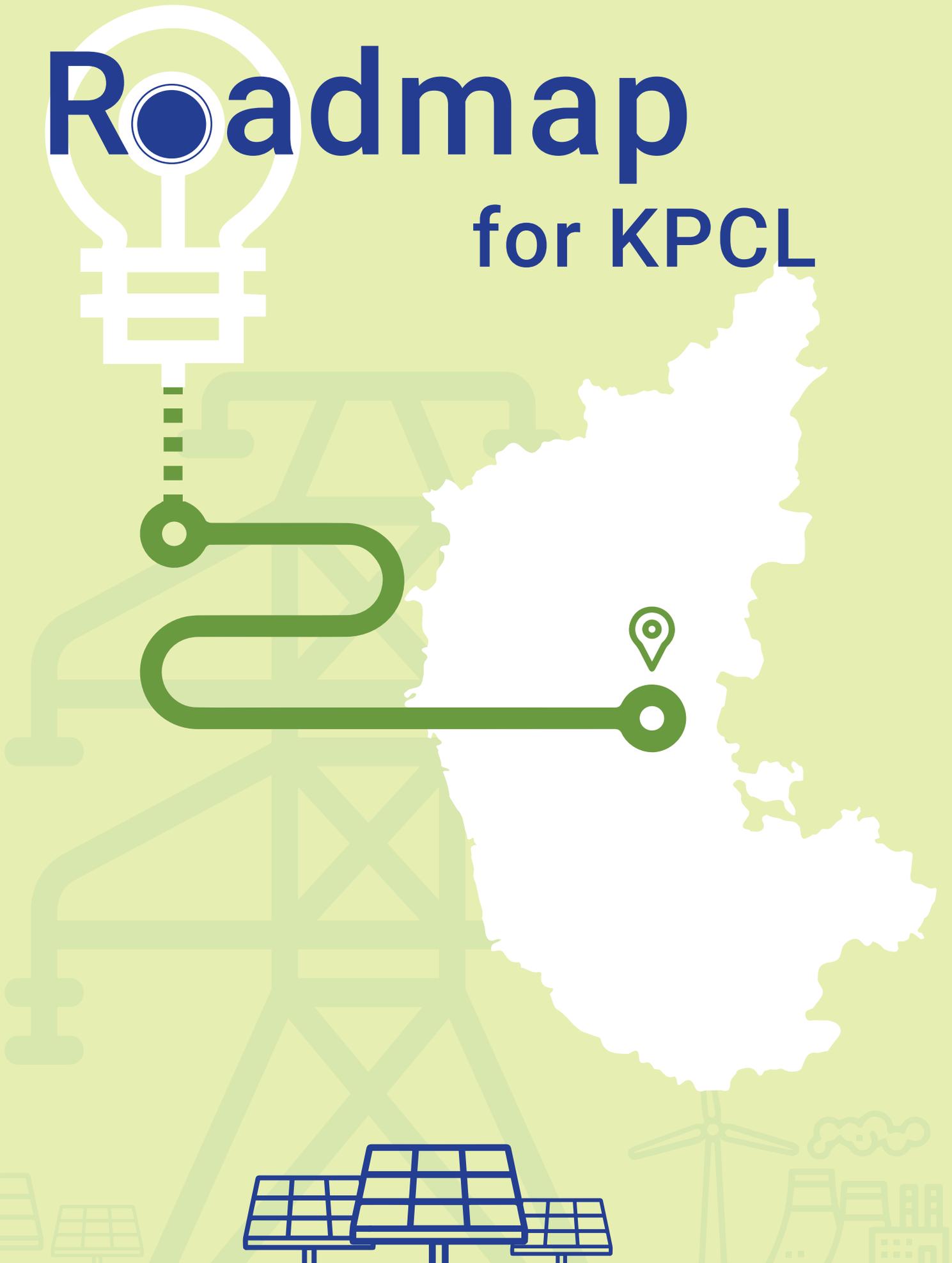


Roadmap for KPCL



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Introduction

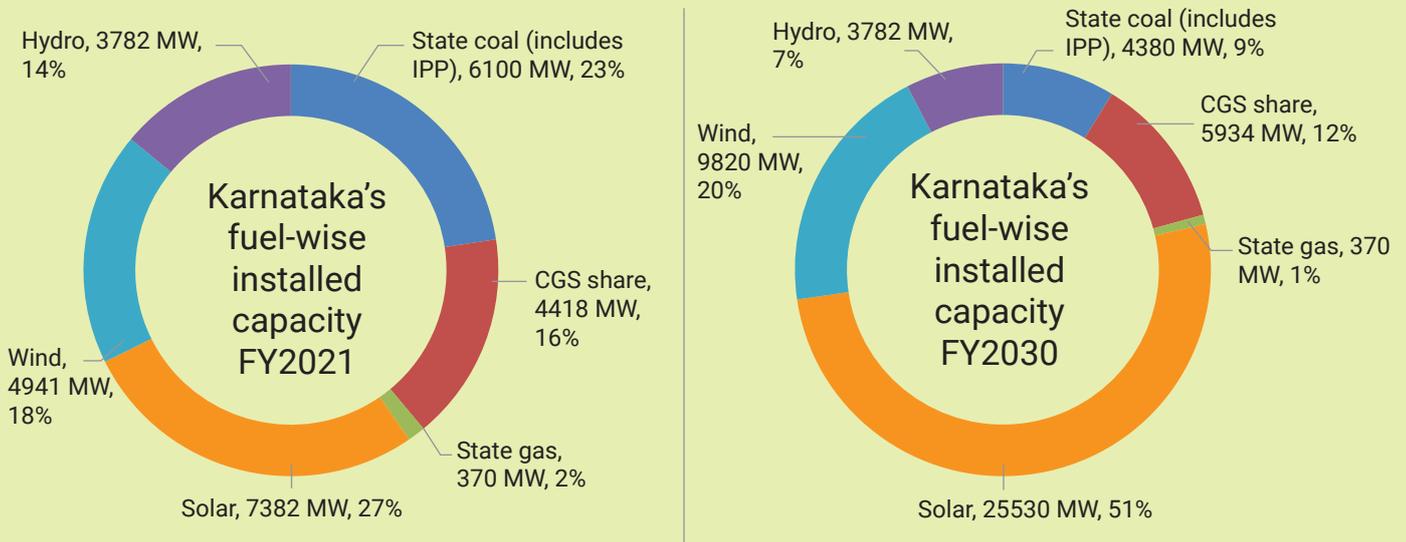
Karnataka is leading in installed RE capacity among Indian states and has the technical potential for further growth. The state-run power generating company, Karnataka Power Corporation Limited (KPCL), can transition to RE and contribute to the state's renewable mix. KPCL can also optimise operations of its coal assets by offering generation flexibility through thermal-RE bundling and exploring alternative revenue streams.

The Center for Study of Science, Technology and Policy (CSTEP) developed a long-term roadmap (until 2030) for KPCL. The study (i) assessed KPCL's potential to contribute to the RE-dominant power sector in Karnataka and (ii) identified revenue opportunities for its sub-optimal operating/ageing power plants.

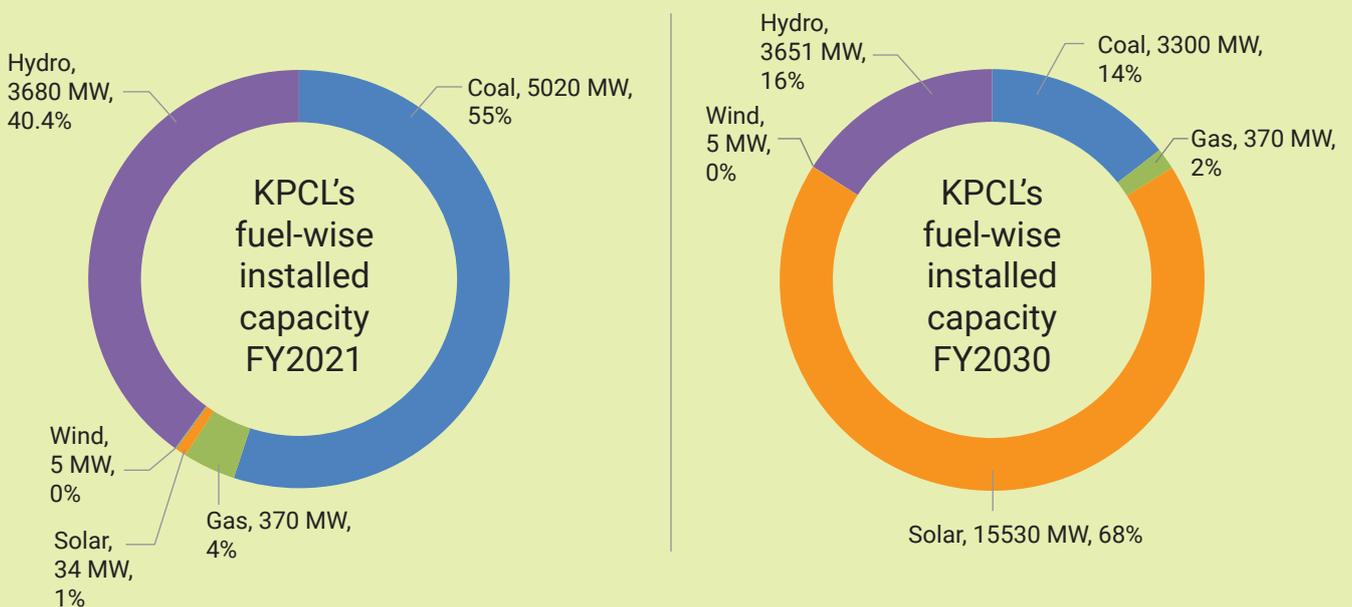


Key Insights

The study found that Karnataka has the potential to achieve renewable energy (RE) capacity of 35.5 GW by 2030.



We studied three scenarios – business as usual (BAU), high solar (HiSol), and high RE (HiRE). In the HiRE and HiSol scenarios, solar and wind capacities are proposed to meet the national target of 450 GW in proportion with the state target of 175 GW set for the year 2021-22. The HiRE scenario led to a significant hydro curtailment along with some RE curtailment. This is due to low demand and increased wind generation during monsoon season. Therefore, HiSol scenario is considered as the most feasible option.





HiSol scenario is the best option as both production and demand for solar energy are high during the summer months.



In the HiSol scenario, total RE capacity in the state by 2030 would be 35.3 GW, with solar power contributing 25.53 GW and wind 9.8 GW.



On top of current RE allotment of 10 GW to various developers by state renewable development agency, KPCL can contribute to state's RE capacity with 15.53 GW of solar energy.



There is no need for new thermal capacity addition in the state till 2030 as energy requirement is met by RE.



To manage the RE transition, 5.95 GW of storage is needed. Of this, 2.75 GW will involve battery storage, while 3.2 GW is being envisioned as pumped hydroelectric energy storage (PHES)– with 2 GW at Sharavathy Power Plant and 1.2 GW at Saundatti Power Plant.



KPCL would generate cumulative revenue of INR 23,221 crore with 15% profit margin by 2030 through sale of RE generation.



KPCL can choose to exit its long-term contracts with electricity distribution companies and trade the entire power from Raichur Thermal Power Station (RTPS) through Open Access (OA) market.



KPCL can generate an additional revenue of INR 2,168 crore by utilising RTPS under OA market and can invest this incremental revenue in RE capacity addition.

Policy Interventions for RE Transition

- Enable interstate transfer of clean power to states such as Haryana, Punjab, and NCR that do not have sufficient RE potential
- Upgrade transmission infrastructure to enable intrastate and interstate RE transmission
- Strict compliance of Renewable Purchase Obligation (RPO) targets by all states

Commercial Feasibility for RE Transition

KPCL can consider an annual capacity addition of 1,726 MW of solar linearly over the years starting 2022 until 2030 to reach 15.53 GW capacity (Figure 1). This would require KPCL to invest INR 8,896 crore on a yearly basis

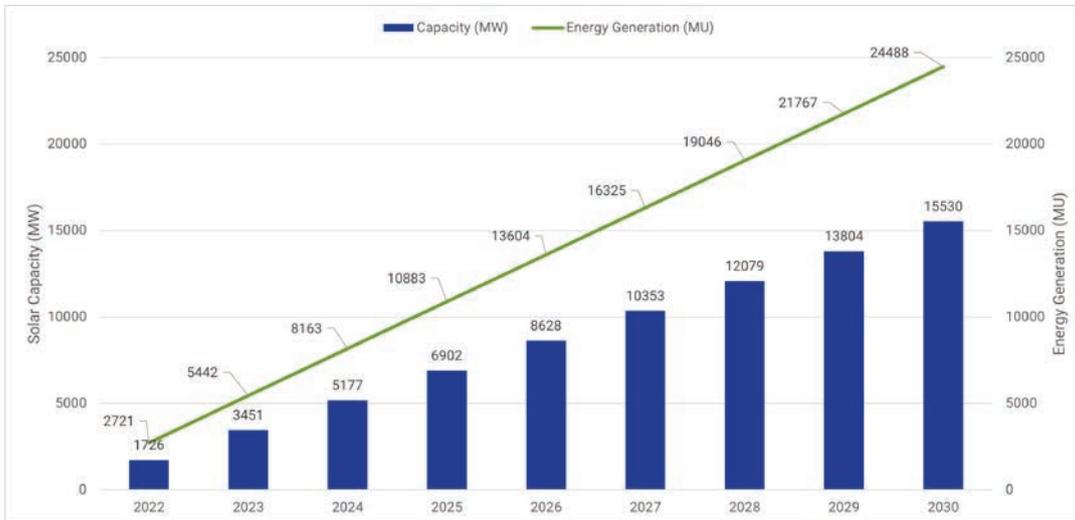


Figure 1: Yearly solar installation capacity and energy generation

With this, KPCL would be able to cater to the demand for low-cost RE by DISCOMs as the generation tariffs calculated are competitive to enable KPCL's participation in the RE market. The tariff, on the higher side in the initial year, will reduce annually due to increased generation from capacity built in previous years. The generation tariff trajectory is in line with the current and future projections of RE costs. This would mean an annual 11.5% internal rate of return for KPCL for its investment till 2030.



Figure 2: Annual revenue and solar generation tariff for KPCL

Optimal Utilisation of Coal Assets

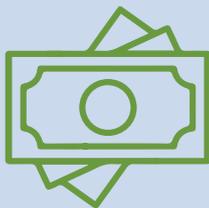
Considering the reduced demand from DISCOMs for energy produced by KPCL's thermal assets, CSTEP examined opportunities for sale of power under open access (OA) market.



Energy-intensive industries such as steel-iron, cement, textile, pulp-paper, and fertiliser, which run continuously without shutting down, were identified as potential clients.



The power demand from these industries was projected at 1,100 MW by FY24.



KPCL can generate revenue of INR 2,168 crores in three years (FY22-FY24) by operating in the OA market.



A part of this incremental revenue can be used as equity investment for solar capacity addition.

How It Works

Two cases were analysed under open access: 1) Industrial demand being catered to by KPCL's thermal plant with lower variable cost 2) Entire industrial demand being catered to by Raichur Thermal Power Station (RTPS)

Case 1 - OA demand being catered to by power plant with lower variable cost and retirement of RTPS units 1-4 by 2024

Various long-term OA (LTOA) and short-term OA (STOA) trade scenarios were developed based on the partial industrial demand to be served by KPCL thermal assets by 2024. (refer Annexure)

KPCL can compete in OA market at a cheaper rate. KPCL's tariff would be lower by 9% in FY22 and 25% in FY24, than the existing tariff paid by industrial consumers to DISCOMs (Figure 3). KPCL would be able to generate additional revenue of INR 284 crores under L2 scenario in 2024. The additional revenue will be over and above the annual revenue being generated by KPCL through existing contracts.

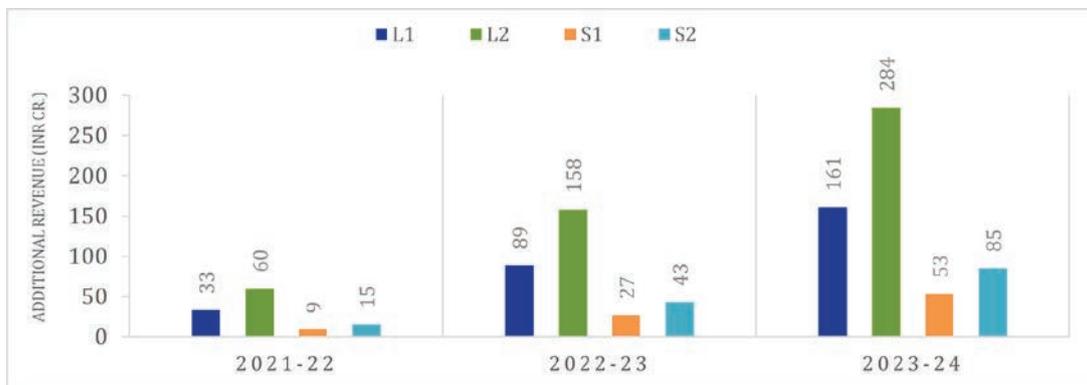


Figure 3: Additional revenue for KPCL under case-1

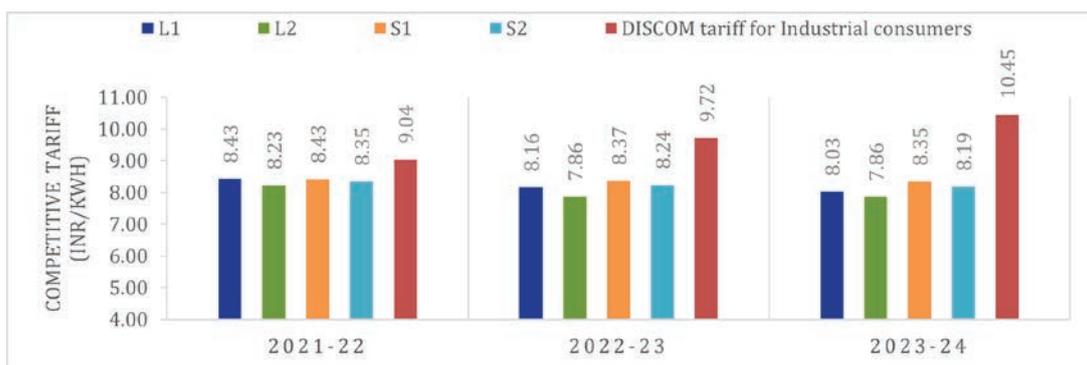


Figure 4: OA competitive tariff under case-1

Case 2 - 1,100 MW of OA demand catered to by utilising RTPS plant under both LTOA and STOA

RTPS's tariff would be lower by 27% in FY22 and 34% in FY24, than the existing tariff paid by industrial consumers to DISCOMs. In 2024, KPCL can generate additional revenue of INR 1,220 crores (under LTOA) by utilising RTPS and Bellary Thermal Power Station units. The additional revenue is over and above the annual revenue being generated (INR 8,380 crores) through existing contracts.

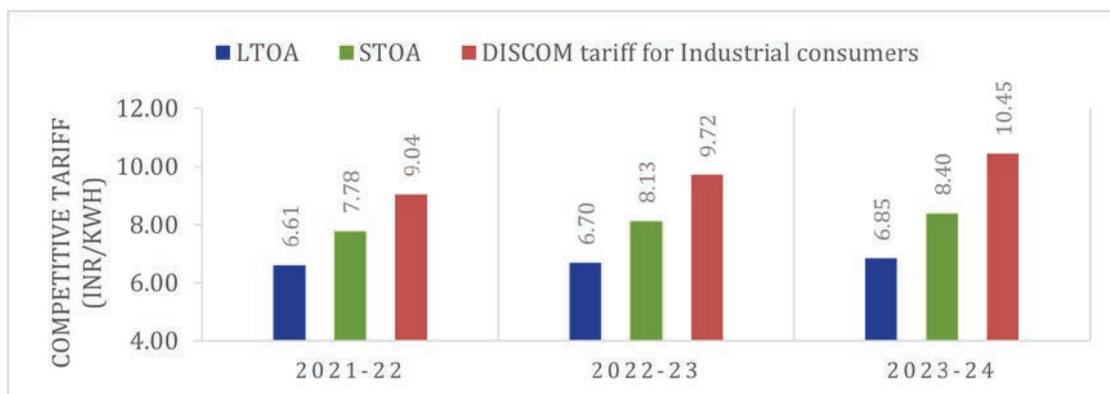


Figure 5: OA Competitive Tariff for RTPS under case-2

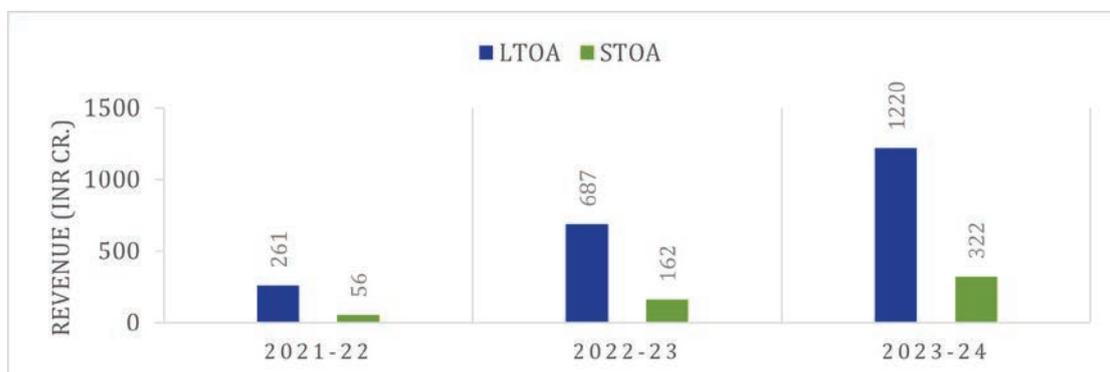


Figure 6: Additional Revenue to KPCL under case-2

Annexure

Table 1: Defining LTOA and STOA trade scenarios under Case-1

Base case	KPCL caters to only current industrial demand from its supply through DISCOM sales. This demand reduces over the years due to high RE generation in the state.
LTOA: Trading For (24x7)x365	
Scenario-L1	Targeting cumulative incremental industrial demand from 2021-24.
Scenario -L2	Incremental industrial demand + unserved industrial demand with 5% annual escalation.
STOA: Trading For 8 Day-time Hours	
Scenario-S1	Targeting cumulative incremental industrial demand from 2021-24.
Scenario-S2	Incremental industrial demand + unserved industrial demand with 5% annual escalation.

Table 2: Year-wise OA demand to be catered by KPCL under case-1

Open access demand (MW)	2020-21	2021-22	2022-23	2023-24
Total Demand from Select Industries	913	958	1,006	1,056
Base-Case	-	157	135	117
Scenario-L1	-	45	93	143
Scenario -L2	-	82	166	252
Scenario-S1	-	55	113	174
Scenario -S2	-	89	182	277

Table 3: Year-wise OA demand to be catered by KPCL under case-2

Scenarios	2021-22	2022-23	2023-24
LTOA: Trading For (24x7)x365	367	733	1100
STOA: Trading For 8 hours a day	367	733	1100



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