

Challenges Faced by DISCOMs in Meeting Renewable Consumption Obligations

2026

Commissioned by:

Power Foundation of India (PFI)

&

All India DISCOMs Association (AIDA)

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Organisation:

About PFI:
The Power Foundation of India (PFI) is a policy research and advocacy organisation, registered as a Society under the aegis of the Ministry of Power (MoP), Government of India. Supported by leading Central Public Sector Enterprises (CPSEs), PFI undertakes evidence-based research and studies to aid informed decision-making by the MoP, Central and State Electricity Regulatory Commissions, and other stakeholders. PFI's research spans diverse aspects of the power sector, including generation, transmission, distribution, electricity trading, energy transition, and environmental sustainability. The Foundation is committed to addressing sectoral challenges to benefit both consumers and investors, thereby fostering sustainable growth of India's power sector. In addition to research, PFI also conceptualises and executes campaigns and outreach programs on themes relevant to the power sector. These engagements enhance awareness, encourage participation, and motivate environmentally responsible behaviour across society.

About AIDA:
The All India Discoms Association (AIDA) is a not-for-profit collaborative platform representing the full spectrum of India's electricity distribution utilities. Its membership comprises state-owned distribution companies, private distribution utilities, electricity departments of Union Territories, and distribution franchisees, collectively serving over 345 million consumers across the country. AIDA provides a common platform for India's electricity distribution sector to connect, deliberate, and collaborate. It facilitates structured engagement among its members, works closely with government ministries and regulatory bodies on policy and regulatory matters, and supports the development of institutional and technical capabilities essential for strengthening the sector. As a member-driven association, every initiative undertaken by AIDA is guided by a single objective: to enhance the efficiency, financial sustainability, and quality of electricity distribution services in India, ultimately benefiting the consumers served by its member utilities.

Report commissioned by:

Power Foundation of India and All India DISCOMs Association

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Acknowledgements

On behalf of the Indian Institute of Management Ahmedabad and in my personal capacity, I would like to thank Power Foundation of India and All India Discoms Association for sponsoring and supporting this study titled “Challenges Faced by DISCOMs in meeting Renewable Consumption Obligations”. In the context of energy transition initiative taken by the country and the power sector, this study attempts to throw some light on the issues and challenges faced by DISCOMs in increasing the share of RE in the overall energy requirements/consumption.

This study would not have been possible without active interest taken by **Sh. R.K. Tyagi,** Director General, PFI; **Sh. Anshuman Srivastava**, ED, PFI; **Sh. Himanshu Chawla**, Head-Regulatory, PFI; **Sh. Mrinal Anand Aggarwal**, Consultant, PFI and **Sh. Sandeep Kumar**, Associate Regulatory, PFI.

I would like to separately acknowledge the support provided by **Sh. Alok Kumar**, Director General, AIDA and **Sh. S.N. Kalita**, Director (Regulatory Affairs), AIDA in mobilizing the efforts from DISCOMs side to provide data required for the study. Sh. Alok Kumar took personal interest in ensuring flow of information from DISCOMs and shared valuable insights based on his extensive experience in the sector. I would like to acknowledge the inputs and comments received from PFI appointed members of expert panel- **Sh. IS Jha** (Former CMD, PGCIL), **Sh. Dinesh Jagdale** (Former Joint Secretary, MNRE), **Sh. PC Garg** (Former COO, CTUIL), PFI and AIDA officials on an earlier draft. Finally, I would also like to thank the officers from DISCOMs, REIA, CTU and CERC, whom I met or contacted, for sharing their insights and perspectives relevant to this study.



Ajay Pandey
Professor, IIM Ahmedabad

Foreword



India's power sector is undergoing a transformative shift as the country advances towards its ambitious clean energy targets while ensuring affordable, reliable, and sustainable electricity for all. Renewable energy has become an integral component of India's energy security strategy, and the progressive Renewable Consumption Obligation (RCO) trajectory envisaged under the Energy Conservation (Amendment) Act, 2022, reinforces the critical role of Distribution Companies (DISCOMs) in driving this transition. While significant progress has been achieved in renewable energy capacity addition, the timely commissioning of projects and seamless integration with the transmission network remain essential for realizing the intended benefits of the energy transition.

Recognizing these emerging challenges, Power Foundation of India (PFI), in collaboration with the All India DISCOMs Association (AIDA), assigned Indian Institute of Management Ahmedabad (IIMA) to undertake study on "Challenges Faced by DISCOMs in Meeting Renewable Consumption Obligations." The study provides an objective cover assessment of renewable energy projects awarded through Renewable Energy Implementing Agencies (REIAs), examines the reasons for project delays & evaluates their financial and regulatory implications on DISCOMs.

The study finds that renewable energy project delays result from interconnected transmission, regulatory, land, execution, and coordination constraints, increasing DISCOM power procurement costs and affecting RCO compliance. It recommends integrated planning, realistic scheduling, synchronized transmission readiness, stronger stakeholder accountability, balanced risk allocation, and deemed RCO compliance for delays beyond DISCOM control to improve project execution and confidence in renewable energy procurement.

I sincerely appreciate the efforts of Professor Ajay Pandey and the team at the Indian Institute of Management Ahmedabad for conducting this comprehensive study. I also acknowledge the valuable support extended by AIDA, participating DISCOMs, REIAs, the Central Transmission Utility (CTU) and other stakeholders, whose inputs and insights have greatly enriched this report.

I am confident that this study will serve as a valuable reference for policymakers, regulators, utilities, implementing agencies, developers, researchers and other stakeholders working towards strengthening Indian's power sector and accelerating the country's clean energy transition.

Dr. R. K. Tyagi
Director General,
Power Foundation of India

Foreword



The All India DISCOMs Association (AIDA) is pleased to present this report on "Study on Challenges Faced by DISCOMs in Meeting Renewable Consumption Obligations (RCO)", undertaken jointly with the Power Foundation of India (PFI) through IIM, Ahmedabad. The study provides a comprehensive assessment of the challenges encountered by distribution companies in procuring renewable energy through Renewable Energy Implementation Agencies (REIAs) and the consequent impact on compliance with the Renewable Purchase Obligations (RPO) and Renewable Consumption Obligations (RCO) mandated under the Energy Conservation (Amendment) Act, 2022.

Based on the analysis of renewable energy procurement undertaken by selected DISCOMs through REIAs during 2019-20 to 2023-24 and extensive consultations with DISCOMs, Renewable Energy Implementing Agencies (REIAs), and the Central Transmission Utility (CTU), the study highlights that delays in commissioning renewable energy projects have emerged as a significant challenge affecting timely compliance with Renewable Purchase Obligations (RPO) and Renewable Consumption Obligations (RCO). Such delays increase operational and financial pressures on DISCOMs, requiring them to arrange alternate sources of power while also creating regulatory compliance challenges. The study underscores the need for a more coordinated, efficient, and accountable framework for planning and procurement of renewable energy projects.

The study also concludes that many of these delays arise from factors beyond the control of DISCOMs, including transmission infrastructure readiness, land acquisition, statutory approvals, and other external constraints. In view of this, the report recommends that regulatory frameworks should appropriately recognise project delays that are beyond the control of DISCOMs while evaluating RPO/RCO compliance. It further emphasizes the need for better alignment between renewable energy procurement and transmission planning, realistic project scheduling, stronger coordination among REIAs, CTU, CEA, developers and DISCOMs. There is also an urgent need for developing contractual frameworks with balanced risk sharing that promote accountability across all stakeholders.

We believe that the findings and recommendations presented in this report will contribute meaningfully to policy and regulatory reforms aimed at strengthening India's renewable energy ecosystem while safeguarding the financial sustainability of DISCOMs. AIDA remains committed to working closely with policymakers, regulators, utilities, and industry stakeholders to develop practical, evidence-based solutions that accelerate India's clean energy transition and build a resilient and future-ready power distribution sector.

Alok Kumar
Director General
All India Discoms Association (AIDA)

Table of Contents

Section No.	Title	Page No.
	Acknowledgements	
	Foreword by Director General, PFI	
	Foreword by Director General, AIDA	
	Executive Summary	**10**
	Abbreviations	**11**
	List of Tables	**13**
1	**Introduction and background**	**14**
1.1	Objectives of the Study	15
1.2	Scope of Work	15
1.3	Methodology followed for the Study	17
2	**Delays in RE Projects: Trends, Causes and Recommendations**	**18**
2.1	Extent, Magnitude and Trends in Delays	18
2.2	Reasons Cited for Delays in RE Projects	18
2.3	Grid Connectivity/LTA Delays	19
	2.3.1 Planning and Scheduling	20
	2.3.2 Execution Delays	21
2.4	Tariff Adoption by CERC	21
2.5	Extension of SCoD and DISCOMs	22
2.6	Summary & Recommendations to reduce delays in RE Projects	23

Section No.	Title	Page No.
3	**Impact of Delays in RE Projects on DISCOMs : Energy Deficit and Financial Implications**	**25**
3.1	Payment of Higher Energy Charges by Scheduling Conventional Plants or by Purchasing Power through Short-term Contracts /Market	25
3.2	Estimate of Energy Deficit due to Delays in RE Projects	27
3.3	Financial Impact on DISCOMs due to Delays in RE Projects	32
	3.3.1 Estimate Based on the Energy Charge of Other Contracted Long-term Sources	35
	3.3.2 Estimate Based on the Market Prices	36
3.4	Financial Impact due to Non-compliance of RPO/RCO	37
3.5	Summary and Recommendations	39
4	**Consultation Process with Stakeholders**	**40**
4.1	Transmission Utilities	40
4.2	Renewable Energy Developers' Perspective	41
5	**Consolidated Findings, Recommendations and Way Forward**	**42**
5.1	5.1 Synthesis of Key Findings	42
5.2	Integrated Recommendations	43
5.3	Proposed Way Forward	44
5.4	Conclusion	45
	Annexure A: RE projects awarded by Select (6) DISCOMs and Current Status	**46**

Executive Summary

India has established an ambitious renewable energy transition pathway, with Renewable Consumption Obligations (RCOs) requiring DISCOMs to progressively increase their renewable energy consumption from 29.91% in FY 2024–25 to 43.33% by FY 2029–30[1]. To fulfil these obligations, DISCOMs are increasingly procuring renewable energy through Renewable Energy Implementing Agencies (REIAs) such as SECI, NTPC, SJVN and NHPC. However, delays in commissioning renewable energy projects have emerged as a significant challenge, affecting energy availability, increasing power procurement costs and exposing DISCOMs to regulatory compliance risks. Against this backdrop, PFI and AIDA appointed IIM Ahmedabad to assess the causes, magnitude and implications of such delays, based on renewable energy projects across six states—Gujarat, Assam, Maharashtra, Bihar, Uttar Pradesh and Tamil Nadu—during FY 2019–20 to FY 2023–24.

The study reveals that the majority of REIA-awarded projects experienced delays, with 69 projects examined, including 10 projects delayed by more than two years. Grid connectivity and ISTS readiness emerged as the most significant controllable causes of delay, followed by tariff adoption and regulatory approvals, while uncontrollable factors included force majeure events, judicial interventions, land allocation issues, and changes in state government policies. The study further highlights that optimistic commissioning schedules, limited coordination between REIAs and CTU during project planning, and inadequate synchronization between renewable energy projects and transmission infrastructure have substantially contributed to implementation delays.

The consequences of these delays extend beyond project implementation. Delayed renewable energy availability compels DISCOMs to procure costlier conventional power or purchase electricity from the short-term market, increasing power purchase costs and creating challenges in achieving RCO. The study also notes that because renewable generation is intermittent, the principal financial impact arises from higher energy procurement costs rather than capacity shortages for most of the projects analysed.

Based on interactions with DISCOMs, REIAs and the Central Transmission Utility (CTU), the report recommends greater coordination among all stakeholders during project planning, realistic transmission and project scheduling, enhanced involvement of DISCOMs and CEA in procurement planning, synchronization of renewable energy commissioning with transmission readiness, and improved contractual and regulatory mechanisms to allocate risks more equitably. Implementing these measures will reduce project delays, improve compliance with renewable energy obligations, enhance DISCOM financial sustainability, and support India's long-term clean energy transition.

[1] RCO Amendment Notification 2025

Abbreviations

Abbreviation	Full Form
AIDA	All India DISCOMs Association
CEA	Central Electricity Authority
CERC	Central Electricity Regulatory Commission
COD	Commercial Operation Date
CPSE	Central Public Sector Enterprise
CTU	Central Transmission Utility
CUF	Capacity Utilisation Factor
DAM	Day-Ahead Market
DISCOM	Distribution Company
FY	Financial Year
GNA	General Network Access
IEX	Indian Energy Exchange
IIMA	Indian Institute of Management Ahmedabad
ISTS	Inter-State Transmission System
LOLP	Loss of Load Probability
LTA	Long-Term Access
MNRE	Ministry of New and Renewable Energy
MoP	Ministry of Power
MVAR	Megavolt-Ampere Reactive
MW	Megawatt
MWh	Megawatt-hour
NHPC	National Hydro Power Corporation
NTPC	National Thermal Power Corporation
PFI	Power Foundation of India

Abbreviation	Full Form
PSA	Power Sale Agreement
REC	Renewable Energy Certificate
RE	Renewable Energy
REGS	Renewable Energy Generating Station
REIA	Renewable Energy Implementing Agency
RCO	Renewable Consumption Obligation
RfS	Request for Selection
ROW	Right of Way
RPO	Renewable Purchase Obligation
SCSD	Scheduled Commencement of Supply Date
SCoD	Scheduled Commissioning Date
SECI	Solar Energy Corporation of India Limited
SERC	State Electricity Regulatory Commission
SPD	Solar Power Developer
STU	State Transmission Utility
TBCB	Tariff-Based Competitive Bidding

List of Tables

Table 1a	Energy Deficit Reported by Gujarat and Bihar (in MUs)	28
Table 1b	Energy Deficit Estimated for UP, Assam, Maharashtra and Tamil Nadu (in MUs)	29
Table 2	Data Reported by DISCOMs on the Parameters Required for Assessment of Financial Impact	32
Table 3	Financial Impact due to Higher Energy Charges	36
Table 4	Financial Impact Estimate based on Market Prices (in Rs Crore)	37
Table 5a	Financial Impact due to RPO/RCO Shortfall based on RE Certificate Prices	38
Table 5b	Financial Impact due to RPO/RCO Shortfall based on RCO Penalty of Rs 0.45/kWh	38

1. Introduction and Background:

This report, titled “Challenges Faced by DISCOMs in Meeting Renewable Consumption Obligations”, presents the findings of a study assigned to IIM Ahmedabad by the Power Foundation of India (PFI) and All India Discoms Association (AIDA). The report is based on the insights on data received from selected DISCOMs regarding renewable energy procurement contracts entered into during FY 2019–20 to FY 2023–24, as well as interactions with Central Transmission Utility (CTU) and Renewable Energy Implementing Agencies (REIA) officials to understand the causes of delays in implementing renewable energy projects procured by DISCOMs through REIAs during this period.

The study was undertaken to assess DISCOMs’ experience with renewable energy procurement contracts procured through REIAs. Under the Energy Conservation (Amendment) Act, 2022[2], the Ministry of Power has mandated DISCOMs to fulfil Renewable Consumption Obligations (RCO), increasing from 29.91% in FY 2024–25 to 43.33% in FY 2029–30[3]. Failure to comply may attract penalties; therefore, it is important to review DISCOMs’ actual experience with these contracts, particularly the timely availability of renewable energy needed to fulfil their RPO/RCO requirements.

To meet the mandate as well as to fulfil their Renewable Purchase Obligations, DISCOMs have been procuring Renewable Energy either directly from the developers or through designated Renewable Energy Implementing Agencies (REIAs) notified by the Ministry of Power (MOP), such as SECI, NTPC, NHPC & SJVN. REIAs in turn enter into Power Purchase Agreements (PPA) with RE developers selected through tariff based competitive bidding. Energy procured through REIAs by DISCOMs is a significant part of RCO to be met by DISCOMs.Experience of DISCOMs in the recent past has been that quite a few projects awarded by the REIAs have been delayed. Any delay in such projects results not only in failure to meet RCO obligation but also forces DISCOMs to buy Renewable Energy Certificates (REC) and/or additional power from the market. As a large part of the DISCOMs’ procurement has been through REIAs, hence the focus of this study was on RE projects contracted through REIAs.

[2] Energy Conservation Amendment Act-2022
[3] RCO Amendment notification September-2025



1.1 Objectives of the Study

Based on the issues faced by the DISCOMs as outlined above, the objectives of the study were finalized as follows:

- To analyze, ascertain and categorize reasons behind commissioning delays of all REIA awarded projects (FY 2019-20 – FY 2023-24).

- To analyze the process through which extensions granted to RE developers with respect to SCoD i.e., through Regulatory Order by CERC/SERCs or through administrative order of MNRE or any other competent authority.

- To assess and quantify the impact on Power Purchase Cost and in turn Tariff of end consumer, due to time extension, Change-in-Law, uncertainty in transmission charge waiver, delay in commissioning of evacuation infrastructure by CTU/STU, delay in availability of Land, etc.

- To assess the financial and compliance impact of such delays on DISCOMs/Developers.

- To provide actionable recommendations to enhance REIA / CTU / others to align them with national RE goals and to mitigate the financial and compliance impact on DISCOMs/Developers.

1.2 Scope of Work:

The Study intended to cover all RE Projects contracted by the six (6) States i.e., **Maharashtra, Gujarat, Tamil Nadu, Uttar Pradesh, Bihar and Assam** for the period from FY 2019-20 to FY 2023-24 and the scope of work under this study was detailed as follow-

Part 1: Analysis of Delays and Institutional Response Mechanisms

This part of the study was expected to focus on understanding the underlying causes behind delays in the commissioning of Renewable Energy projects awarded by REIAs. The study, therefore, was expected to:

- Identify and categorize the reasons for delay, whether attributable to developers, transmission licensees, forest departments, or issues related to supply chain. Also, to examine how these delays were processed and approved —whether through Regulatory Orders by CERC/SERCs or administrative approvals by MNRE or other competent authorities.

- Distinguish delays arising due to Force Majeure events versus those caused by other reasons attributable to developer / CTU / STU / DISCOM / landowning agencies etc.

- Evaluate the institutional mechanisms available to address delays and the adequacy of such frameworks in minimizing disruptions.

- Propose frameworks where accountability for delays is equitably shared among stakeholders, with a focus on ensuring that consequences are not disproportionately borne by DISCOMs. It will examine how delays should trigger appropriate contractual penalties or disincentives for developers to enhance overall discipline in project delivery.

- The overarching goal of this section was to identify means to minimize project delays and develop efficiency in the renewable energy procurement ecosystem.

For assessing and understanding the above, the following information was required from the DISCOMs-

1. The contractual timelines for the concerned RE projects based on PPA/contract.

2. The PSAs (Power Sale Agreements) associated with RE projects related to the provisions related to delays attributable to the developer, CTU/STU, administrative or regulatory clearances, Change in Law and force majeure events.

3. Information on the delays in all REIA awarded projects and reasons cited for delays. Also, the timing and promptness of notifying delays.

4. The response of REIA and other concerned entities to notify delays and causes thereof.

This part of the study required access to PPA/contracts for the projects and all subsequent inputs/ communications relevant for ascertaining the contractual and actual timelines as the project was implemented such as progress reports, notification of delays and any communication from and to the developer by REIA/ DISCOMs/ Regulator.

Part 2: Impact of Delay in RE projects on DISCOMs Resource Planning

This part of the study was to investigate how delays in REIA-awarded project commissioning disrupted the resource planning processes of DISCOMs. It was expected to:

- Assess how DISCOMs originally planned for the integration of renewable energy capacity into their power procurement mix prior to the delay.

- Examine and quantify how delays forced deviations from the planned resource mix, including:
  - Changes in procurement from short-term markets or costly conventional sources, especially during peak hours.
  - Impact on transmission charges waiver and the cost thereof
  - Financial impact due to change-in-laws
  - Purchase of Renewable Energy Certificates (RECs) to meet RCO.
  - Payment of proposed penalty for non-compliance of RCO target
  - Other Financial and Compliance impact of such delays on DISCOMs.

- Impact to additional financial burden on end consumer in terms of Tariff

- Explore how SERCs have addressed these unplanned costs in Tariff Orders and whether there is a need for Regulatory clarity, appropriate mechanism of sharing of financial burden or institutional support to shield DISCOMs and consumers from such burdens.

For assessing and understanding the above, the following information was required from the DISCOMs-

1. The plan of a DISCOM to use the energy from contracted RE project block-wise, season-wise and assumed CUF, probability of being available block-wise for fulfilling RCO and RPO based contracted SCoD.

2. The assessment of shortfall of energy from contracted RE project due to the delay on the DISCOM month-wise for the period of delay. This was required for estimating the extent of shortfall in RCO and RPO due to the delays.

3. Details on the response of the DISCOM such as alternative procurement from market, bilateral trade and the price paid for the energy shortfall due to delay. The difference in contracted RE price during the period of delay time month-wise /sample days wise and actual price paid for the deficit, was required for estimation of increase in Power Purchase Cost due to delays.

4. Details on the impact of delay on change-in laws and transmission charge waivers. This was required to determine the present and future impact on cost of power purchase.

This part of the study required access to the DISCOM's plan of using contracted RE for meeting

energy requirement month-wise wise as detailed in point 1 above and similarly, the actual use of resources including short-term purchases month-wise for the period of delay as outlined in point 2 &3. Since this data can be voluminous, it was desirable if the data was made available in a machine-readable form.

1.3 Methodology followed for the Study:

Since the focus of the study was to assess the reasons for delays in RE projects awarded by the designated REIAs in six (6) States as mentioned above, the DISCOMs were approached through the office of Director (Regulatory Affairs), AIDA late in the month of September 2025 with the request to provide following information initially-

1. The original schedule and actual date of SCOD for each RE project slated for commissioning during the above-mentioned period.

2. The reasons ascertained for the delay in each RE project.

3. PA and PSA of each RE project in case the procurement was mediated by a REIA.

4. All communications with REIA, developers and other stakeholders during the project.

5. The handling of delays in any delayed project by the REIA/regulator etc.

6. The usage planned for each of these RE projects/capacity.

7. The handling of deficit arising out of delays by the DISCOM

The DISCOMs were requested to also nominate a point of contact for further information that would be required during the study.

During the months of October 2025 and November 2025, the six DISCOMs have provided the initial data regarding details of all the projects and the delays, if any, of all RE projects contracted through REIAs.

However, the data on planned usage of the generation from these projects was not as comprehensive as originally envisaged and as requested from all the DISCOMs.

Subsequently in March 2026, the DISCOMs were once again approached with the request to provide their own estimates of energy loss year wise starting from FY 2019-20 through to FY 2024-25 due to delays by filling in details in a specified format. They were also requested to provide separately their average energy charge for long-term PPAs to assess the impact of energy loss of intermittent RE sources, which presumably would have been met by operating the long-term capacities as the RE energy was not available due to delays. In case they were forced to buy power from the market to make up for the energy shortfall, the relevant information was also sought. To the extent the DISCOMs bought RE certificates to meet their RCO/RPO compliance requirements, they were requested to provide the detailed information in a specific format.

Based on the data received from the DISCOMs and reasons cited for delays in many projects, the office of DG, AIDA facilitated interactions with CTU and REIAs to understand the perspective of these key stakeholders who are in direct contact with the project developers.

This study is thus based on the data, as received, from the DISCOMs and based on insights gained from the interactions with officials of REIAs and CTU.



2. Delays in RE Projects: Trends, Causes and Recommendations

State-wise project-wise data provided by the state DISCOMs on RE projects procured through REIAs during the period covered (beginning 2019-20) is compiled and presented in the Annexure A of this report.

2.1 Extent, Magnitude and Trends in Delays

As can be seen in Annexure A, most renewable energy projects contracted by DISCOMs through REIAs have been delayed, and only a small number adhered to their original SCoDs. Most delays are less than one year; however, 10 of the 69 projects covered in the study have been delayed by two years or more. Several projects have revised SCoDs in 2026 or 2027, and the eventual length of their delays will depend on whether they are commissioned according to those revised schedules.

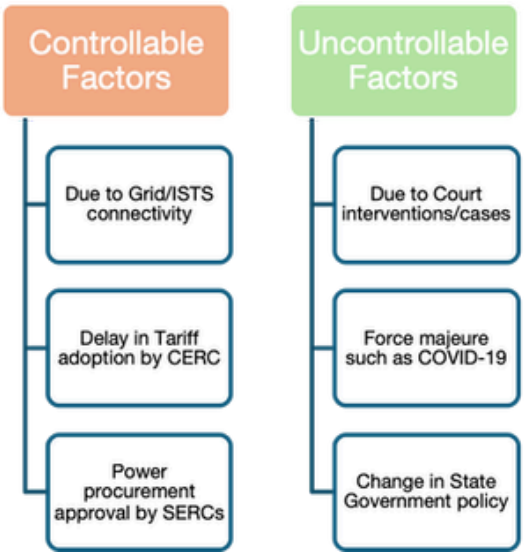
Another interesting aspect of the data in Annexure A is that the delays in projects are increasing over the years as far as these select 6 states are concerned. Partly it is because some of the DISCOMs have been contracting more RE projects during the later part of the period covered in the study. The extreme case is that of Maharashtra where all the reported projects (21 in all) have SCoD of 2026 or later. Besides the increase in contracted projects in later years, the delays of the projects scheduled for commissioning, in the recent past and going forward, have been increasing. Out of the 10 projects facing delays of more than 2 years, 6 were scheduled for commissioning after 2023 or later. The consequence of higher number of projects contracted coupled with higher delays has resulted in higher energy losses due to the delays in the later years of the period covered under the study. This fact, in terms of details of energy losses and financial impact due to RE project delays, is covered in the next chapter of this report.



2.2 Reasons Cited for Delays in RE Projects

For the delays in RE projects, multiple reasons have been reported as per the data provided by the DISCOMs on delays in the REIA tendered RE projects. From the point of view of understanding the reasons and to be able to improve upon the processes, which might lead to reduction in such delays going forward, the delays were classified as controllable and uncontrollable delays.

The controllable factors, which have been reported, are the ones in which some entity within the sector (be it developer, REIA, DISCOM, CTU/STU or the regulator(s)) could have controlled the delays through better planning, execution or monitoring. On the other hand, the uncontrollable factors are those which are outside the jurisdiction and the area of influence of the entities within the sector. With this classification in mind, the list of reasons for the project delays is summarized below-



Out of these, more than 25 projects have been reportedly delayed due to Grid Connectivity issues. Most of these are in areas having high RE potential such as Rajasthan, Kutch etc. The next highest reason, which can be considered controllable, is reported as the delay due to tariff adoption by CERC and approval of power purchase by SERCs.

While some of the DISCOMs have furnished the relevant communication between the REIA and the DISCOM, all have not yet furnished the information to judge whether the DISCOMs were aware of the cause of delays as and when it arose. Based on the detailed analysis of information provided by the DISCOMs, the actionable insights need to focus on the two major issues- (a) delay in grid connectivity/LTA forcing delay in COD, and (b) adoption of tariff by CERC and approval of procurement by SERCs.

Accordingly, the Director General of AIDA had facilitated a set of meetings with the CTU and some of the REIAs (NTPC/NHPC) with the following objectives-

1. With the CTU to understand the issue related to connectivity.

2. With the REIAs as to how they look at these emergent issues while contracting and initiating development of RE projects.

2.3 Grid Connectivity/LTA Delays

As pointed out earlier, the data on the delays of RE projects suggests that maximum number of projects faced delays because the project could not obtain connectivity with the Grid/ISTS (Inter State Transmission System) as originally planned. All REIA procured RE projects obtain “in principle” approval for grid connectivity at the time of entering PPA with REIAs. However, the actual time taken has been longer than what was factored while estimating SCoD. The only reason for such delays can be either due to optimistic schedule while forecasting the completion of transmission link and system or due to delay in execution even when the schedule was realistic. To understand the actual reason for the delays due to lack of connectivity, meetings with CTU and REIA were necessary.

Before reporting the perspective of CTU, it is important to note that the relevant clause of the standard PPA between the SECI as a REIA and the Developer, which results in extension of SCoD due to non-operationalization of GNA, is as under -

> *"Subsequent to grant of connectivity, in case there is a delay in operationalization of GNA by the CTU and/or there is a delay in readiness of the ISTS substation at the Delivery Point, including readiness of the power evacuation and transmission infrastructure of the ISTS network until SCSD of the Project, and it is established that: (i) The SPD has complied with the complete application formalities as per RfS, (ii) The SPD has adhered to the applicable Procedure in this regard as notified by the CERC/CTU, and (iii) The delay in operationalization of GNA and/or delay in readiness of the ISTS substation at the Delivery Point, including readiness of the power evacuation and transmission infrastructure of the ISTS network, is solely attributable to the CTU/transmission licensee and is beyond the control of the SPD; The above shall be treated as delays beyond the control of the SPD and SCSD for such Projects shall be revised as the date as on 60 days subsequent to the readiness of the Delivery Point and power evacuation infrastructure and/or grant/operationalization of GNA. Decision on requisite extension on account of the above factor shall be taken by SECI."*[4]

The interactions with CTU and REIA were accordingly focused on understanding whether the planning and scheduling of RE projects awarded by REIAs was optimistic or whether execution delays in transmission links and systems was the main reason for experienced delays.

2.3.1 Planning and Scheduling

As stated earlier, one possible reason for the delays in commissioning of REIA procured RE projects could have been unduly optimistic timeframe while estimating the SCoD. In the interactions with the CTU and REIA, the following points emerged-

- According to the REIA, the CTU was not in the loop when the RE projects were tendered except for 'in principle" approval. The RE capacity additions were tendered based on the National Electricity Plan.

- According to the CTU, the schedules envisaged were based on project completion timeframe of 20 months, which was achieved in some projects. However, a more realistic time frame of 3-4 years would have been more in line with the experience of the past and present. This has been recognized now and has been admitted in various forums including Joint Coordination Committee.

- The rush to contract for RE projects was also driven by the 100% transmission fee waiver applicable to RE projects commissioned up to June 2025. This waiver would be reduced to 75% for projects commissioned by June 2026 and will be eliminated after June 2028 with 25% reduction in the waiver every year.

- Subsequently, the delays in RE projects due to delay in Grid Connectivity for projects with SCoD on or before June 2025 have been allowed for two extensions of six months each provided the delay is due to delay accepted by CTU. No such framework has been as yet put in place for projects with SCoD after June 2025.

- As the RE projects have so far been geographically concentrated in a few districts of the country, the transmission system required to evacuate the energy from contracted RE projects is likely to increase transmission cost for the buyers after the waiver as the waiver defrays the cost on all beneficiaries rather than the buyer and this may result in unwillingness to contract for RE.

[4] Standard PPA between the SECI as a REIA and the Developer

- It was pointed out that currently 42 GW RE capacities tendered by REIAs are waiting for the signing of PSA with DISCOMs, who are not keen at this juncture partly due to delays and uncertainties associated with already contracted capacity and partly expecting lower prices in the future. The newly contracted capacities are also expected to have higher transmission costs.

Based on the above inputs, it can be stated that the lack of involvement of CTU and unduly optimistic timeframe for completion of enabling transmission system has been one of the major reasons for observed delays in RE projects.

Unlike in the past where the gestation period of generation capacity addition used to be greater than or equal to the gestation period for transmission system addition/augmentation, the RE projects can be completed much faster (18-24 months) as compared to the enabling transmission system except in situations where transmission systems have been put in place in anticipation of RE projects. This fact calls for greater involvement of CTU while tendering the RE projects and while scheduling SCoD of such projects.

2.3.2 Execution Delays

In addition to optimistic timeframe envisaged for creating/strengthening enabling transmission system required for the RE projects, some of the transmission projects have been delayed due to delays in execution affecting the contracted RE projects. In the data supplied by DISCOMs only one reason, i.e., delays in some projects due to Great Indian Bustard habitat concerns taken by the Court has been reported as a reason for the delay due to execution. In conversations with the CTU, following additional insights emerged-

- The right-of-way required for transmission projects has been delayed in some cases. Furthermore, obtaining right-of-way and access for construction is becoming increasingly challenging, even in areas of Rajasthan where this was not a major issue in the past.
- In projects where some land is also required, obtaining land is even more difficult than getting ROW and has affected some transmission licensees.
- For a short period after 2020, the tenders for transmission licenses were affected by changes in policies restricting procurement of material from entities owned by some countries.
- On a query related to any execution delay attributable to performance of transmission project developers, the CTU experience has not been adverse so far with respect to any of the active developers/transmission licensees.
- CTU officials pointed out that the transmission costs are expected to rise if the high RE potential areas remain in the focus for RE capacity addition.

These inputs from CTU suggest that execution delays, where they occur, are mostly attributable to factors such as court cases and impediments to obtaining “right-of-way” or acquiring land. Public resistance to the construction of transmission lines —widely known as the “not in my backyard” or NIMBY problem—is also increasing. One alternative suggested by various officials is to harness renewable energy potential across the country rather than relying only on areas with the highest potential.

2.4 Tariff Adoption by CERC

Any delay in tariff adoption by the regulator is likely to affect the SCoD as per the clause of standard PPA between the developer and SECI as a REIA, as given under-

“Notwithstanding the Effective Date, the condition precedent for the enforcement of the obligations of either party against the other under this Agreement shall be that, within 60 days of submission of application/petition for

tariff adoption in Appropriate Commission or within 120 days from the signing of Power Sale Agreement (PSA), whichever is more, within 120 days from the signing of Power Sale Agreement (PSA), whichever is more, SECI/Buying Entity shall obtain adoption of tariff from CERC/SERC as applicable, on the terms and conditions contained in this Agreement read with the terms and conditions contained in the Power Sale Agreement entered into between SECI and the Buying Entity(ies). The Parties agree that in the event, the order of adoption of tariff as mentioned above is not issued by the CERC/SERC within the time specified above, the provisions of Article 2.1.4 shall apply.

Further, the article referred to above (2.1.4) states that –"if the requisite Appropriate Commission's order is issued after the timeline as per Article 2.1.3, this shall entail a corresponding extension in SCSD for equal number of days for which the order has been delayed beyond such period as specified in Article 2.1.3.[5]"

In interactions with a REIA, it was pointed out that till 2023, the tariff adoption by CERC required both the PPA with developer and PSA with DISCOMs. Formally, the jurisdiction of CERC for tariff determination is established only when a DISCOM buys power, either directly or through a trader like a REIA. A generator selling to a trader, i.e., REIA is outside the jurisdiction of CERC. Lately starting 2023, the CERC has been adopting tariff once PPAs are signed subject to signing of PSAs. The perspective of the REIA and the CERC was that the delay cited is mostly due to delay in signing PSAs rather than at the end of CERC.

2.5 Extension of SCoD and DISCOMs

In order to understand the role and influence of DISCOMs in extension of SCoD, it was important to understand the contractual arrangement through which REIA awarded projects are contracted by the DISCOMs. The following points emerged from the understanding based on contracts (PSA and PPA) and interaction with the REIA-

- The arrangement with DISCOM is based on consolidated contract covering both PPA and PSA and hence the provisions of both need to be read together.

- The PPA provides for extension due to delays outside the control of developer such as force majeure, delay attributable to transmission connectivity, regulatory approval etc.

- The REIAs do not grant the extension in SCoD without the consent of DISCOMs as they are the end beneficiary and end up bearing the consequences; financial and otherwise.

- It was the experience of one of the REIAs that DISCOMs sometimes do not respond to communication related to extension of SCoD. This, however, could also be due to the nature of contracts as the PPA allows for extension under certain circumstances cited above. In effect clauses of PPA and PSA read together mean that any delay due to reasons outside the control of developers has to be borne by the DISCOMs and they may not be able to do much about that.

Another relevant omnibus clause of the standard PPA that allows the extension of SCoD is quoted below. This enables the extension provided the delay is not attributable to the developer-

"In the event that the SPD is prevented from performing its obligations under Article 4.1 by the SCSD due to:

a) any SECI Event of Default; or

b) Force Majeure Events affecting SECI/ Buying Entity(ies) , or

c) Force Majeure Events affecting the SPD,

the SCSD and the Expiry Date shall be deferred, for a reasonable period but not less than 'day for day' basis, to permit the SPD or SECI/ Buying Entity(ies) through the use of due diligence, to overcome the effects of the Force Majeure Events affecting the SPD or SECI/Buying Entity(ies), or till such time such Event of Default is rectified by SECI."[6]

[5&6] Standard PPA SECI - SPD

2.6 Summary & Recommendations to reduce delays in RE Projects

Based on the data provided by the DISCOMs, quite a few RE projects awarded by REIAs have been delayed during the period covered in this study. The delays have increased in the latter years. The delays in RE projects are attributable to both uncontrollable and controllable factors. Prima-facie, the uncontrollable factors are- court interventions/cases, change in the State Government policy, land allocation by state government, model code of conduct for elections, force majeure such as COVID-19 etc. Similarly, the controllable factors, prima facie, cited are- delays due to Grid/ISTS connectivity, tariff adoption by CERC, power procurement approval by SERCs etc.

The following key insights emerged-

1. The RE projects awarded by REIAs didn't have CTU in the loop while planning for SCoD. The tenders were based on the capacity additions as envisaged by the National Electricity Plan.

2. The CTU itself worked with an unrealistic timeframe for the completion of transmission projects required to provide connectivity to the renewable energy projects awarded by REIAs.

3. The transmission fee waiver policy incentivized developers and DISCOMs to aggressively bid for and contract respectively putting further strain on pace of transmission capacity addition.

4. While tariff adoption was a factor causing delay, the delay was due to lack of signing of PSA with DISCOMs. This issue has now been resolved as CERC adopts tariffs once REIAs have tendered projects.

5. The PPAs with developers allow for extension of SCoD if the delay is not attributable to the developer and such delays will eventually be borne by DISCOMs as PSA must be read in conjunction with PPA. The relevant clauses of the standard PPA have been quoted in this report above.

6. The REIAs inform the DISCOMs about the extension of SCoD as soon as they get informed. However, due to back-to-back arrangement it can be argued that REIAs are not affected by any delay as a pure trader.

7. As of the date of this report, 42 GW of renewable energy capacity tendered by REIAs is awaiting the signing of PSAs with DISCOMs, which are becoming increasingly risk averse.

From the above insights, the following points emerge which can be factored to minimize the delays in REIA awarded projects-

- There is need to float tenders for RE projects to augment installed capacity in line with the readiness and realistic gestation period as required by CTU for enabling grid connectivity.

- CTU itself must factor in more realistic gestation period based on the specific RE project requirements. Ideally, the SCoD for each REIA tendered projects should be in sync with the schedule of the transmission system required for connecting that project. This will be also consistent with the current PPAs as any delay in connectivity automatically resets SCoD or RE projects.

- The key stakeholders- CTU and REIAs, do not bear the risks associated with delays in RE projects and hence, there is a need for more involvement of an entity like CEA which has overall visibility of RE potential and transmission system availability as per the -plans. DISCOMs should also be involved in the REIA tendered projects right from planning stage as their objective is to meet energy requirements and to ensure RCO/RPO compliance. This will allow them to take measures in advance to meet energy requirement as well as RCO/RPO mandate.

Going forward, DISCOMs will need to factor in transmission costs if they procure RE from distant sources requiring substantial investment in augmenting transmission capacity.

- The current clauses in PPA and PSA read together leave grid connectivity, regulatory delays and farce majeure risks transferred to DISCOMs. Contractually it is fair as far as the developer is concerned as it cannot be penalized for factors outside its control. Currently the PPA and PSA together leave no room for DISCOMs to object/dispute if the delays are on account of these reasons. It is fait accompli as far as the DISCOMs are concerned.

- The initiator of the procurement (PPA), i.e., the REIA, as a pure trader, bears no risks due to project delays and has therefore no incentive to time the procurement in line with and in coordination with other stakeholders.

CTU also offers connectivity on "best efforts" basis. While CTU and REIAs cannot be expected to bear any risks contractually, the process needs to be strengthened with greater DISCOMs involvement at the procurement stage to avoid over-optimistic schedules. An alternative would be to tender for new RE projects only when the transmission system and regulatory approvals are in place but that may slow down the national effort towards energy transition.

- Given the fact that REIAs and CTU do not bear any risk, it might be also worthwhile to consider aligning the interest of REIAs with that of DISCOMs. In addition to synchronizing SCoD of RE projects with scheduled competition of date of transmission project, REIA trading margin can be linked with the quantum of delay in each project, i.e. the 7 paise /kWh trading margin charged by REIAs should be lower depending upon the delay in a REIA awarded RE project.



3. Impact of Delays in RE Projects on DISCOMs : Energy Deficit and Financial Implications

The delays in RE projects contracted by DISCOMs through REIAs have resulted in energy deficit relative to their plan. The energy deficit due to delays affected the DISCOMs in following two ways-

3.1 Payment of Higher Energy Charges by Scheduling Conventional Plants or by Purchasing Power through Short-term Contracts /Market

The power deficit caused by the delays in commissioning of RE projects would have to be met by DISCOMs either by requisitioning and scheduling higher output from the conventional plants or by buying power from the market or traders. The former is more likely if the DISCOMs had planned adequate contracted capacity of dispatchable conventional capacity. This scenario is more likely for solar RE projects as their generation is usually outside the peak system demand of a DISCOM and the intermittent solar RE capacity without storage cannot be planned for peak hours. The wind RE capacity has, however, a very different generation profile and can sometimes coincide for some time with peak hours. To the extent wind or hybrid RE projects were planned to meet peak requirements, the only alternative facing the DISCOMs is to buy energy from the market/traders to meet peak demand. Thus, the minimum effect of energy deficit in either of the two situations is the additional cost of operating conventional plants relative to RE energy. It is important to note that any estimation of financial impact cannot be too precise as the delayed projects would have generated electricity with some probability in each timeslot during the period of delay and therefore, the impact at best can be an estimate of expected value of extra cost incurred by the DISCOMs.

In fact, in the absence of firm price-quantity contract over the contract period, even the firm capacity conventional generators do not have any obligation to supply in case of outages.

3.1.1 RE Power is Unlikely to Contribute to Resource Adequacy/ Capacity Procurement

The impact of delays in RE projects would have been higher if the energy from delayed RE projects was planned for meeting peak demand requirement. This is, however, unlikely as RE power cannot be relied upon for resource adequacy / capacity contracting. In the guidelines for Resource Adequacy Planning Framework of India framed under rule 16 of the Electricity (Amendment) Rules, 2022 disseminated in June 2023, the fact that RE power plants will be generating intermittently is recognised and covered in Annexure C of the guidelines. It differentiates “firm capacity” from “variable renewable generation” and recognizes that the generation from RE may not coincide the periods of peak demand. For estimating the capacity credit of RE plants, the methodologies suggested are-

(a) Capacity credit approximation with Top Demand Hours:

In this case, a basic approximation of capacity credit can be obtained by averaging the historical contribution of a generator / generator class during peak demand hours. The selection of how many peak demand hours to include, however, often varies across geographies.

(b) Capacity credit approximation with Top Net Load Hours

In this case, consideration is given to the fact that periods of system stress occur when high demand coincides with low renewable energy generation. A metric called 'net load' is defined as 'total renewable energy generation subtracted from overall demand', which must be met from dispatchable resources like thermal plants, hydro plants, etc. Due to system stress caused by the duck curve, net load is a better proxy for system stress for new capacities than peak demand. In this method, capacity credit can be obtained by averaging the contribution of a generator / generator class during top net load hours.

(c) Expected Load carrying capability:

In this method, a model uses an hourly timeseries demand data for a particular period. The model also uses the availability of different generation resources in each hour of the year. Random outages of generators are also applied considering the historical and expected outage conditions. Determine supply matching is used to determine the LOLP of the system. .....

The resource adequacy plans of the states where the peak does not coincide with the RE generation reflect this fact (for example UP and BIHAR are forecasting procurement via STOA/MTOA (short term/ medium open access) for resource adequacy as neither their peak coincides with RE generation nor probabilistic nature of RE generation provides high capacity credit from RE generation.

3.1.2 Delay in RE Projects causes High Energy Charge Conventional Generators to be Scheduled

In short, the effect of delay in RE generation is more likely to be due to higher energy charge paid for by scheduling conventional high-cost generation which in the presence of RE generation would have been backed down. If the RE project was procured as a nearly "firm contract" using storage or RTC contract, then the DISCOM could have been short on capacity as well besides energy. But that is not the profile of RE projects studied here.

The intermittency of RE generation is also reflected in the estimates of the DISCOM as far as their energy loss estimates are concerned as they have used CUF for estimation as they cannot provide a firm estimate or plan of the energy scheduled from these delayed projects.

Thus, the most appropriate measure for assessing the impact due to delay in RE projects is the difference in the price to be paid for costliest (in terms of energy charges) conventional plant relative to contracted RE power during the period of delay. This information requires knowing the energy charge of the costliest plant which could have been backed down during the period of delay. In the absence of plant wise energy charge and their ability to ramp up/down, we are constrained to use the average energy charge, which is a lower bound of the estimated impact. Having argued in favour of appropriate measure of impact being the difference between energy charges of a high-cost conventional generator and contracted price for RE power, we nonetheless estimate and report market price-based measure of impact also in the report.

3.1.3 Potential/ Actual Cost of Non-Compliance on RCO/RPO

The energy deficit arising out of RE project delays can also result in loss of RE energy accounted for meeting RCO (renewable consumption obligations)/RPO by the DISCOMs. This can be either met by buying RE certificates or by paying penalty for non-compliance at the rate specified by the regulators.

Accordingly, the DISCOMs covered in this study were requested to provide an estimate of energy loss caused by the delays in RE projects. To assess the financial impact of delays, they were requested to provide energy charge of contracted conventional plants, market purchases during solar and wind hours, overall deficit/surplus in RPO/RCO, and cost of RE certificate purchases. While some of the DISCOMs provided somewhat more comprehensive data, others could not provide all the details sought. None of them could provide data at the level of day-to-day planned utilization of such contracted resources[*]. Based on the data provided and based on assumption consistent with their data, the energy deficit caused by delays has been estimated in the study. The rationale and assumption have been stated clearly where the data is not directly from the DISCOMs.

3.2 Estimate of Energy Deficit due to Delays in RE Projects

Three states- Gujarat, Bihar and Tamil Nadu provided the energy deficit caused by the delays in RE projects year-wise. However, due to certain errors, we had to estimate the energy deficit for Tamil Nadu to make it consistent with other information related to project delay. For the states of Gujarat and Bihar, the information year-wise is presented in Table 1a.

For the remaining four states, the energy deficit was estimated using assumed CUFs of 22% for solar capacity and 32% for wind capacity, based on the number of days of delay for each project. Table 1b presents the estimated energy deficit for Uttar Pradesh, Maharashtra, Assam and Tamil Nadu. Even for the states that provided their own data, the estimates were based on CUF assumptions.

As shown in the table, the energy deficit in the selected states has been increasing because larger capacities have been scheduled for commissioning in recent years. Maharashtra has not experienced an energy deficit to date because most of its contracted projects are due for commissioning after March 2026. The estimates do not capture the likely future increase in energy deficits, as projects affected by grid-connectivity delays may experience longer postponements, as indicated in Annexure A.

[*]Given the intermittency of RE, this was expected as stated earlier in this section.



Table 1a: Energy Deficit Reported by Gujarat and Bihar (in MU)

Gujarat

S. No.	Project	Capacity (MW)	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23	FY 2023-24	FY 2024-25	FY 2025-26
1	SECI-GUVNL	700	-	-	-	-	-	673	1290
2	SECI-GUVNL	600	-	-	-	-	-	-	-
	Total		**0**	**0**	**0**	**0**	**0**	**673**	**1290**

Bihar

S. No.	Project detail	Capacity MW	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23	FY 2023-24	FY 2024-25	FY 2025-26
1	SECI Wind	50	54	152	24	0	0	0	0
2	SECI Wind	300	0	43	865	0	0	0	0
3	SECI Wind	50	0	0	6	104	0	0	0
4	SECI Solar	150	0	146	373	373	373	359	0
5	SECI Solar	300	0	210	389	0	0	0	0
6	SECI Solar	180	0	0	329	517	517	300	0
7	SECI Solar	150	0	0	267	420	420	209	0
8	SECI Solar	150	0	0	201	67	0	0	0
9	SECI Solar	600	0	0	0	0	0	915	1316
10	NTPC Solar	300	0	334	150	0	0	0	0
11	Hybrid	210	0	0	0	0	162	472	472
	Total		**54**	**885**	**2603**	**1480**	**1471**	**2257**	**1788**

Table 1b: Energy Deficit Estimated for UP, Assam, Maharashtra and Tamil Nadu (in MU)

Assam

S. No.	Project detail	Capacity MW	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23	FY 2023-24	FY 2024-25	FY 2025-26
1	SJVN Green Energy	70	0	0	0	0	0	0	54
2	SJVN Green Energy	50	0	0	0	0	0	0	62
3	SJVN Green Energy	200	0	0	0	0	0	0	249
	Total		**0**	**0**	**0**	**0**	**0**	**0**	**365**

Maharashtra

S. No.	Project detail	Capacity MW	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23	FY 2023-24	FY 2024-25	FY 2025-26
1	NHPC Solar	25	0	0	0	0	0	0	0
2	NHPC Solar	400	0	0	0	0	0	0	0
3	NHPC Solar	250	0	0	0	0	0	0	0
4	NHPC Solar	300	0	0	0	0	0	0	0
5	NHPC Solar	250	0	0	0	0	0	0	0
6	NHPC Solar	250	0	0	0	0	0	0	0
7	NTPC Solar	300	0	0	0	0	0	0	0
8	NTPC Solar	300	0	0	0	0	0	0	0
9	NTPC Solar	700	0	0	0	0	0	0	0
10	NTPC Solar	300	0	0	0	0	0	0	0
11	SECI Solar	700	0	0	0	0	0	0	0
12	NTPC Wind-Solar Hybrid	250	0	0	0	0	0	0	0
13	NTPC Wind-Solar Hybrid	300	0	0	0	0	0	0	0
14	NTPC Wind-Solar Hybrid	230	0	0	0	0	0	0	0
15	SJVN (FDRE)	180	0	0	0	0	0	0	0
16	SJVN (FDRE)	418	0	0	0	0	0	0	0

S. No.	Project detail	Capacity MW	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23	FY 2023-24	FY 2024-25	FY 2025-26
17	SJVN (FDRE)	150	0	0	0	0	0	0	0
18	SJVN (FDRE)	120	0	0	0	0	0	0	0
19	SJVN (FDRE)	120	0	0	0	0	0	0	0
20	SJVN (FDRE)	160	0	0	0	0	0	0	0
21	SJVN (FDRE)	320	0	0	0	0	0	0	0
	Total		**0**	**0**	**0**	**0**	**0**	**0**	**0**

Uttar Pradesh

S. No.	Project detail	Capacity MW	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23	FY 2023-24	FY 2024-25	FY 2025-26
1	SECI Solar	100	0	0	0	0	0	0	140
2	SECI Solar	100	0	0	0	0	0	0	117
3	SECI Solar	300	0	0	0	0	0	0	352
4	SECI Solar	300	0	0	0	0	0	0	0
5	SECI Solar	250	0	0	0	0	0	0	0
6	SECI Solar	300	0	0	0	0	0	0	0
7	SECI Solar	150	0	0	0	0	0	0	0
8	NHPC Solar	250	0	0	0	0	0	0	0
9	NHPC Solar	1000	0	0	0	0	0	0	0
10	NHPC Solar	275	0	0	0	0	0	0	0
11	SECI Wind	85	0	0	61	0	0	0	0
12	SECI Wind	51	0	0	142	66	0	0	0
13	SECI Wind	324	0	0	909	498	0	0	0
14	SECI Wind	50	0	0	133	96	0	0	0
15	SECI Wind	130	0	0	347	364	14	0	0
16	SECI Wind	113	0	0	0	0	79	315	315

S. No.	Project detail	Capacity MW	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23	FY 2023-24	FY 2024-25	FY 2025-26
17	SECI Wind	68	0	0	0	0	48	189	189
18	SECI Wind	56	0	0	0	0	40	158	158
19	SECI Wind	169	0	0	0	0	119	473	473
20	SECI Wind	45	0	0	0	0	32	126	126
21	SECI Wind	129	0	0	0	0	0	0	268
22	SECI Wind	194	0	0	0	0	0	0	543
23	SECI Wind	194	0	0	0	0	0	0	543
24	SECI Wind	300	0	0	0	0	0	0	376
25	SECI Wind	200	0	0	0	0	0	0	250
	Total		**0**	**0**	**1593**	**1025**	**332**	**1261**	**3849**

Tamil Nadu

S. No.	Project detail	Capacity MW	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23	FY 2023-24	FY 2024-25	FY 2025-26
1	SECI Tranche VI	60	0	0	0	-9	0	0	0
		100	0	0	0	0	0	0	0
2	SECI Tranche VI	170	0	0	0	0	0	0	0
3	SECI Tranche VI	120	0	0	0	0	-58	0	0
		50	0	0	0	0	21	0	0
4	SECI Manf. linked	667	0	0	0	0	599	1285	926
5	SECI Manf linked	333	0	0	0	0	0	491	642
6	SECI Tranche VIII	100	0	0	0	0	0	0	34
		55.55	0	0	0	0	0	0	26
		144.5	0	0	0	0	0	0	81
7	SECI Tranche VIII	200	0	0	0	0	0	0	-15
	Total		**0**	**0**	**0**	**-9**	**562**	**1776**	**1693**

To sum up, the energy deficit reported by the DISCOMs and estimated following methodologies followed by the DISCOM after factoring in delays indicate a rising trend and some of the states such as Maharashtra, which started contracting REIA tendered RE projects later in the period are yet to face the energy deficit.

In this report, we next estimate the financial impact of RE project delays on the DISCOMs based on the data supplied by the DISCOMs and estimates based on assumptions like that of DISCOMs.

3.3 Financial Impact on DISCOMs due to Delays in RE Projects

To assess the impact of delays, year-wise data on the following parameters was sought from the DISCOMs-

1. Average Energy Charge in Rs/kWh
2. RPO Shortfall/Excess in MUs excl. RE Certificates
3. Energy Purchased from traders/exchange during solar hours in MUs
4. Energy Purchased from traders/exchange during wind hours in MUs
5. Average cost of short-term energy purchase during solar hours in Rs/kWh
6. Average cost of short-term energy purchase during wind hours in Rs/ kWh
7. RE Certificates purchase costs in Rs Crores
8. RE certificate quantity of energy purchased in MUs

The data as supplied by the six DISCOMs is presented in Table 2. As can be seen from the Table that the DISCOMs have not reported the data at a level where exact impact of the energy deficit based on original plan can be estimated precisely. Partly this was expected as RE energy sources are intermittent and only a broad generation profile can be used for planning the energy from such sources in the future.

Table 2: Data Reported by DISCOMs on the Parameters Required for Assessment of Financial Impact

Gujarat							
Particulars	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**
Average Energy Charge in Rs/kWh	4.51	4.52	5.07	5.98	5.53	5.42	
RPO Shortfall/Excess in MU excl. RE Certificates	1068	-34	267	1756	-155	-6604	534
RE Certificate Cost Rs/kWh	N/A	N/A	N/A	N/A	N/A	N/A	
Average cost of short-term energy purchase during solar hours in Rs/kWh	N/A	3.46	4.36	5.68	5.36	4.27	3.98
Average cost of short-term energy purchase during wind hours in Rs/ kWh	N/A	3.47	5.88	6.24	6.37	5.05	5.07

Assam							
Particulars	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**
Average Energy Charge in Rs/kWh	4.10	4.39	4.02	5.57	5.27	5.06	
RPO Shortfall/Excess in MU excl. RE Certificates	187	525	487	-737	359	N/R	
RE Certificate Cost Rs/kWh	N/A	N/A	N/A	N/A	N/A	N/A	
Average cost of short-term energy purchase during solar hours in Rs/kWh	N/A	N/A	N/A	N/A	N/A	N/A	
Average cost of short-term energy purchase during wind hours in Rs/ kWh	N/A	N/A	N/A	N/A	N/A	N/A	

Maharashtra							
Particulars	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**
Average Energy Charge in Rs/kWh	N/A	N/A	N/A	N/A	N/A	N/A	
RPO Shortfall/Excess in MU excl. RE Certificates	5088	3943	5015	5390	12372	18223	
RE Certificate Cost Rs/kWh	N/A	N/A	N/A	N/A	N/A	N/A	
Average cost of short-term energy purchase during solar hours in Rs/kWh	4.23	-	-	7.44	7.59	6.90	
Average cost of short-term energy purchase during wind hours in Rs/ kWh	4.23	-	-	7.44	7.59	6.90	

Bihar							
Particulars	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**
Average Energy Charge in Rs/kWh	4.16	4.31	4.36	4.73	4.67	4.79	4.81
RPO Shortfall/Excess in MU excl. RE Certificates	351.49	1317.89	876.96	1665.67	3119.68	5464.95	-
RE Certificate Cost Rs/kWh	1.45	0.32	0.32	0.32	0.13	0.21	
Average cost of short-term energy purchase during solar(2%) & non-solar(98%) hours in Rs/kWh	3.91	3.40	5.22	8.72	8.39	7.28	9.14
Average Cost(Rs/kwh) at Power Exchange(IEX) during solar hours(06:00-18:00 hrs) for DAM	-	-	-	5.39	4.61	3.50	2.50
Average Cost(Rs/kwh) at Power Exchange(IEX) during non-solar hours(18:00-06:00 hrs) for DAM	-	-	-	6.52	5.86	5.44	4.52

Uttar Pradesh							
Particulars	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**
Average Energy Charge in Rs/kWh	N/A	N/A	N/A	N/A	N/A	N/A	
RPO Shortfall/Excess in MU excl. RE Certificates	N/A	N/A	N/A	N/A	N/A	N/A	
RE Certificate Cost Rs/kWh	N/A	N/A	N/A	N/A	N/A	N/A	
Average cost of short-term energy purchase during solar hours in Rs/kWh	N/A	N/A	N/A	N/A	N/A	N/A	
Average cost of short-term energy purchase during wind hours in Rs/ kWh	N/A	N/A	N/A	N/A	N/A	N/A	

Tamil Nadu							
Particulars	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**
Average Energy Charge in Rs/kWh	N/A	N/A	N/A	N/A	N/A	N/A	
RPO Shortfall/Excess in MU excl. RE Certificates	N/A	N/A	N/A	N/A	N/A	7980.00	-
RE Certificate Cost Rs/kWh	N/A	N/A	N/A	N/A	N/A	N/A	
Average cost of short-term energy purchase during solar hours in Rs/kWh	N/A	N/A	N/A	N/A	N/A	6.97	5.78
Average cost of short-term energy purchase during wind hours in Rs/ kWh	N/A	N/A	N/A	N/A	N/A	8.59	7.42
N/A- Not Available							

3.3.1 Estimate Based on the Energy Charge of Other Contracted Long-term Sources

Based on the data on energy charges provided by Gujarat, Assam and Bihar, we directly estimate the financial impact of energy loss due to delays by assuming that the higher energy charges payable to conventional long-term plants would have been used to meet the energy deficit due to delays in commissioning of RE projects. Out of the remaining three states of Maharashtra, UP and Tamil Nadu where energy charges are not available, Maharashtra has not yet suffered any energy deficit and hence had not been affected due to delays so far. For UP and Tamil Nadu, we use two alternative methods- (a) to use average energy charge of the three states reporting their energy charge, and (b) the average market prices as reported by Bihar DISCOMs. It is important to state here clearly that these estimates are truly an underestimate of financial impact on DISCOMs as the relevant long-term conventional sources factoring in would have higher energy charge than the average.

But in the absence of details such as the energy charge of each plant and technical minimum feasible, this is most reasonable assumption we can work with. In this section, we report the financial impact estimated based on additional cost incurred via higher energy charge on long-term sources as compared to cheaper RE energy, which was contracted by the DISCOMs. Based on numbers provided by Bihar, Assam & Gujarat, the average energy charges range from a low of Rs 4.10/kWh in 2019-20 for Assam to a high of Rs 5.42/kWh in 2024-25 for Gujarat. In most of the years, it is above Rs 4.50/kWh for all the three states. Except for Assam and hybrid RE projects, most of the RE projects in the sample were contracted at prices between Rs. 2.50/kWh and Rs 3.00/kWh. This means that any energy loss because of the delay results in the loss of at least Rs 1.50/ kWh. At a CUF of 22%, any delay in commissioning of a solar capacity thus is expected to result in a loss of around Rs 8000/MW per day.

A similar loss or slightly higher loss is expected in case of a wind project as wind generation profile may cover peak hours of a DISCOM and will have higher CUF even of the contracted price is somewhat higher! This approach is likely to estimate the financial impact due to delays on the higher side if the market price of electricity during solar hours is lower than the contracted price of electricity from the solar RE projects through REIAs. This is the case from the year 2025-26 as reported by Bihar with the average market price of Rs 2.50/kWh and has continued till now.

In Table 3, the financial impact of RE project delays in terms of higher energy charges paid by the DISCOMs covered in the study are reported. As pointed earlier, the financial impact of delays on DISCOMs is on the rise. Out of six states covered in this report, an estimated Rs 200-400 Crores additional energy charges have been incurred by four affected states. Besides estimating financial impact as additional cost incurred by paying higher energy charges, we also estimate the financial impact based on the market price though this may not be as relevant for solar capacity particularly as the DISCOMs would not have planned their base load by use of such capacity.

Table 3: Financial Impact due to Higher Energy Charges

(Rs. Cr.)

	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26
Gujarat	0	0	0	0	0	19.17	N/A
Assam	0	0	0	0	0	0	N/A
Maharashtra	0	0	0	0	0	0	N/A
Bihar	0.87	14.99	42.10	30.43	26.36	39.77	30.27
Uttar Pradesh	0	0	25.22	25.92	7.92	29.33	N/A
Tamil Nadu	0	0	0	-0.23	14.36	44.04	N/A

3.3.2 Estimate Based on the Market Prices

For estimating the financial impact based on market price correctly, we need to know the timing of the energy deficit which is not possible for intermittent RE sources. Further as pointed out earlier, DISCOMs are more likely to use RE energy in conjunction with conventional dispatchable capacity and the base load plan has to factor the intermittency of RE sources.

Nonetheless, we estimate the financial impact of DISCOMs with the assumption that the appropriate opportunity cost of non-availability of RE energy is market price. We use data provided by DISCOMs for these estimates. While Bihar provided the data for DAM (day-ahead market) price for 4 years separately for solar and non-solar hours starting from 2022-23.

For the first three years, we have no similar data and hence we estimate the effect of delays from 2022-23 onwards.

Table 4 reports on the estimate of financial impact on DISCOMs due to RE projects delay based on the market prices. The magnitude of the estimates is higher than the estimates reported earlier based on energy charge. This is because the market prices, on average, as reported by Bihar were higher than energy charges prior to 2024-25. The effect is more volatile under this assumption as market prices are more volatile than the energy charges of long-term capacity.

To ascertain the reasonableness of information on market price, IEX website was searched.

Unfortunately, the data provided is limited and must be queried for each period of no more than 31 days. It provided time-block wise which makes it volatile and not suitable for averaging. The variation in the impact is more significant for states like UP which had contracted wind capacity as the wind energy might have been available during peak hours, when market prices are higher. The maximum impact based on market prices is of the order of 900 crores for 2022-23 as opposed to 400 crores based on energy charges. For other years, the magnitude is similar. Since 2025-26, the reported average market prices are similar to or lower than contracted solar projects, the financial impact of energy deficit due to delays in solar RE projects is likely to be negative as is given by the estimate for Bihar following this approach.

Table 4: Financial Impact Estimate based on Market Prices

(Rs. Cr.)

	2022-23	2023-24	2024-25	2025-26
Gujarat	0	0	17.83	N/A
Assam	0	0	0	N/A
Maharashtra	0	0	0	N/A
Bihar	84.99	51.45	35.12	-2.97
Uttar Pradesh	93.9	14.57	21.57	N/A
Tamil Nadu	-0.61	28.88	39.2	N/A

3.4 Financial Impact due to Non-compliance of RPO/RCO

The energy deficit resulting from delays in contracted RE projects would result in non-compliance of RPO/RCO mandates. Out of the six DISCOMs, two – Gujarat and Bihar have been compliant through either procurement or purchase of RE certificates. Bihar has provided data on price paid for acquiring RE certificates year-wise.

RPO/RCO non-compliance can have either of the two consequences for the DISCOMs- (a) DISCOM buys RE certificates to meet the obligation or (b) pays penalties for the deficit. Accordingly, this report estimates the financial impact of RE projects delays on DISCOMs because of RPO/RCO shortfall following the above-mentioned two approaches.

In Table 5a, the financial impact on DISCOMs based on RE certificate prices is reported.

In Table 5b, a penalty of Rs 0.45/ unit , which is the upper end of band specified in the Draft Electricity Amendment Bill of 2025/26.

Table 5a: Financial Impact due to RPO/RCO Shortfall based on RE Certificate Prices

(Rs. Cr.)

States	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26
Gujarat	0	0	0	0	0	0	N/A
Assam	0	0	0	0	0	0	N/A
Maharashtra	0	0	0	0	0	0	N/A
Bihar	0.78	2.88	8.45	4.81	1.89	4.69	N/A
Uttar Pradesh	0	0	5.17	3.33	0.43	2.62	N/A
Tamil Nadu	0	0	0	-0.03	0.72	3.69	N/A

Table 5b: Financial Impact due to RPO/RCO Shortfall based on RCO penalty of Rs 0.45/ kWh

(Rs. Cr.)

States	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26
Gujarat	0	0	0	0	0	0	N/A
Assam	0	0	0	0	0	0	N/A
Maharashtra	0	0	0	0	0	0	N/A
Bihar	0.24	3.98	11.71	6.66	6.62	10.15	N/A
Uttar Pradesh	0	0	7.17	4.61	1.49	5.68	N/A
Tamil Nadu	0	0	0	-0.04	2.53	7.99	N/A

Based on the numbers in Table 5a and 5b, the magnitude of financial impact due to non-compliance is much smaller than the impact due to loss of cheaper energy from RE sources.

The maximum impact has been in case of Bihar, where DISCOMs have been complying with RPO through purchase of RE certificates.

3.5 Summary and Recommendations

The experience of six DISCOMs covered in this study has been quite varied. Those DISCOMs which had contracted RE projects in the earlier years of the period covered in this study have been affected significantly by the delays in RE projects. The energy deficit caused by the delays had to be met with either scheduling more expensive plants or by buying energy from the market, more likely the former due to intermittency of RE sources. The energy deficit also resulted in RPO/RCO shortfall, which is also a cost given the mandate and regulatory enforcement potential. An estimate has been provided for the same in this report for 4 out of 6 DISCOMs which had contracted RE projects with SCoD up to the fiscal 2024-25.

Based on the analysis above, the following can be inferred and recommended-

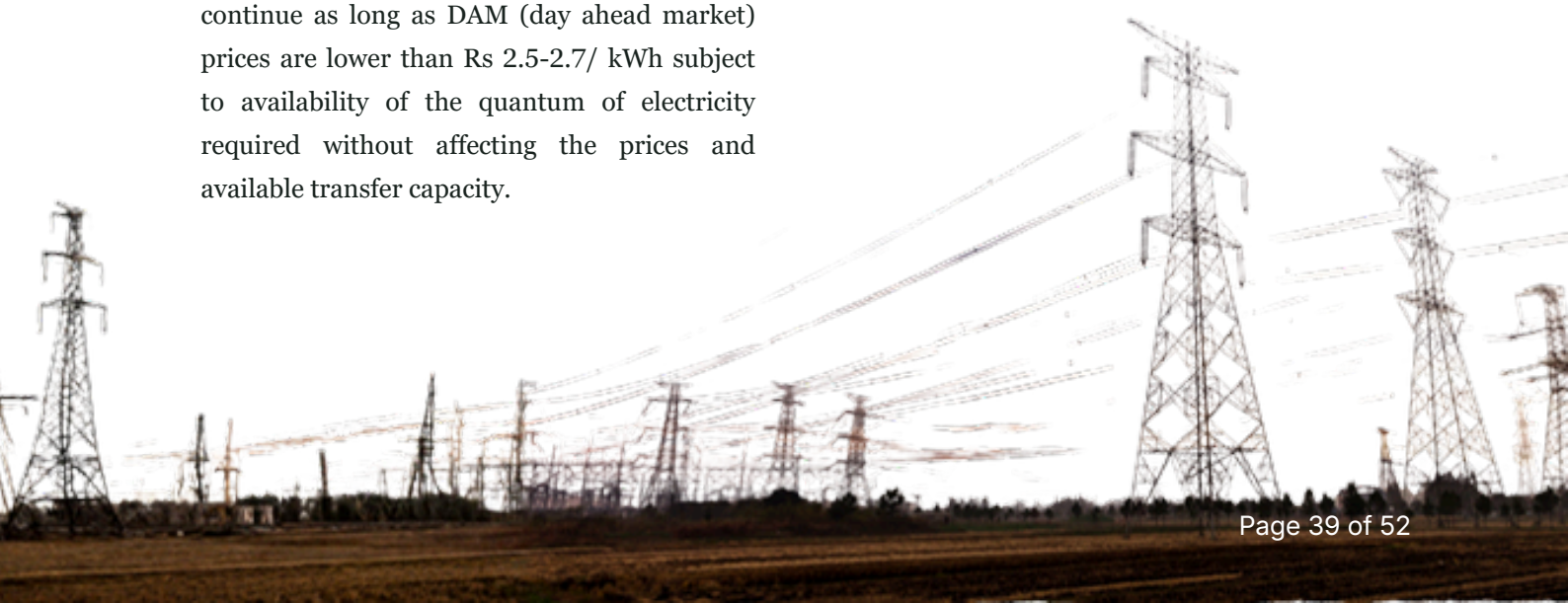
- DISCOMs suffered a loss of at least Rs 8000 per MW per day because of delays in RE projects on account of having to pay higher energy charges from generating electricity from conventional plants.

- The fiscal loss to the DISCOMs due to delays in solar projects was negligible or negative whenever they could buy electricity by purchasing power from the market during solar hours as happened during 2025-26 and may continue as long as DAM (day ahead market) prices are lower than Rs 2.5-2.7/ kWh subject to availability of the quantum of electricity required without affecting the prices and available transfer capacity.

- In addition to loss or gains on account on higher energy charges/power purchase costs contingent on market price, DISCOMs suffered an additional loss due to RPO/RCO shortfall, which could be approximately 20-30% of the above-mentioned costs., i.e., anywhere from Rs 0.30/kWh to proposed penalty of Rs 0.45/kWh. This would translate to loss of Rs1600-2500 per MW per day of delay.

- While the direct costs incurred by the DISCOMs cannot be avoided, the regulators should factor in the shortfall in RPO/RCO compliance due to delays in RE projects as these delays are not within the control of DISCOMs.

- Based on the data collected from DISCOMs, it will be in the interest of DISCOMs to track and assess the impact on DISCOM due to RE project delays by comparing forecasted generation profile of each project and tracking the price difference of the cost incurred to make up for the energy deficit in case of delays in RE projects. That would require knowing which plant(s) could have been backed down at that time of the day if RE was available at a cheaper contracted cost.



4. Consultation Process with Stakeholders

As part of the finalization of the study findings, PFI has undertaken consultative process with key stakeholders, including CTUIL, RE developers, and others. The views and inputs received are summarized below.

4.1 Transmission Utilities

1. The report highlights that a major reason for delays in renewable energy projects is mainly due to mismatch between the commissioning schedules of RE projects and the associated transmission network. The timelines initially assumed by the CTU may have been ambitious. While the objective was to accelerate RE deployment, the associated system planning and implementation timelines appear to have been relatively ambitious.

2. ISTS transmission projects awarded on a BOOT basis were provided an implementation timeframe of 18–24 months, considering the commissioning timelines of RE projects. However, delays were observed in the completion of several projects. Accordingly, the National Committee on Transmission (NCT), in its 40th meeting held in April 2026, revised the implementation timeframe to 24–36 months to reflect more realistic project schedules.

3. CTU has been appointing Independent Engineers (IEs) for monitoring of TBCB projects. The IEs regularly monitor the progress of the projects and submit reports to CTUIL.

4. To align the timelines of RE projects and associated transmission projects, CEA/CTU conducts quarterly/monthly coordination meetings involving Transmission Service Provider (TSPs), RE Developers, REIAs and other concerned stakeholders. The anticipated CODs of the projects are jointly assessed by CEA and CTU, with support from the Independent Engineers.

5. To expedite project implementation, CTU conducts coordination meetings to resolve bilateral issues between TSPs and between TSPs and RE Developers.

6. Based on requests received from TSPs, CTUIL also takes up project-related issues with the concerned local/state administration, Ministry of Power and CEA, as required, to facilitate their early resolution and expedite project commissioning.

7. To address persistent Right of Way (RoW) issues faced by TSPs, meetings are also conducted at the PMO, Cabinet Secretariat and Ministry of Power levels at regular intervals to facilitate time-bound resolution of issues.

8. The Transmission Service Agreement (TSA) provides for Liquidated Damages (LDs) in case of delay in commissioning of transmission assets by the TSP. The applicable LD is 3.33% of Monthly Transmission Charges (MTC) for delays up to 60 days and 5% of MTC thereafter, subject to the applicable contractual provisions.

9. The Ministry of Power and CEA have undertaken various measures to address delays in RE generation and transmission projects. CEA conducts regular coordination meetings involving RE developers, transmission system providers, State Power Secretaries and Chief Secretaries to facilitate the resolution of issues related to land, RoW and other project implementation constraints.

4.2 Renewable Energy Developers' Perspective

1. RE developers applauded the finding of the report especially the mismatch between the commissioning schedule of renewable energy projects and the associated transmission network and proposed recommendations to safeguard DISCOM. However, developers requested to also include framework to protect renewable energy developers from the commercial and regulatory consequences of such delays.

2. A developer should remain responsible for risks that it can reasonably manage, but should not face liquidated damages, termination, loss of connectivity benefits or other adverse consequences for delays caused by transmission infrastructure or actions of other stakeholders.

3. The first response to transmission congestion should be better coordination between generation procurement and transmission planning, realistic transmission commissioning schedules, improved utilisation of existing network capacity and timely augmentation of identified renewable energy corridors.



5. Consolidated Findings, Recommendations and Way Forward

5.1 Synthesis of Key Findings

The study examined the delays in renewable energy (RE) projects awarded through Renewable Energy Implementing Agencies (REIAs) and assessed their implications for DISCOMs. The analysis covered project-level delays, transmission connectivity, regulatory processes, contractual arrangements, energy procurement and RPO/RCO compliance. The findings indicate that delays in RE projects and their impact on DISCOMs are closely interconnected and need to be addressed through coordinated generation, transmission, procurement and regulatory planning.

The principal issue contributing to delays is the mismatch between the commissioning schedule of RE projects and the readiness of the associated transmission system. In several cases, RE projects have been tendered without sufficient coordination with CTU regarding the realistic timeline for transmission availability. At the same time, DISCOMs have had limited involvement at the initial procurement planning stage, despite being the ultimate purchasers of the contracted renewable power. The transmission charge waiver mechanism has supported accelerated RE procurement, but the resulting increase in contracted capacity has also placed additional pressure on timely transmission development. Regulatory processes, including tariff adoption and PSA execution, have also contributed to delays, although the tariff adoption process has subsequently evolved.

A significant concern emerging from the study is the allocation of risks arising from project delays. Under the existing PPA and PSA arrangements, delays that are not attributable to the developer may result in extension of SCoD. While such provisions protect developers from risks outside their control, the resulting delay in availability of contracted RE power can ultimately affect DISCOMs through additional power procurement requirements and potential RPO/RCO implications. REIAs, operating largely through back-to-back arrangements, may have comparatively limited exposure to these consequences. The study therefore indicates a need to examine whether the existing contractual and incentive structure provides an appropriate balance of risks among DISCOMs, REIAs and other stakeholders.

The study also highlights the relationship between generation location and transmission requirements. Concentration of renewable generation in certain resource-rich locations, together with transmission charge waivers and the existing GNA framework, can result in substantial transmission augmentation requirements, congestion and longer implementation timelines.

The location of generation therefore has implications not only for individual projects but also for overall system costs and transmission planning.

The impact on DISCOMs is not uniform and depends on the availability and cost of replacement power. Where delayed RE power has to be replaced by relatively higher-cost conventional generation, significant additional procurement costs may arise. The study estimates an indicative impact of around Rs 8,000 per MW per day in such circumstances. However, the impact can vary depending on market prices, availability of power and transmission capacity. Delays may also result in RPO/RCO shortfalls, with the study estimating an additional impact of approximately Rs 0.30–Rs 0.45/kWh, equivalent to around Rs 1,600–Rs 2,500 per MW per day, depending on the applicable regulatory framework.

Thus, the consequences of RE project delays are not confined to project developers but can extend across the electricity supply chain, particularly to DISCOMs through delayed energy availability, replacement power costs and compliance implications.

5.2 Integrated Recommendations

Based on the findings of the study, RE procurement should be more closely aligned with transmission readiness and realistic project commissioning timelines. The SCoD of RE projects should, to the extent practicable, be synchronized with the expected availability of the associated transmission system. Greater coordination among CEA, CTU, REIAs, DISCOMs, CERC/SERCs and RE developers is required from the planning stage to align generation, transmission and procurement schedules. DISCOM participation at the procurement planning stage would enable better assessment of future energy requirements, RPO/RCO obligations, generation profiles, transmission requirements and the financial implications of procurement.

The existing risk allocation under PSAs entered into by DISCOMs through REIAs may be reviewed. Stakeholder consultations indicate concerns regarding the extent to which DISCOMs bear the consequences of delays or non-performance on account of REIA's & CTU, while REIAs generally continue to receive their agreed margins under back-to-back procurement arrangements and CTU also unpenalised.

The lack of sufficient transmission infrastructure to evacuate power or delay on account of REIA, compels DISCOMs to rely more on short-term power purchases which is often at significant higher rates during non-solar hours. Such increased power purchase costs, which could have been avoided due to timely completion of Transmission network, is passed through in ARR by SERCs and leads to tariff burden to the end consumers. Further, delay on account of CTU/ REIA affects fulfilment of Renewable Consumption Obligations (RCO) by DISCOMs on account of which penalties are levied to DISCOMs by SERCs which has to be borne by DISCOMs only without their fault. Thus, provisions to account for delay and compensation thereof on the part of CTU / REIA to be introduced thus ensuring that developers, DISCOMs, and ultimately consumers are not adversely affected by delay in projects.The risk allocation framework should therefore ensure that risks are appropriately shared among the parties best placed to manage or mitigate them. The available project-level data and experience should be used to assess the nature, frequency and consequences of delays and whether existing contractual incentives adequately support timely project delivery.

The margins and incentives of REIAs may also be examined to determine whether appropriate mechanisms can better align their interests with timely project delivery and availability of contracted power, particularly where delays adversely affect the off-taker.

The study also recommends examination of the GNA framework and associated cost allocation mechanisms with a view to introducing appropriate locational price signals. Under the existing framework, generators have considerable flexibility in selecting project locations, while the transmission system is subsequently developed to accommodate the resulting generation. This may result in the generator not fully internalizing the incremental transmission-system cost associated with its selected location. The concentration of generation in resource-rich States, together with transmission charge waivers, can increase transmission augmentation requirements and contribute to congestion and longer implementation timelines. Accordingly, differentiated charges or other appropriate price signals may be considered based on the incremental system cost associated with a generation location, while suitable incentives may also be considered for locations where transmission capacity is available or under-utilised. The objective would be to encourage more balanced development of RE capacity, improve utilization of the existing

transmission network and reduce avoidable transmission augmentation without imposing an excessive financial burden on generators.

Where DISCOMs have already contracted renewable power and the contracted project is delayed due to circumstances beyond their control, the resulting RPO/RCO shortfall should be treated separately from a compliance failure attributable to the DISCOM. An appropriate mechanism for deemed RPO/RCO compliance may therefore be considered for the relevant period, subject to clearly defined conditions, documentation and verification.

Such treatment could apply where the DISCOM has entered into a valid PPA/PSA, fulfilled its contractual obligations and the contracted RE project has not commenced supply due to factors beyond the DISCOM's control. This would ensure that DISCOMs are not subject to additional compliance consequences for renewable energy that they had already contracted but could not receive due to circumstances outside their control.

RE procurement should also be supported by greater certainty regarding transmission readiness. CTU and REIAs should coordinate during the planning stage to assess connectivity requirements, transmission availability and realistic project timelines before tendering new capacity. DISCOMs should be involved at an early stage of procurement planning so that their energy requirements, RPO/RCO obligations and financial implications can be considered before contracting. Project-specific SCoD should reflect the actual requirements for generation development, connectivity, transmission construction, statutory approvals and commissioning rather than relying solely on standard timelines.

A standardized project-level monitoring mechanism should be established to track the original and revised SCoD, connectivity status, transmission readiness, reasons for delay, responsibility for delay and actual commissioning. DISCOMs should also systematically assess the financial impact of delayed RE projects by comparing contracted renewable generation with actual replacement power procured. Such assessment should consider the quantum of unavailable RE generation, source and cost of replacement power, market prices, conventional generation costs, transmission availability and associated RPO/RCO implications. The findings from such monitoring should be incorporated into future RE procurement, transmission planning and contractual design.

5.3 Proposed Way Forward

The findings support the development of an integrated Generation–Transmission–Procurement Coordination Framework under which RE procurement planning, transmission development, GNA requirements, regulatory approvals and DISCOM requirements are considered together. The process should begin with an assessment of future RE requirements and procurement obligations, followed by evaluation of transmission readiness and realistic project timelines, consultation with DISCOMs and subsequent REIA tendering. PPA and PSA execution, connectivity, transmission development, SCoD monitoring and project commissioning should then be tracked through a common monitoring mechanism, followed by assessment of the financial and RPO/RCO impact of any delay.

Such a framework would enable potential constraints to be identified at an early stage and reduce the likelihood of projects being contracted with commissioning schedules that are not aligned with transmission or regulatory readiness. A common database or monitoring mechanism covering project award, PPA/PSA execution, connectivity, transmission readiness, SCoD, SCoD extensions, reasons for delay, commissioning and financial impact would provide a consistent basis for monitoring and corrective action. The information generated through this process could also be used to improve future procurement planning, transmission development and contractual arrangements.

5.4 Conclusion

The study establishes that delays in RE projects are a system-level issue rather than an issue attributable to a single stakeholder. While certain delays arise from factors beyond the control of the concerned parties, their impact can be reduced through better coordination, realistic scheduling, improved transmission planning and appropriate contractual and regulatory mechanisms. The key areas requiring attention are risk allocation between DISCOMs, CTU and REIAs, synchronization of generation and transmission planning, appropriate GNA-related price signals, greater involvement of DISCOMs in procurement planning and suitable RPO/RCO treatment for contracted projects delayed for reasons beyond the control of DISCOMs.

Strengthening the linkage between RE procurement, transmission planning and DISCOM requirements, together with realistic SCoD, appropriate risk allocation and systematic project monitoring, can reduce avoidable delays and provide greater certainty to stakeholders. Such an integrated approach would help minimize the financial and RPO/RCO implications of delayed RE projects for DISCOMs while supporting more efficient and coordinated development of renewable energy capacity.



Annexure A: RE projects awarded by Select (6) DISCOMs and Current Status

Gujarat

	Contract	Quantity in MW	SCOD	Developer	Location	Expected/Actual SCOD	Expected/ Actual delay
1	SECI-GUVNL	700	Sep 30, 2024		Gujarat	18 months from EPC award	
2	SECI-GUVNL	600	Jun 30, 2025	SAEL	Andhra Pradesh	Dec 31, 2025	6 months

Assam

	Contract	Quantity in MW	SCOD	Developer	Location	Expected/Actual SCOD	Expected/ Actual delay
1	SJVN Green Energy	70	Aug 7, 2025		Dhubri, Assam	Dec 31, 2025	5 months
2	SJVN Green Energy	50	Aug 7, 2025		Sonitpur, Assam	Jul 31, 2026	1 year
3	SJVN Green Energy	200	Aug 7, 2025		Yet to be identified, Assam	Mar 31, 2026	

Maharashtra

	Contract	Quantity in MW	SCOD	Developer	Location	Expected/Actual SCOD	Expected/ Actual delay
1	NHPC Solar	25	May 2, 2026	Hazel Hybren	Bikaner	Nov 11, 2026	6 months
2	NHPC Solar	400	May 1, 2026	Jakson Ltd	Bikaner	Aug 22, 2026	4 months
3	NHPC Solar	250	Apr 26, 2026	Sprng Power	Jaisalmer	Aug 28, 2026	4 months
4	NHPC Solar	300	Apr 24, 2026	Green Infra Wind	Barmer	Nov 7, 2026	6 months
5	NHPC Solar	250	Apr 18, 2026	Apraava Energy	Barmer	Dec 27, 2026	8 months
6	NHPC Solar	250	Apr 30, 2026	Hinduja Renewable	Barmer	Dec 30, 2026	8 months
7	NTPC Solar	300	Jun 30, 2026	Anboto Solar	Barmer	Dec 30, 2026	6 months

	Contract	Quantity in MW	SCOD	Developer	Location	Expected/Actual SCOD	Expected/ Actual delay
8	NTPC Solar	300	Jun 30, 2026	Apraava Energy	Bikaner	Dec 27, 2026	7 months
9	NTPC Solar	700	Jun 30, 2026	JSW Renew Energy 13	Mohal & N. Solapur		
10	NTPC Solar	300	Jun 30, 2026	AVADA Surya	Rajasthan	Nov 7, 2026	4 months
11	SECI Solar	700	Oct 7, 2026	JSW Renew 11	Jalna		
12	NTPC Wind-Solar Hybrid	250	Jun 28, 2026	Spng Vayu	MP (wind) , Gujarat (Solar)	Solar Jun 30, 2027, Wind Jun15, 2025	1 year for Wind
13	NTPC Wind-Solar Hybrid	300	Jun 30, 2026	ACME Cleantech	Gujarat (wind) , Rajasthan (Solar)	Solar Aug22, 2026, Wind Apr. 30, 2026	2 months
14	NTPC Wind-Solar Hybrid	230	Jun 28, 2026	Juniper Green	Gujarat (wind) , Rajasthan (Solar)	Dec 2026	6 months
15	SJVN (FDRE)	180	Apr 26, 2026	TEQ Green	Rajasthan, Karnataka & Gujarat	Solar Nov 7, 2026 , Wind 17Jan, 2027	7 & 9 months for solar & wind
16	SJVN (FDRE)	418	May 6, 2026	Zorya Solar	Rajasthan, Karnataka & MP	Mar 31, 2030	3 years +
17	SJVN (FDRE)	150	May 13, 2026	Solar craft Power	Karnataka		
18	SJVN (FDRE)	120	May 13, 2026	Clean Energy Hybrid	Andhra Pradesh	Jun 30, 2026	1 month
19	SJVN (FDRE)	120	Apr 30, 2026	Juniper Green	Barmer & Gujarat		
20	SJVN (FDRE)	160	3-May-26 & 16-Feb-27	Tata Power Renewable	Tamilnadu, Karnataka, Maharashtra & Rajasthan	Solar Aug-26 & Wind Jan-27	3 months for solar
21	SJVN (FDRE)	320	21-May-26 extended to-21_Jan-27	ACME Sun Power	Rajasthan	Dec-26 & Jan-27	6 months

Bihar

	Contract	Quantity in MW	SCOD	Developer	Location	Expected/Actual SCOD	Expected/Actual delay
1	SECI Wind	50		Alfanar	Gujarat	May 29, 2021	1 year 6 months
2	SECI Wind	300		Ostro Kannada		Jan 30, 20 22 (only 199.5 MW)	10.5 months
3	SECI Wind	50		Morjan		Dec 1, 2022 (49.5 MW)	1 year 8.5 months
4	SECI Solar	150		ACME	Dhaulpur	Dec 22, 2024	4 years 1.5 months
5	SECI Solar	300		Renew		Oct 5, 2021	9.5 months
6	SECI Solar	180		SBE		Jan 23, 2025	3 years 5.5 months
7	SECI Solar	150		SBE		Jul 1, 2024	2 years 10.6 months
8	SECI Solar	150		GRT Jwellers		Jun 17, 2022	10.2 months
9	SECI Solar	600		Adani Green		Aug 1, 2026	2 years
10	NTPC Solar	300		SB		Jun 18, 2021	8.3 months
11	Hybrid	210		Greenko		Dec 1, 2025	2 years

Uttar Pradesh

	Contract	Quantity in MW	SCOD	Developer	Location	Expected/Actual SCOD	Expected/Actual delay
1	SECI Solar	100	Jul 9, 2025	Jakson		Dec 31, 2026	1 year 6 months
2	SECI Solar	100	Aug 21, 2025	Shiva Corporation		Dec 31, 2026	1 year 4 months
3	SECI Solar	300	Aug 21, 2025	Renew Solar		Jan 6, 2027	1 year 5 months
4	SECI Solar	300	Mar 31, 2026	Avaada Energy Pvt		May 2027	1 year 2 months
5	SECI Solar	250	Mar 31, 2026	Sprng Energy Pvt		Sep 2026	6 months
6	SECI Solar	300	Mar 31, 2026	Renew Solar		May 30, 2026	2 months
7	SECI Solar	150	Mar 31, 2026	Solarcraft Power		May 2027	1 year 2 months
8	NHPC Solar	250	Apr 17, 2026	Solairdirect Energy Pvt		Apr 17, 2026	
9	NHPC Solar	1000	Apr 30, 2026	Avaada Energy		Jun 2028	2 years 2 months

	Contract	Quantity in MW	SCOD	Developer	Location	Expected/Actual SCOD	Expected/Actual delay
10	NHPC Solar	275	May 1, 2026	Hazel Hybren		Jul 2027	1 year 2 months
11	SECI Wind	85	Mar 2021	Adani Renewable Energy Park (Guj)		Jun 2, 2021	3 months
12	SECI Wind	50.6	Mar 2021	Powerica		Aug 18, 2022	1 year 4 months
13	SECI Wind	324.4	Mar 2021	SBESS Services		Sep 17, 2022	1 year 5+ months
14	SECI Wind	50	Apr 18, 2021	Ostro Energy		Dec 6, 2022	1 year 8 months
15	SECI Wind	130	Apr 18, 2021	Adani Renewable Energy Park		Jan 4, 2023 & May 26, 2023	2 years
16	SECI Wind	112.5	Dec 30, 2023	Renew Naveen Urja		Jul 26, 2025	1 year 7 months
17	SECI Wind	67.5	Dec 30, 2023	Green Infra		Jul 26, 2025	1 year 7 months
18	SECI Wind	56.25	Dec 30, 2023	Anupavan Renewable		Jul 26, 2025	1 year 7 months
19	SECI Wind	168.75	Dec 30, 2023	Adani Renewable Energy 15		Jul 26, 2025	1 year 7 months
20	SECI Wind	45	Dec 30, 2023	Azure Power		Jul 26, 2025	1 year 7 months
21	SECI Wind	129.11	Mar 29, 2025	NTPC Renewable		50 MW Feb-26, Balance June 26	9 months
22	SECI Wind	193.63	Mar 29, 2025	JSW Neo Energy		Revised to 23-Jan-26	10 months
23	SECI Wind	193.63	Mar 29, 2025	Torrent Power		Jan 23, 2026	11 months
24	SECI Wind	300	Oct 19, 2025	Apraava Energy		Mar 2027	1 year 5 months
25	SECI Wind	200	Oct 19, 2025	SJVN Energy		Project Terminated	

Tamil Nadu

	Contract	Quantity in MW	SCOD	Developer	Location	Expected/Actual SCOD	Expected/Actual delay
1	SECI Tranche VI ISTS Scheme of 1200 MW	160	May 11, 2022	Avaada Sustainable RJ Projects	60 MW	Apr 13, 2022	- 1 month
					100 MW	May 12, 2022	0 month
2	SECI Tranche VI ISTS Scheme of 1200 MW	170	May 12, 2022	ReNew Solar Urja		May 11, 2022	0 month
3	SECI Tranche VI ISTS Scheme of 1200 MW	170	Dec 31, 2023	Masaya	120 MW	Sep 30, 2023	-3 months
					50 MW	Mar 20, 2024	2 months 20 days
4	SECI Manufacturing Linked ISTS Scheme	667	Oct 13, 2023	Adani		Dec 19, 2025	2 years 2 months
5	SECI Manufacturing Linked ISTS Scheme	333	Jun 25, 2024	Adani		Dec 19, 2026	2 year 6 months
6	SECI Tranche VIII	300	Apr 20, 2025	Eden Renewable Alma	100 MW	Jun 23, 2025	2 months
				Phalodi, Rajasthan	55.55 MW	Jul 17, 2025	3 months
					144.45 MW	Aug 4, 2025	3.5 months
7	SECI Tranche VIII	200	May 20, 2025	ReNew Surya Vihaan	158.30 MW	May 2, 2025	-18 days
				Jaisalmer, Rajasthan	41.70 MW	May 19, 2025	On time

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