solar. OREDA has also installed nearly 4,900 solar water pumps under Component B of PM-KUSUM and 250 kW off-grid solar power plants, 200 solar streetlights, and 40 solar water kiosks. The latter three activities have been conducted as a part of the centrally funded Konark Solarisation project, which also included developing two public EV charging stations of 15 kW each[31].

Structurally, OREDA is currently in the middle of transition and expansion. The state government has approved corporatization of the organisation. Over the last two years, additional technical officers have been employed at the 30 district-level cells. At the head office, there are now three technical divisions as opposed to one in the past[32].

At present, majority of the funding suport of the agency is received the state and central government in the form of budgetary suport and grants[33].

## 3.3 Key findings

Better-performing REDAs are observed to be institutionally stronger organizations relative to those in 'low-RE' states. The analysis of the data and information shared by these eight REDAs has led to key findings across four broad dimensions – organisational structure, human resources, finances, and asset/ programme management.[34] The findings from the responses are discussed below, while the detailed responses are presented in Table 3.2.

**Table 3.2: Survey responses from eight selected REDAs**

| ORGANIZATIONAL STRUCTURE | | | | | | | |
|---|---|---|---|---|---|---|---|
| **REDA** | **What is the agency registered as?** | **Does the agency have any sub-sidiaries or JVs?** | **How many members does the governing body have?** | **How often does the governing body meet in one year?** | **Which aspects of the agency are reviewed by the governing body?** | **What actions can the organisation take on its own?** | **How many divisions does the agency have?** |
| RRECL | Corporation | Yes | 7 | 5 –6 times per year | Technical, financial and administrative | Regular affairs | 9 technical + 1 support |
| KREDL | Corporation | Yes | 15 | 3 times per year | Financial and administrative | Regular affairs; spending limit of ₹10 million | 6 technical + 3 support |
| TSREDCO | Corporation | No | 8 | 4 times per year | Financial and administrative | Regular affairs and business development | 3 technical + 3 support |
| CREDA | Society | No | 9 | 3 – 4 times per year | NA | All decisions other than policy | 4 technical + 1 support |
| MEDA | Society | No | 8 | 4 times per year | NA | Regular affairs; spending limit of ₹1 million | 5 technical + 2 support |
| OREDA | Society | No | No infor-mation | Once a year | No fixed agenda | Unclear spending limit; some regular affairs need dept clearance | 3 technical + 2 support (technical are identical) |
| JREDA | Society | No | 13 | 4 times a year (mandate); irregular in practice | Ongoing programmes and policy matters | Spending limit of ₹150 million; new projects need dept approval | No divisions |
| WBREDA | Society | Yes | 11 | 4- 6 times per year | Ongoing programmes and policy matters | All decisions other than policy | 2 technical + 2 support (technical are identical) |

*Table 3.2 continued*

| HUMAN RESOURCES | | | | | | |
|---|---|---|---|---|---|---|
| **REDA** | **Does the organization head have additional appoint-ments?** | **How many people are employed in the head office?** | **How many district offices does the agency have?** | **How many people are employed in each district office?** | **Does the agency set targets for divisions? How are these targets set?** | **What is the training and professional development system of the agency?** |
| RRECL | No | 66 | 9 district offices | 14 (aggregate) | Targets set through periodic review by MD | Regular training on rotation basis |
| KREDL | No | 90 | 2 regional offices | 5 (aggregate) | Long term target from policy; annual targets from long term target | Training structure in development; 3 to 4 trainings per year currently |
| TSREDCO | No | 85 | 11 district offices | 3 – 5 | Annual targets from policy broken down to division and district level | Training delivered by state government |
| CREDA | Yes | 150 | 33 district offices; 7 regional offices | 5 each at district and regional offices | Division-wise targets set on the basis of programme funding | Annual O&M training for technicians |
| MEDA | No | 180 | 20 district and regional offices | 7 each at district and regional offices | Annual targets from policy, reviewed quarterly | Training delivered by state govern-ment |
| OREDA | Yes | 53 | 30 | 3 – 4 | Targets not set at division level | No training system |
| JREDA | Yes | 50 | No district offices | NA | No divisions | No training system |
| WBREDA | No | 44 | 1 district office | 2 | Targets not set at division level | No training system |

| FINANCES | | | | |
|---|---|---|---|---|
| **REDA** | **What was the most recent annual budget of the agency set by the overseeing department?** | **What are the major sources of income for the agency?** | **How many times was the most recent annual budget reviewed?** | **For the last three financial years, what has been the budget utilisation of the agency on average?** |
| RRECL | No information | No information | No information | No information |
| KREDL | Self-sustaining; Total income = ₹1.4 billion (FY 21-22) | Investment facilitation fees, power generation | Quarterly | No budgetary support |
| TSREDCO | Self-sustaining | Investment facilitation fees | Quarterly | No budgetary support |
| CREDA | ₹7.4 billion (FY 21-22) | State government grants, own funds | Quarterly | 96% |

*Table 3.2 continued*

| FINANCES | | | | |
|---|---|---|---|---|
| **REDA** | **What was the most recent annual budget of the agency set by the overseeing department?** | **What are the major sources of income for the agency?** | **How many times was the most recent annual budget reviewed?** | **For the last three financial years, what has been the budget utilisation of the agency on average?** |
| MEDA | ₹640 million (Q4 FY 21-22) | Central and state govt grants, DPDC, own funds | Quarterly | 90% |
| OREDA | ₹567 million (FY 23-24) | Central and state govt grants, own funds | Monthly | Full utilisation |
| JREDA | ₹2.5 billion (FY 23-24) | Central and state govt grants | Quarterly (mandate); irregular in practice | Full utilisation |
| WBREDA | ₹654 million (FY 22-23) | State govt grants, own funds | Annually | Full utilisation |

| ASSET/PROGRAMME MONITORING | | |
|---|---|---|
| **REDA** | **How is program implementation monitored?** | **How is programme success evaluated?** |
| RRECL | Regular review meetings by mid and senior management of programme manager | Success evaluated on basis of target capacity |
| KREDL | RE developers submit quarterly reports | NA |
| TSREDCO | Online tracking system | Varies from programme to programme |
| CREDA | RMS, feedback from beneficiaries | Success evaluated on basis of target capacity |
| MEDA | RMS, feedback from state utilities | No information |
| OREDA | Online tracking system, monthly meetings | No system currently |
| JREDA | No set system. | Impact evaluations by external organisations |
| WBREDA | Online tracking system, RMS | Success evaluated in terms of energy savings |

## A. Organisational structure

**Corporations vs. agencies:** A common point of discussion for state-level policymakers is whether greater efficiency can be ensured in implementing agencies by re-organising them as corporations. Key to this discussion is profit making and self-sustaining (the ability to finance operations without budgetary support from state government). While both corporations and societies can excel at building their revenue sources, corporations have an inbuilt pressure to perform efficiently to be self-sustaining (due to missing budgetary support). A corporation may also be better equipped to set up SPVs and JVs to develop and own projects.

That said, organizational structure should not be a limiting factor for good performance – of five better-performing REDAs, two are registered as societies, and three operate as corporations. Notably, most REDAs in 'low-RE' states are organised as societies. One of these - OREDA - is currently in the process of corporatisation and subsequent research on its experience can provide further insight on this subject.

**Engagement of the governing body:** A strong institution, whether a for-profit corporation or a not-for-profit agency, requires a strong board of directors/trustees. At leading REDAs, the board of directors meets regularly to discuss a fixed agenda regarding key aspects of the agency's performance. Board meetings are held every quarter in MEDA, CREDA, and TSREDCO, on a bi-

monthly basis in RRECL, and three times per financial year in KREDL. The agenda at these meetings typically covers financial, administrative, and programmatic aspects of the agency.

In 'low-RE' states, this is largely not the case. While the governing body of WBREDA meets regularly, meetings are infrequent in OREDA and JREDA. JREDA's governing body is mandated to meet every quarter however, meetings are sometimes delayed by up to three months, which can result in long turn-around times on big-ticket items. In OREDA's case, meetings of the governing body only took place once a year in the past. Presently, due to the ongoing transition, these have been put on hold.

Further, meetings of the governing body are also characterised by a significantly different agenda in 'low-RE' states. In the past, the agenda at OREDA's governing body meetings was not fixed. Instead, it was prepared by the chief executive (with inputs from the chairman) based on the most pressing concerns. It is unclear if this consistently included financial, technical, and administrative matters. At JREDA and WBREDA, the agenda is notably wide, covering not only programmatic concerns but also policy-related issues.

Carrying out meetings too infrequently may undermine the ability of governing bodies to effectively direct state nodal agencies. Further, key aspects of the agency's performance may have slipped through the cracks due to a variable or too vast agenda. The suggestion is that meetings of the governing body at REDAs in 'low-RE' states may not have been able to regularly review key aspects of the agencies' performance.

**Divisional responsibilities:** At leading REDAs, there is a clear, logical attribution of areas of operation to different divisions in the agency. Typically, the division is in terms of the various types of RE sources or specific RE programmes. This is important to assign adequate attention to each of the focus areas, as well as to identify responsibility and set targets.

In comparison, divisions of REDAs in 'low-RE' states are relatively unspecialised. JREDA does not have separate divisions for different sources of RE or different schemes. While WBREDA has two engineering divisions, their work is not differentiated. OREDA is similar in this regard: although schemes are differentiated across divisions, the same work is often undertaken in its three technical divisions.

The lack of division-level differentiation of work in REDAs of 'low-RE' states is in stark contrast to better-performing REDAs. Gains from the specialisation of work likely remain to be achieved in the former.

## B. Human Resources

**Stable and dedicated leadership:** Representatives of all surveyed leading REDAs stated that driven and capable leaders had played a role in the emergent success of the agencies. One indicator of such consistent engagement is that chief officers at all leading REDAs do not have additional appointments. Contrary to this, chief officers of REDAs in the selected 'low-RE' states have additional appointments. In OREDA and JREDA, the additional appointments are in the energy sector but not RE-related. Meanwhile, it is also important for the leadership be given adequate level of autonomy (measured as the financial limit up to which decisions can be taken without department oversight).

**Staffing follows operations:** CREDA and MEDA are seen to employ a large number of staff, spread across district, regional, and head offices. Meanwhile, REDAs like RRECL and KREDL employ relatively fewer staff, and that too largely at their central branch. This is because REDAs need to be adequately staffed to meet assigned roles and responsibilities.

Typically, REDAs operate across two staffing structures. In states focused on DRE implementation, the human resource requirement is higher, with a strong district presence. In states with a stronger focus on large RE projects, the REDA staff tends to be centrally located in the headquarters. This

more decentralized presence is crucial for DRE implementation – understanding requirements, devising solutions, mobilizing interest, providing O&M support, etc.

All three REDAs in 'low-RE' states are mandated to operate in the DRE space. Despite this, they largely lack the district-level presence required to effectively carry out O&M of installed assets. OREDA's grassroots presence - comprised of 14 district offices staffed with additional directors and technicians - was only established in 2022. WBREDA has only one district-level cell and is planning on expanding its network significantly. This is also the plan of JREDA, which presently has no district-level cells.

**Divisional target setting and review:** Target setting and regular reviews are fundaments to organizational efficiency. The literature on the institutional capacity of governmental agencies indicates that setting targets at the level of the division can improve organisational performance[35]. At leading REDAs, targets at the division level are typically seen to be set on an annual basis and reviewed periodically. REDAs in 'low-RE' states meanwhile do not have division-level targets, suggesting that performance is only tracked at the institutional level. This suggests that significant gains to organisational performance can be made by instituting more robust planning and review.

**Training and capacity building:** Per respondents, training has emerged as a key area for organisations to focus on. RRECL is the only agency with a formal training structure in place. KREDL is in the process of drafting a training and professional development framework to formalise capacity building in the organisation. MEDA and TSREDCO rely on state-government-led training programmes. As it stands, CREDA only provides regular training for cluster-level technicians (for O&M of assets).

No training system is in place at REDAs in 'low-RE' states. At OREDA, there are ongoing discussions to regularise the training of technical officers, such as additional directors, and technicians. At WBREDA and JREDA, technical officers are sent for training occasionally, but there is no system in place.

## C. Finances

**Financial self-reliance:** Notably, TSREDCO and KREDL are entirely self-sustaining – they do not receive any funding from their respective state governments. Further, in 2021-22, CREDA raised over 40 per cent of its funding through commissions. On the other hand, MEDA generates a relatively small portion of its income itself, and it largely relies on grants.

A comparison with REDAs in 'low-RE' states reveals significant differences in the quality and quantity of funding. In terms of quality, funding in OREDA, JREDA, and WBREDA is largely from one source – state government grants. While OREDA and WBREDA do generate funds from commissions, the share of their self-generated incomes in total funding is minor. The quantity of funding received by them is also much lower than their better-performing counterparts. To illustrate, the grant funding received by MEDA in one quarter (Q4 2022) was larger than the annual grant funding received by OREDA and WBREDA. JREDA, with an annual grant of ₹2.5 billion is a notable exception to this case.

These findings suggest that REDAs in 'low-RE' states need higher funds while also developing new sources of finances. The literature on organisational capacity suggests that self-generated income increases autonomy and improves accountability to beneficiaries in implementing organisations[36]. Further, maintaining a grassroots network of technicians to attend to the O&M needs of DRE solutions is a costly endeavour.

Note that both leading and lagging states feature high budget utilisation. However, there is a substantial gap in the funding received by agencies in either subset. Therefore, high levels of budget utilisation may be a function of the effective use of funds in the first group (high-performing REDAs), while reflecting shortage of funds in the second group (REDAs of low-RE states). Though this needs further exploration.

**Regular financial review:** Respondents identified regular review of budget allocations and expenditures as key to responsible financial management. CREDA sets budgets on an annual basis and reviews expenditures every quarter. MEDA receives funds from the overseeing body (Energy, Industry and Labour Department, Government of Maharashtra) every quarter, at which juncture a systematic review of allocation and expenditure is carried out. KREDL and TSREDCO both review budgets at quarterly meetings of the board.

At REDAs in 'low-RE' states, financial reviews are less frequent. OREDA has recently started carrying out monthly financial reviews, however, in the past, the time between each review varied. At JREDA, while the governing body is mandated to review finances every quarter, meetings are often delayed by up to three months. At WBREDA, the financials of the organisation are only reviewed once a year.

REDAs in 'low-RE' states uniformly utilise the entirety of their budgets. Given these agencies receive significantly lesser budgetary assistance than their better-performing peers, full utilisation is not surprising.

## D. Asset/ Programme Management

**Monitoring and evaluation:** Leading REDAs consistently monitor ongoing programmes as well as installed assets. RRECL has a formal programme management system that delineates responsibilities and ensures regular check-ins. CREDA, MEDA, and TSREDCO all rely on RMS systems for asset management. Additionally, CREDA also reaches out to beneficiaries following project completion to identify key learnings. KREDL, due to the state's focus on utility-scale RE, relies on the developers themselves to submit quarterly reports during the commissioning progress. Post commissioning, the expectation with respect to large RE projects is that the developers will manage and operate plants efficiently, to maximize their returns.

REDAs in sampled low-RE states have introduced some mechanisms for monitoring and evaluation of assets, but lack larger comprehensive structures. At WBREDA, the installed rooftop solar assets under recent schemes are monitored through an online portal. To evaluate the impact of these assets, energy savings are calculated and reported by the agency. However, the monitoring and evaluation of other RE projects are not being carried out.

At OREDA, an online portal has been set up for ensuring asset-maintenance to help raise and link customer service requests to vendors and track progress through monthly meetings. However, the agency does not carry out online or offline monitoring of assets in a comprehensive manner. Meanwhile, JREDA has from time to time engaged external organisations to carry out impact evaluations, but there are no mechanisms for continuous monitoring.

## 3.5 Conclusion

This detailed study of some of the better-performing REDAs and the state nodal agencies in 'low-RE' states in India brings to light distinctions in certain aspects of assigned responsibility and institutional capacity. Overall, better-performing REDAs have managed to support the investment ecosystem in respective states through comprehensive set of measures. It is further observed that agencies tend to be specialized in the domain of their focus (whether in utility-scale or DRE segments), and this specialisation further leads to a defined organisational structure, sources of funding, and capabilities of human resources.

Meanwhile, the relative efficiency of the better-performing REDAs suggests best practices for government agencies in general, and state nodal agencies for RE in particular. While a more detailed institutional assessment would have engaged in consultation with staff across levels, and not a single representative speaker, the preliminary assessment is adequate for identifying key determining factors for REDAs to enhance their outcomes substantially. Overall, the organisation-level factors driving the variation in the performance across multiple dimensions of organisational structure, human resources, finances and asset monitoring. These highlighted findings serve as a starting point for REDAs in RE-lagging states to begin adjusting their approach to improve institutional performance.

CHAPTER 4

# Conclusion

**India is** steadily progressing towards its globally committed target of installing 500 GW of renewable energy (RE) capacity by 2030. At present, 191.6 GW of RE capacity has been installed, while around 89 GW of new capacity is under construction and another 67 GW is under various stages of development. Planning for additional 151 GW of capacity is yet to be initiated. Further, to build a net zero-target economy by 2050, India would need to add about 125 GW of RE capacity every year.

Achieving the momentous target in an efficient, equitable, and just manner requires enhanced efforts from all stakeholders, including policymakers, regulators, investors, funders, and implementors. In this, states must take the primary responsibility of enhancing their role and contribution, through identification of their respective strengths, adopting proactiveness and agility in their policies for investment promotion, and building strong institutions for policy and programme implementation.

While the central government policies, measures and incentive packages would need to be realigned to support resource diversification as well as to explore and build the RE generation potential of the 'low-RE' states, local policy and institutional strengthening is crucial for investment promotion and enabling growth. Renewable energy development agencies (REDAs), as nodal agencies for RE policy implementation at the state-level, are important institutions for this. However, strengthening their capacity and capability is primary.

A detailed review of the areas of operation, institutional structures, and operational practices of REDAs, in high RE and low RE states points to two core requirements. The first requirement is to expand the role of existing REDAs in low RE states into state-owned think tanks for RE growth that can assess and communicate opportunities, devise technology and policy solutions, engage with stakeholders, and facilitate investments. The second requirement is for these institutions to adopt institutional structures and practices that support efficiency in operations. The two requirements and recommendations are discussed in detail below.

## 4.1 Anchoring RE growth

The roles and responsibilities assigned to a REDA stem from the state policy and can vary substantially from being responsible for investment promotion to implementing state/central schemes. Further, despite the specifics mentioned in the state policies, in practicality, the implementation of these itself can vary, with certain REDAs adopting a more proactive role than others. The role is seen to be largely passive and limited in the case of REDAs operating in low-RE states, while it remains proactive, dynamic, and solution-orientated in REDAs in RE states.

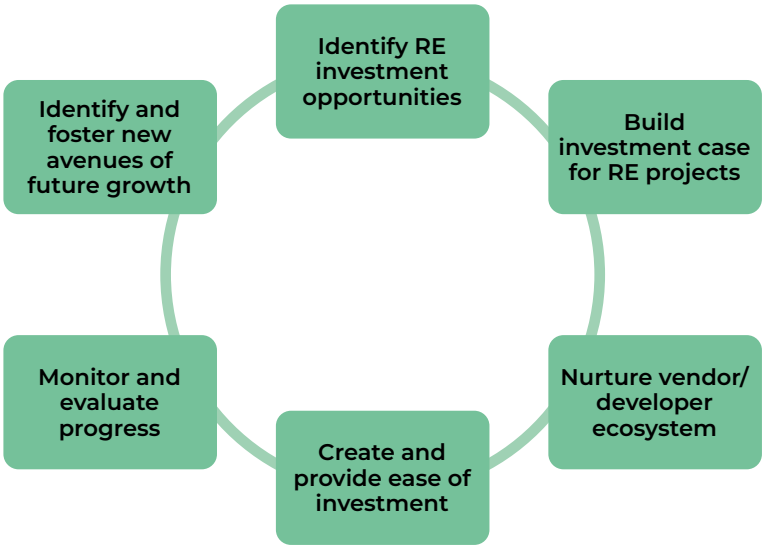
To stimulate RE growth, REDAs must adopt the role of a think tank, that constantly works to identify and implement solutions aligned with the local requirements and limitations. The larger objective is to create a conducive environment for developers and vendors to scale up RE.

Key elements of a REDA's transformation into an ecosystem enabler would include:

- **Identify RE investment opportunities:** States in India vary substantially in RE endowments. REDAs are best placed to build facilities that can undertake detailed techno-economic assessments of the state's available RE generation potential, across sources. This is important to accordingly help shape the state policy and incentive package, as well as to create a bank of potential projects/sites for development. This is particularly crucial in states with limited wasteland availability. Here, REDAs must take up the responsibility of identifying suitable land parcels for the benefit of solar developers, as well as identifying other RE resources that can be built in the state. This can also be monetized by REDAs with a provision of detailed data being sold to potential investors.

- **Build investment case for RE projects:** The next crucial area of engagement for REDAs is to initiate a comprehensive set of activities that help build the investment case for the state's high potential RE sources. This may entail any or some of the following measures, depending on the state-specific scenarios:
  - » Develop and roll out business models aligned with the techno-commercial feasibility of RE resources in the state.
  - » Engage with state and central decision-makers to create a conducive policy and incentive environment for investments.
  - » Engage with state regulators to ensure that regulatory hurdles to investments are removed.
  - » Design and implement pilot projects for technology or business model demonstrations.
  - » Coordinate with other agencies such as the central government's Renewable Energy Implementing Agencies (REIAs) for the development of initial projects.
  - » Coordinate with funding agencies to ensure the availability of low-cost funds for RE projects and programmes.
  - » Coordinate with relevant agencies to identify and aggregate new demand for RE projects.
- **Create and provide ease of investment to developers:** For RE project development, there are three crucial elements of the support that REDAs can provide to create an investment-friendly environment in the state.
  - » Identification of land parcels/sites for project development is a crucial task for REDAs to undertake, especially in states with relatively low wasteland availability. REDAs can further deepen their support by leasing these land parcels for sub-lease to developers or help developers in directly leasing the required land.
  - » Facilitating developers in securing the required approvals (from discom, transco, SLDC, electrical inspector, etc.) promptly is another crucial area of support. This can be achieved through an online single-window clearance system that streamlines the approval process and reduces approval timelines. Facilitation can also be provided through an offline mechanism, wherein REDAs can pursue clearances with concerned departments in case of any delays. However, an automated online portal mechanism would be most efficient in this context.
  - » Planning for and ensuring development of the required support infrastructure for RE projects is the third important faciliation. For large land parcels, the solar parks model can be leveraged. For non-park projects, REDAs must pursue grid and road development for major RE site clusters to create a basket of investment-ready projects.
- **Nurture vendor/developer ecosystem:** Engage with RE developers and vendors to communicate the investment potential and the business case for these investments. This would entail a dedicated strategy of structured communication, ranging from investment conclaves to one-to-one meetings. For DRE, in particular, this would entail the encouragement and development of local entrepreneurs who can provide services of system integrators as well as repair and maintenance. This can also be extended to enabling the manufacuring ecosystem development within the state.
- **Identify and foster new avenues of growth through collaborations:** REDAs must adopt a forward-looking approach towards RE growth in their respective state, wherein the focus should not just be on the 'in-vogue' technologies and trends, but also on new opportunities and future possibilities. For this, REDAs must build formal engagements with expert organizations. New and niche technology segments can be explored through collaborations with academic institutions and technical institutions of national and global repute, as well as continous engagement with industry. Similarly, for policy and buisness model innovation, REDAs must build collaborations with policy research organisations and industry experts.

**Figure 4.1: Evolving role of REDAs**




## 4.2 Institutional strengthening for efficiency

To take up this comprehensive role of stimulating and facilitating RE growth, REDAs need to be made institutionally strong. Given the existing situation across most REDAs, significant capacity building is needed to achieve an institutional transformation. Typically, REDAs that are organized as corporations have managed to stimulate greater operation efficiency (due to the pressure of self-sustaining operations). There is thus a strong argument for reorganizing existing REDAs into corporations. Further, given the limited operational bandwidth of these institutions, there is also an argument made for limiting their focus to RE, instead of diversifying into energy efficiency and electric vehicle promotion.

In any case, whether these are operated as corporations or societies and whether they remain active in areas other than RE, the adoption of the following practices is crucial to drive their operational performance:

- **Strong and dedicated leadership:** A REDA must be led by a driven and capable leader (a CEO or MD), whose sole responsibility should be to promote RE growth in the state. It is crucial that heading a REDA should not be viewed as an 'additional appointment' in a 'low-RE' state but as a core responsibility. While a broader policy framework for growth continues to be designed by the state department, the REDAs' CEO/MD must be given adequate autonomy to innovate and act on time.

  Further, the overall operations of the organization must be governed by a strong board of directors/trustees, that represent a mix of relevant stakeholders (from agencies that have a bearing on RE growth, including discom, transco, land, agricuture, rural development etc.). The board of directors should meet regularly to discuss fixed agendas regarding key aspects of the agency's performance.

- **Divisional clarity and target setting:** REDAs should have a logical division of verticals, typically driven by RE technologies, given the dedicated and customized attention needed for each. There should be clarity with respect to task allocations for each division, along with adequate staff provisions. This is important for assigning clear responsibility and setting division-level targets for performance. Regular review of the division's performance against these targets is fundamental to ensuring organizational efficiency.

- **Adequate staffing:** The staff strength of the agencies should adequately reflect their network size and outreach requirements. The role and responsibility assigned to the REDA must be closely assessed, to identify the division-wise staffing requirement. This would include an adequate proportion of technical and non-technical staff. Activities to be outsourced to a PMU should also be assessed closely to ensure optimization of operational efficiency.
- **Structured capacity building and training:** In addition to adequate staffing, REDAs need to develop a structured training and capacity building programme for technical and non-technical staff. RE is a dynamic and fast-evolving space both in terms of technology and policy, and often the staff at low-RE REDAs is seen to be lacking in awareness and knowledge.
- **Financial self-reliance:** REDAs must aim to become financially self-reliant or raise a significant part of their income independently. While several corporatized REDAs have been successfully operating independently and generating profits from their operations, most of the REDAs remain highly dependent on state budgets and MNRE schemes to sustain operational costs. The agencies must look to develop business/operation plans that support raising funds from a range of different charges.
- **Ensure sustainability of assets:** REDAs should devise and implement effective strategies for ensuring sustainability of installed assets. Dedicated efforts are particularly important in the case of DRE implementation. This would require the integration of monitoring technologies, ensuring adequate on-ground presence, and developing monitoring protocols. The employed mechanism must also ensure prompt repair and maintenance services throughout the asset's life. This should be prioritized, as the success of DRE schemes crucially depends on the performance and sustainability of these assets.

# Annexure 1

## List of REDAs

| S No. | State/ Union Territory | State Nodal Agency for RE policy | Acronym |
|---|---|---|---|
| 1 | Andhra Pradesh | New and Renewable Energy Development Corporation of Andhra Pradesh | NREDCAP |
| 2 | Arunachal Pradesh | Arunachal Pradesh Renewable Energy Development Agency | APEDA |
| 3 | Assam | Assam Energy Development Agency | AEDA |
| | | Assam Power Distribution Company Limited | APDCL |
| 4 | Bihar | Bihar Renewable Energy Development Agency | BREDA |
| 5 | Chhattisgarh | Chhattisgarh State Renewable Energy Development Agency | CREDA |
| 6 | Delhi | Energy Efficiency and Renewable Energy Management Centre | EEREMC |
| 7 | Goa | Goa Energy Development Agency | GEDA |
| 8 | Gujarat | Gujarat Energy Development Agency | GEDA |
| | | Gujarat Urja Vikas Nigam Limited | GUVNL |
| 9 | Haryana | Haryana Renewable Energy Development Agency | HAREDA |
| 10 | Himachal Pradesh | Himachal Pradesh Energy Development Agency | HIMURJA |
| 11 | Jammu & Kashmir | Jammu & Kashmir Energy Development Agency | JAKEDA |
| 12 | Jharkhand | Jharkhand Renewable Energy Development Agency | JREDA |
| 13 | Karnataka | Karnataka Renewable Energy Development Limited | KREDL |
| 14 | Kerala | Agency for Non-Conventional and Rural Technology | ANERT |
| 15 | Madhya Pradesh | Madhya Pradesh Urja Vikas Nigam Limited | MPUVNL |
| 16 | Maharashtra | Maharashtra Energy Development Agency | MEDA (MahaUrja) |
| 17 | Manipur | Manipur Renewable Energy Development Agency | MANIREDA |
| 18 | Meghalaya | Meghalaya New and Renewable Energy Development Agency | MNREDA |
| 19 | Mizoram | Zoram Energy Development Agency | ZEDA |
| 20 | Nagaland | Directorate of New and Renewable Energy | DNRE |
| 21 | Odisha | Odisha Renewable Energy Development Agency | OREDA |
| | | GRIDCO Limited | GRIDCO |
| 22 | Punjab | Punjab Energy Development Agency | PEDA |
| 23 | Rajasthan | Rajasthan Renewable Energy Corporation Limited | RRECL |
| 24 | Sikkim | Sikkim Renewable Energy Development Agency | SREDA |
| 25 | Tamil Nadu | Tamil Nadu Energy Development Agency | TEDA |
| | | Tamil Nadu Generation and Distribution Company Limited | TANGEDCO |
| 26 | Telangana | Telangana State Renewable Energy Development Company Limited | TSREDCO |
| 27 | Tripura | Tripura Renewable Energy Development Agency | TREDA |

*Annexure 1 Continued*

| S No. | State/ Union Territory | State Nodal Agency for RE policy | Acronym |
|---|---|---|---|
| 28 | Uttar Pradesh | Uttar Pradesh New and Renewable Energy Development Agency | UPNEDA |
| 29 | Uttarakhand | Uttarakhand Renewable Energy Development Agency | UREDA |
| 30 | West Bengal | West Bengal Renewable Energy Development Agency | WBREDA |
| | | West Bengal Green Energy Development Corporation Limited | WBGEDCL |
| 31 | Andaman & Nicobar | Electricity Department, Andaman and Nicobar | EDAN |
| 32 | Chandigarh | Chandigarh Renewable Energy Science and Technology Promotion Society | CREST |
| 33 | Dadra Nagar Haveli Daman and Diu | Dadra Nagar Haveli Daman and Diu Power Distribution Corporation Limited | DNHDDPCL |
| 34 | Lakshadweep | Lakshadweep Energy Development Agency | LEDA |
| 35 | Puducherry | Renewable Energy Agency Puducherry | REAP |
| 36 | Kargil | Kargil Renewable Energy Development Agency | KREDA |
| 37 | Ladakh | Ladakh Renewable Energy Development Agency | LREDA |

Source: AREAS, State policies

# Annexure 2

## Areas of operation of REDAs

| S No. | REDA | Areas of Operation | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Utility Solar | Utility Wind, hybrid | Rooftop Solar (Govt + C&I) | Solar Water Pumps | Small Hydro | Biogas, Biomass, Waste to Energy | DRE (livelih-oods) | DRE (electrification) | DRE (other) | EV | R&D |
| 1 | NREDCAP | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | |
| 2 | APEDA | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | | |
| 3 | AEDA | | | ✓ | ✓ | ✓ | | ✓ | ✓ | | | ✓ |
| 4 | BREDA | ✓ | | ✓ | ✓ | | ✓ | | ✓ | ✓ | | ✓ |
| 5 | CREDA | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ |
| 6 | EEREMC | ✓ | | ✓ | | | | | | ✓ | | |
| 7 | GEDA (Goa) | ✓ | ✓ | ✓ | ✓ | | ✓ | | ✓ | | ✓ | |
| 8 | GEDA (Gujarat) | | ✓ | ✓ | | ✓ | ✓ | | | | ✓ | |
| 9 | HAREDA | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | |
| 10 | HIMURJA | ✓ | | ✓ | | ✓ | | ✓ | ✓ | ✓ | | |
| 11 | JAKEDA | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | | |
| 12 | JREDA | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | |

*Annexure 2 Continued*

| S No. | REDA | Areas of Operation | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Utility Solar | Utility Wind, hybrid | Rooftop Solar (Govt + C&I) | Solar Water Pumps | Small Hydro | Biogas, Biomass, Waste to Energy | DRE (livelih-oods) | DRE (electrification) | DRE (other) | EV | R&D |
| 13 | KREDL | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | | ✓ |
| 14 | ANERT | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 15 | MPUVNL | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | |
| 16 | MEDA | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| 17 | MANIREDA | ✓ | ✓ | | | ✓ | | | ✓ | ✓ | | |
| 18 | MNREDA | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| 19 | ZEDA | ✓ | | | | | | | | | | |
| 20 | DNRE | ✓ | ✓ | ✓ | | ✓ | ✓ | | | ✓ | | |
| 21 | OREDA | | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | |
| 22 | PEDA | ✓ | | ✓ | ✓ | ✓ | ✓ | | | ✓ | | |
| 23 | RRECL | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| 24 | SREDA | | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | | |
| 25 | TEDA | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 26 | TSREDCO | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | |
| 27 | TREDA | ✓ | | ✓ | ✓ | | ✓ | | ✓ | ✓ | | |
| 28 | UPNEDA | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| 29 | UREDA | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 30 | WBREDA | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| 31 | EDAN | ✓ | | ✓ | | ✓ | ✓ | | ✓ | ✓ | | |
| 32 | CREST | ✓ | | ✓ | | | | | | ✓ | | ✓ |
| 33 | DNHDDPCL | ✓ | | ✓ | | | | | | | | |
| 34 | LEDA | ✓ | | | | | | | | | | |
| 35 | REAP | ✓ | ✓ | ✓ | | | ✓ | | | ✓ | | |
| 36 | KREDA | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | | |
| 37 | LREDA | ✓ | | | | ✓ | | | | ✓ | | |

Source: RE policies of states/ UTs, websites of REDAs

# Annexure 3

## REDA Workshop

A two-day workshop for renewable energy development agencies (REDAs) was organized in August 2023, in coordination with the Department of Energy, Government of Odisha on "Enhancing the Role of REDAs in the Next Phase of RE Growth" in Bhubaneswar, Odisha. The workshop served as a platform for knowledge sharing and discussion on new strategies for scaling up RE and challenges faced at the institutional, state, and national levels. REDAs of eight states participated in the event, including representatives from states leading in the installed capacity of RE as well as 'low-RE' states. The states represented at the event were Bihar, West Bengal, Odisha, Maharashtra, Karnataka, Rajasthan, Telangana and Chhattisgarh.

The two-day discussion meeting (on 18th and 19th of August) consisted of six sessions. On the first day, meeting participants discussed the need for institutional reform and critical challenges faced by REDAs in the scale-up of RE in their respective states. On the second day, agencies proposed and discussed possible solutions which could be actioned at the state- and institutional-levels, by drawing on the varied experiences of the cohort.

The deliberations highlighted the need for re-alignment of central policymaking, the adoption of a comparative advantage approach by state policymakers, and the strengthening of institutional capacity. Representatives of participating agencies also provided inputs regarding the organisational structures, activities undertaken and plans for the future, which have been incorporated into the present study.

# Annexure 4

## Institutional Capacity Measurement Questionnaire

**A. Basic Information**

1. What is the agency registered as?
2. Which state department (or departments) does the agency receive its mandate from?
3. Which state department (or departments) does the agency receive funding from?
4. Does the agency have any subsidiary organisations? If yes, please mention their name.
5. What are the immediate priority areas for the institution?

**B. Leadership and Governance**

1. How many members does the governing body have?
2. Is there any representation of women or vulnerable groups (SC/ST) on the board?
3. How often does the governing body meet in one year?
4. Which aspects of the agency are reviewed in the meeting of the governing body?
5. Does the Chief Executive/Director have additional appointments?
6. Does the agency have a strategic plan? When was it last updated/ reviewed?
7. What actions can the organisation take on its own? Which actions need to be cleared with the overseeing department beforehand?

**C. Systems and Structures**

1. Is there a publicly available and upto date organisational chart or organogram?
2. What is the system for internal communication (staff meetings, One Drive/ Google Drive, WhatsApp group)? How often is the system used?
3. Are policies and procedures (for procurement, leaves, hiring etc) documented? What is the method of informing staff about these?
4. Does the agency set targets for divisions? How are these targets set?
5. How is employee level performance tracked and evaluated?
6. What is the training and professional development system of the agency?
7. How many district offices does the agency have?
8. How many divisions does the agency have? What are their names?
9. Which divisions of the agency are associated with each of the following activities?

| Activity | Division name |
|---|---|
| Utility Solar | |
| Utility wind/hybrid | |
| Rooftop solar - domestic | |
| Rooftop solar - government + C&I | |
| Solar water pumps | |
| Small Hydro | |
| Biogas, Biomass, Waste to Energy | |
| DRE for livelihood | |
| DRE for electrification | |
| Other DRE | |
| Electric vehicles | |
| R&D in RE | |

10. How is decision making distributed between division heads and governing body?

**D. Human Resources**

1. How many people are employed in the head office?
2. How many people are employed in each district office?

3. How many people are employed in technical positions in the agency HQ?
4. How many technical positions in the agency are currently vacant?
5. How many employees in technical positions have education or prior experience in RE?
6. What is the number of employees in each division?

| Division name | Number of employees |
|---|---|
| | |
| | |
| | |
| | |
| | |

7. Does the agency have a PMU?
8. How much staff is employed by the PMU at the head office vs the district offices?
9. How many new employees have joined the agency in the past three years?

**E. Finances**

1. Are the financial statements of the agency publicly available?
2. What was the annual budget of the agency set by the overseeing department FY 22-23?
3. How many times was the annual budget reviewed in FY 22-23?
4. For the last three financial years, what has been the budget utilisation of the agency?
5. What are the major sources of income for the agency?
6. What is the expenditure of the agency under each of the following domains in FY 22-23?

| Activity | Expenditure in Rs Cr |
|---|---|
| Utility Solar | |
| Utility wind/hybrid | |
| Rooftop solar - domestic | |
| Rooftop solar - government + C&I | |
| Solar water pumps | |
| Small Hydro | |
| Biogas, Biomass, Waste to Energy | |
| DRE for livelihood | |
| DRE for electrification | |
| Other DRE | |
| Electric vehicles | |
| R&D in RE | |

**F. Areas of responsibility**

Please provide the following information regarding the areas of responsibility given to the agency as per legislation:

1. Which of the following domains is the agency responsible for? (Yes or no)
2. How is this responsibility shared between the agency and other government organisations?
3. What goals or targets been set for each domain?
4. What is the type of scheme or programme being implemented under each domain? Options are:
   a. Central scheme
   b. State scheme – designed by overseeing department
   c. State scheme – designed by agency
   d. Support for obtaining clearances
   e. Support for tendering and implementing
   f. Carry out viability studies

| Activity | Responsibility (Yes or No) | Share of responsibility | Goals/ Targets | Type of scheme |
|---|---|---|---|---|
| Utility Solar | | | | |
| Utility wind/hybrid | | | | |
| Rooftop solar - domestic | | | | |
| Rooftop solar - government + C&I | | | | |
| Solar water pumps | | | | |
| Small Hydro | | | | |
| Biogas, Biomass, Waste to Energy | | | | |
| DRE for livelihood | | | | |
| DRE for electrification | | | | |
| Other DRE | | | | |
| Electric vehicles | | | | |
| R&D in RE | | | | |

**G. Activities**

1. In percentage terms, please assess the contribution of the agency to the total installed capacity/ distributed products/ research outputs under each of the following domains:

| Activity | Contribution in percentage terms |
|---|---|
| Utility Solar | |
| Utility wind/hybrid | |
| Rooftop solar - domestic | |
| Rooftop solar - government + C&I | |
| Solar water pumps | |
| Small Hydro | |
| Biogas, Biomass, Waste to Energy | |
| DRE for livelihood | |
| DRE for electrification | |
| Other DRE | |
| Electric vehicles | |
| R&D in RE | |

2. Does the agency publish an annual program/ activity report?
3. How does the agency communicate scheme and programme information to relevant parties?

**H. Program management**

1. How is program implementation monitored?
2. How is programme success evaluated?

**I. Partnerships**

1. Which government organisations does the agency collaborate with? In what capacity?
2. Which NGO/ civil society organisations does the agency collaborate with? In what capacity?
3. Does the agency engage in outreach efforts for the public?

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