Enabling State Level Actions for NDC – Power Sector: Odisha

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Excerpt: Most states in India, today, face a paradox: We have a situation where key sectors, like power and transport, which fuel their economies are also the same one which are a major contributor to emissions. The challenge ahead is to transform these sectors in a way which they continue to enable economic progress, but also to reduce their carbon-footprint and contribute to India's Nationally Determined Contributions (NDC) Goals. While transition of major sectors is not easy, it can be done by making a series of interventions in the market that nudge the sector towards enhanced efficiency and create incentives which renewable options viable for power producers and consumers.

This paper makes actionable recommendations which can enable Odisha's power sector to make this transition successfully. Some ofthese recommendations include: enabling a gradual shift of the Captive Power Plants (CPPs) to the grid while assuring reliable power supply to industrial consumers; rationalising tariffs in way which addresses the current financial distress in DISCOMS; promoting an emission factor-based cap and trade scheme for power plants which phases out older-inefficient thermal and power plants.

To Access full paper and detailed Recommendations Read Here: [hyperlink to where the paper is hosted]

MacArthur Foundation

Abbreviations

CPP	Captive Power Plant
CS	Captive Shift
DISCOM	Distribution Company
EHT	Extra High Tension
GHG	Green House Gas
HT	High Tension
NDC	Nationally Determined Contributions
OREP	Odisha Renewable Energy Policy
PPAs	Power Purchase Agreements
RE	Renewable Energy
Ret.	Retirement
RPO	Renewable Purchase Obligation
ST	Super Thermal
TPS	Thermal Power Station
TTPS	Talcher Thermal Power Station

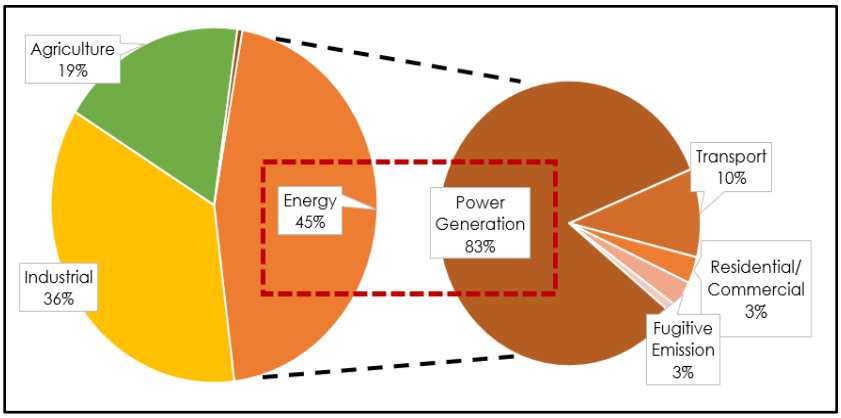
1 Introduction

The power sector is the largest contributor to GHG emissions in India and hencereducing the carbon footprint of this sector is essentialin achieving the goals of limiting climate change. Each state has its own sets of challenges in transforming its power sector. Thus, state-level actions are required to transform this sector and contribute to India's Nationally Determined Contributions (NDC) Goals. The NDC Goals that directly involve the power sector are Goal 3 i.e. reduction of emission intensity of GDP by 33-35% by 2030 over 2005 level and Goal 4 i.e. achieving 40% of cumulative installed capacity through non-fossil fuel resources by 2030.The challenge lies in incentivizing the policy options viz.to increase the efficiency by reducing the transmission,distribution & auxiliary losses; increase the share of renewable energy (RE) and renewable purchase obligation (RPO) compliance; reduce captive power generation and increase the reliability of power available so that efficiency is ensured both at the supply and demand side.

2 Background

The power sector plays a vital role in the development of an economy. Itis a major contributor to India's total GHG emissions with a share of 44% (Source: MoEFCC, 2018). In Odisha, power generation contributes approx. 83% of the state energy sector emissions (see Figure 1). Odisha has a per capita emission of 2.35 tons which is higher than the national average of 1.7 tons. It is thus essential to explore ways of limiting emissions from this emission-intensive sector. This study focuses on suggesting prevalent interventions for both supply and demand side as well as formulate additional ideas for implementing at policy and market level.

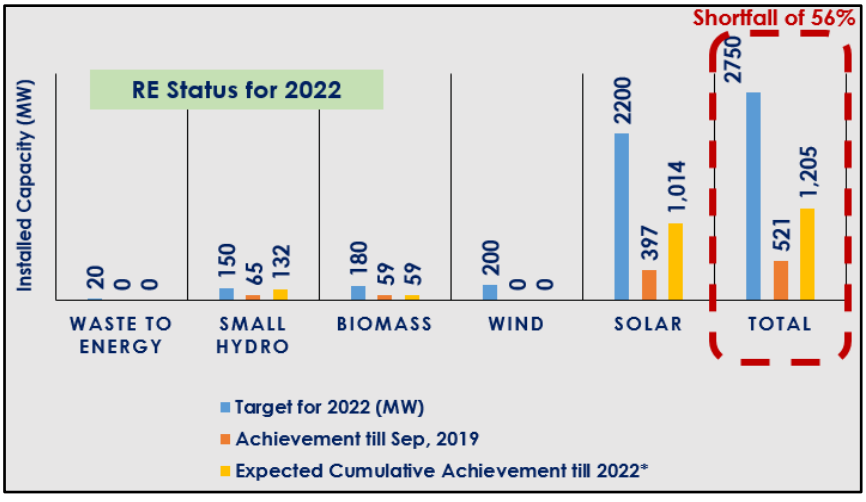
Figure 1:Odisha's total emissions in 2011-12 (%share)



3 Status- Odisha Power Sector

The total RE installed capacity target as laid down by Odisha Renewable Energy Policy (OREP), 2016 till 2022 is 2.75 GW. Figure 2 showcases the RE technology-wise: a target for 2022, achievement until Sep 2019, and expected achievement until 2022.A shortfall of 56% is evident in the expected cumulative achievement until 2022 as compared to the set target. A major hurdle in increasing the share of RE isthe high opportunity cost due to the existing power purchase agreements (PPAs) with thermal power plants (TPPs).Land acquisition poses another major problem for RE development in the state as significant RE potential land is located in forest and agricultural areas. Last but not the least, the weak economic condition of DISCOMs is another major factor that's hindering the shift to RE in the state of Odisha.

Figure 2:RE technology-wise: a target for 2022, achievement until Sep 2019, and expected achievement until 2022 for the state of Odisha

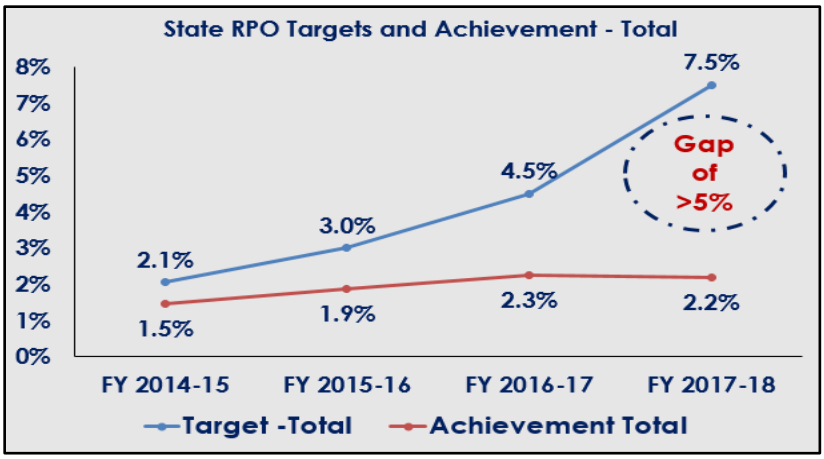


Source: Odisha RE Policy 2016, GRIDCO Tariff Orders and IRADe Analysis

RPO is imposed on the obligated entities to ensure that a fixed portion of energy, as specified by the State Electricity Regulatory Commission, is procured from an RE generating station. DISCOMs are important obligated entities as they are responsible for supplying power for usage across the state to various consumers. Figure 3 below, shows the total RPO and its compliance by Odisha DISCOMs achievedin FY 2017-

18. The compliance for the year was only 2.2% which was significantly short of the set target of 7.5%.The total RPO target for the state goes up to 11% by 2020.

Figure 3:State DISCOMs RPO Targets and Achievement – Total



Source: Department of Energy Activities Report 2018-19

4 Increasing the share of RE and fuel efficiency– Odisha Power Sector

The 19th Electric Power Survey (EPS) of India Report forecaststhe electricity demand in Odisha till 2026-27. It also provides perspective electricity demand projections for the years 2031-32 and 2036-37. IRADe researchers made calculations for the year 2030 (NDC target year)based on various scenarios and assumptions as given in Table 1. A progressive decrease in emissions from the base scenario is evident.

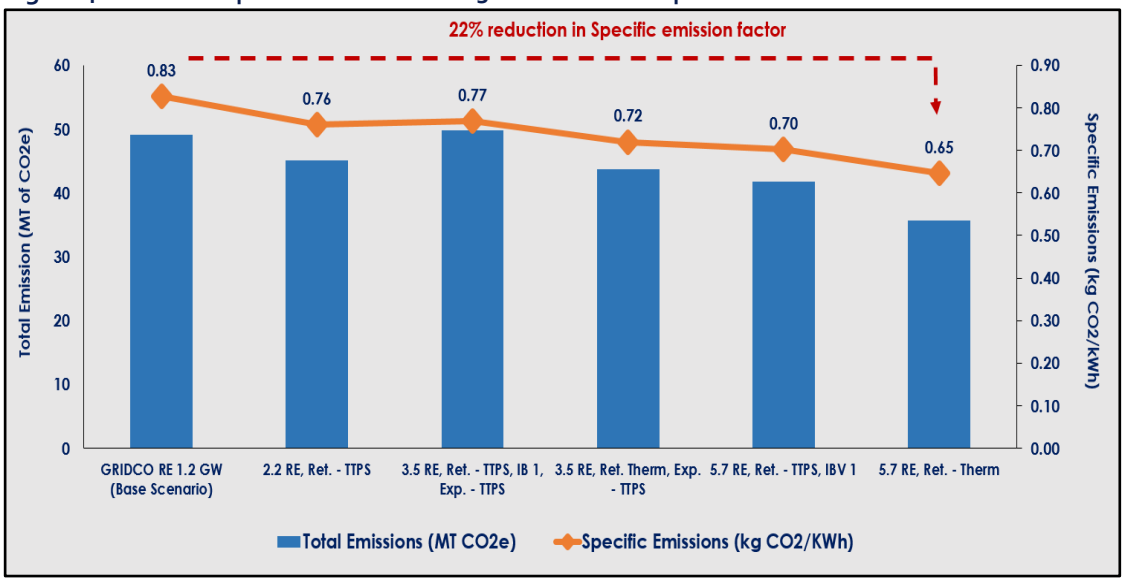
Table 1: Scenarios and assumptions for Odisha power sector in 2030

Scenario	Assumptions
GRIDCO – RE 1.2 GW (Base Scenario)	• RE Capacity of **1.2 GW** as per GRIDCO Tariff Order (2019-20) and no further growth of RE thereof
2.2 RE, Ret. –TTPS	• **2.2 GW** RE Capacity Addition of Odisha's share in**175 GW** target • ***Retirement**- Talcher TPS
3.5 RE, Ret. -TTPS, IB 1, Exp.- TTPS	• **3.5 GW** RE Capacity Addition of Odisha's share in **275 GW** target • **Retirement**- Talcher TPS & IB Valley TPS 1 • **Expansion**- New SC power plant in place of Talcher TPS
3.5 RE, Ret. -Therm, Exp.- TTPS	• **Retirement**- Talcher TPS, IB Valley TPS 1 & Talcher STPS
5.7 RE, Ret.- TTPS, IB 1	• **5.7 GW** RE Capacity Addition of Odisha's share in **450 GW** target • **Retirement-** Talcher TPS & IB Valley TPS 1
5.7 RE, Ret.- Therm	• **Retirement**- Talcher TPS, IB Valley TPS 1 & Talcher STPS

**TTPS = 460 MW, IB Valley 1 = 420 MW, Talcher STPS 1 = 1000 MW (Odisha's share is 305 MW)*

Figure 4 showcasesthe trend oftotal and specific emissions for the state of Odisha from the power sector in 2030. It is evident that by increasing RE capacity and retirement of older Thermal Power Stations (TPSs) an effective decrease in emissions can be achieved.

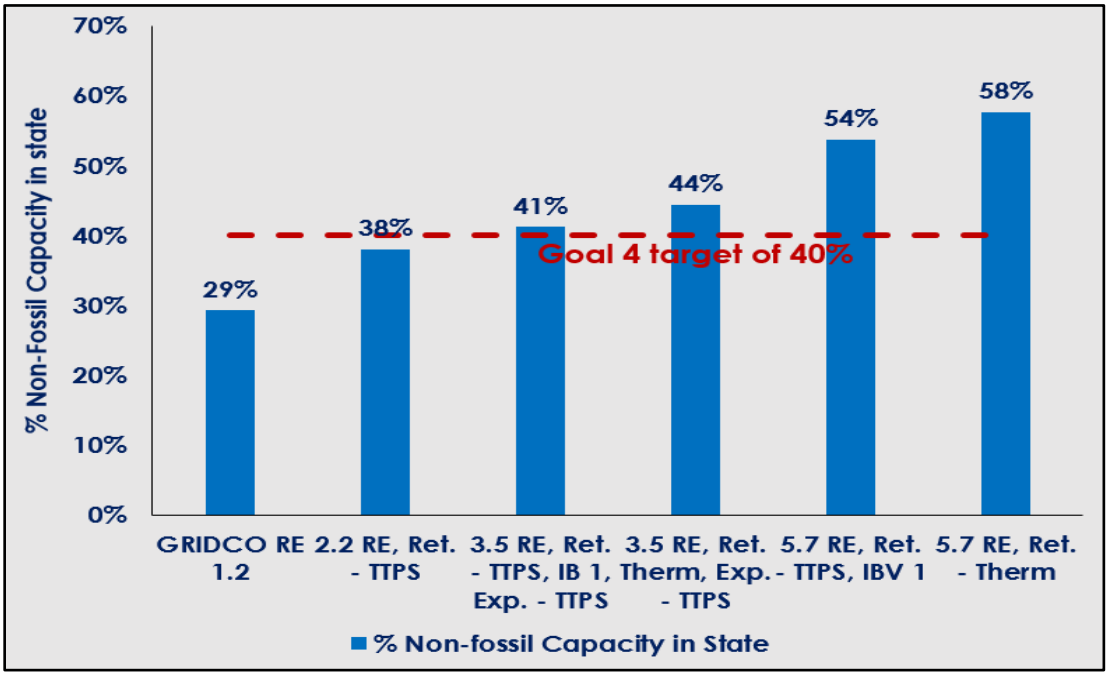
Figure 4: Total and specific emission in 2030 from Odisha's power sector



Source: IRADe Analysis

Figure 5 gives the installed capacity of non-fossil fuel-based resources in the state (Utilities only) by 2030. It is evident that at least 3.5 GW of RE is needed to achieve NDC Goal 4 target by 2030 in Odisha.

Figure 5: Percentage of non-fossil fuel-based installed capacity in Odisha (Utilities) in 2030 in various scenarios



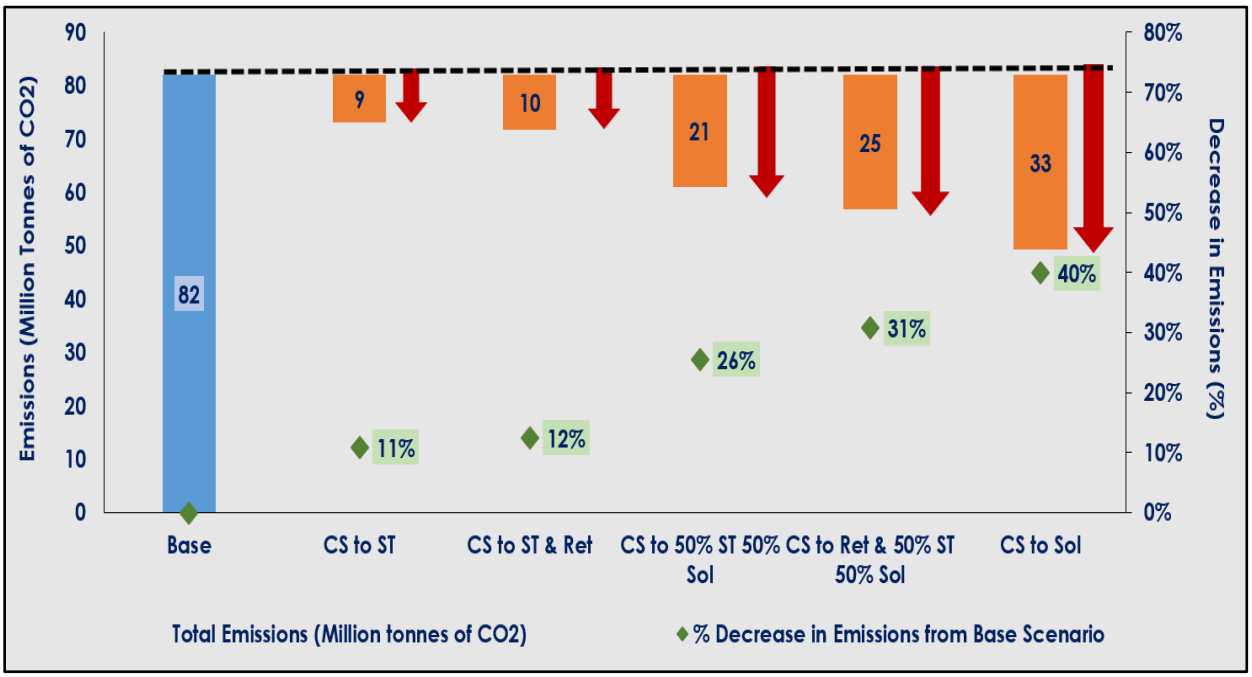
Source: IRADe Analysis

5 Shifting thermal captive capacities to grid

The state of Odisha being rich in minerals is home to various industries. Besides, the state is also rich in coal resources. Large industries in the state are supported by Captive Power Plants (CPPs) for their energy requirements.An analysis of around 70% sample of thermal CPPs in Odisha was done and it was found that the emission factor of the sample was almost 30% higher than the Odisha grid. Scenario study for analyzed CPPs in 2018-19 was done by shifting captives to the grid by adding additional super thermal capacities and solar capacities in different ratios.

Figure 6 shows when all the analyzed CPPs are shifted to solar, a 40% reduction in emissions from the base scenario was seen. Economic analysis comparing the tariffs of CPPs against the average charge of HT/EHT in the state revealed that industries will incur huge losses on shifting to the grid.

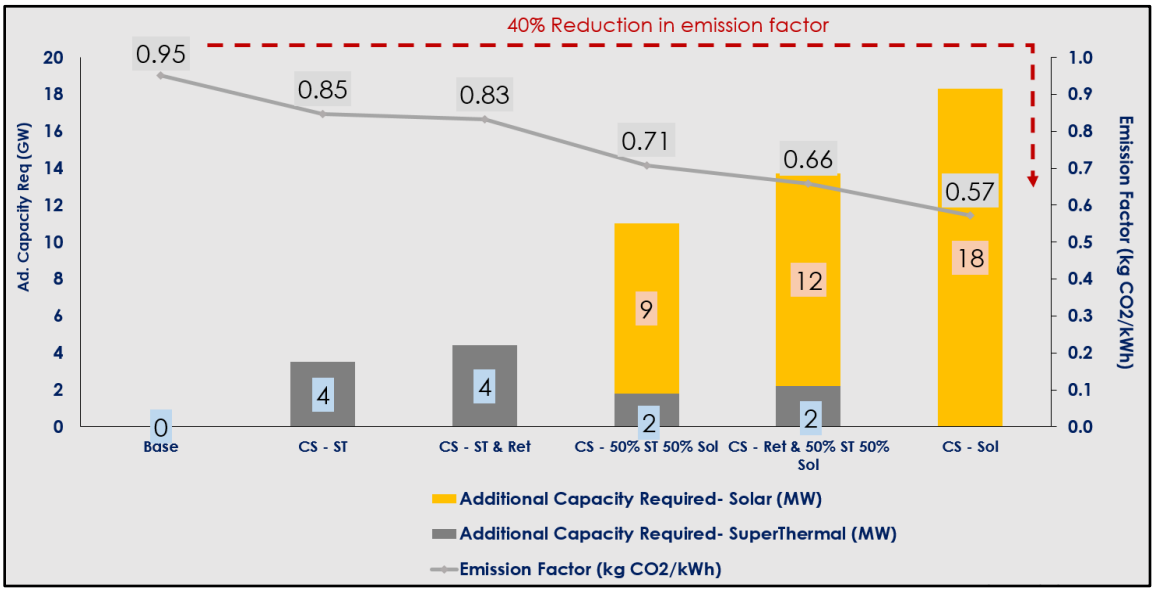
Figure 6: Emissions from the power sector in 2018-19 (including analyzed CPPs)



Source: IRADe Analysis

The average emission factor of analyzed CPPs was found to be higher than grid thermal (Coal) power plants by virtue of their size. Thus, it was concluded that the potential for emission reduction exists from shifting the CPPs into the grid.

Figure 7: Additional capacity requirements for Captive shift in 2018-19



Source: IRADe Analysis

Figure 7 displays the source-wise additional capacity required in each scenario in 2018-19. The tariff for two 200 MW CPPs was calculated based on the methodology used by CERC and landed cost of coal in 2018-19. The first CPP was assumed to be ten years old in 2018-19 and was termed old CPP, and the other CPP was assumed to be commissioned in 2018-19 and was termed as new CPP. The tariff of these CPPs was compared to the Average per Unit charge (HT) and average per unit charge (EHT) in Odisha in 2018-19.

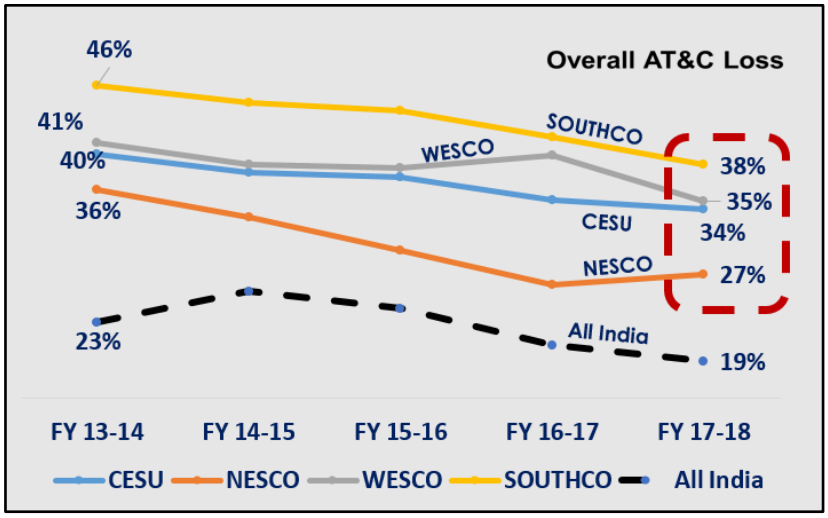
The analysis shows that large industries still have an economic advantage in setting up a new CPP rather than obtaining power from the grid. It is also evident that the industries incur losses even when the cost of power supplied is reduced to the average cost of supply in 2018-19 for Odisha. Overall around 30% reduction in tariffs is needed for such a shift to take place. The analysis shows that a clear emission reduction potential exists in shifting CPP capacities to the grid. However, losses that firms would incur on making such a move are also staggering. Thus, policy incentives are required to discourage new CPPs of smaller capacities to get installed and encourage old CPPs to shift to the grid.

6 Improving efficiency in the distribution system

AT & C losses in Odisha are higher than the national average, some of the key reasons are lower billing efficiency, lower collection efficiency, and defective meter supply in the LT division which comprised 53% of total sales in Odisha. Other reasons included the non-realization of billed energy and defective meters in the agriculture sector. An analysis of CESU in 2018-19 revealed that a reduction in technical losses of 10% could abate around 0.6 Million Tonnes of CO_2 annually.

Figure 8 shows that SOUTHCO has the highest losses among all the four DISCOMs with close to 40 paise per rupee of electricity purchased by the DISCOM lost. While the losses have come down for all the DISCOMs, the rate of loss reduction has failed to meet the targets identified by the state.

Figure 8: Aggregate technical and commercial losses - Odisha DISCOMs



Source: OERC Tariff Order for Discoms

7 Way Forward

a. **A gradual shift of the captive power plantsto the grid and no new installations of the same is required.**This would help decrease the emissions from the industries. For a smooth transition to occur, the reliability of the power to industrial consumers has to be ensured and the capacity of the grid should be increased accordingly.

b. **Tariff rationalization i.e. cost-reflective tariffs for industries should be promoted** because electricity is a large part of industries' spending. Thereby ensuring better utilization of the state's capacity and would also help the distribution companies to reduce their financial distress as technical and non-technical losses are lower for industrial supply.

c. **Renewable purchase obligationtrajectory for captive power plants**should be restored to promote increased renewable energy usage in the sector

d. Coal price distortions have negatively impacted the profitability of industries. **A uniform coal price should be promoted for all sectors**. It will also provide a financial leeway and thus enable the industries to have a renewable purchase obligation trajectory aligned with the distribution companies.

e. Nowadays, the cost of solar and non-solar renewable energy technologies is comparable thus **categorizing them with separate renewable purchase obligation targets should be rethought.**

f. **Distribution companies may avoid long-term contracts** in an evolving electricity market scenario as fixed cost commitment over the long term limits the freedom to choose cheaper power and also hinders the creation of an electricity market where prices are discovered in the most efficient way.

g. Higher emission factors were observed for some old plants and small size **captive power plants**. **Emission factor-based cap and trade scheme for power plants should be promoted** thereby resulting in the following:

- Retirement of inefficient thermal power plants and captive power plants
- Promote better utilization of more efficient power plants
- Provide a further push to renewable energy
- Promote innovation in existing power stations

h. **Canal top solar PV plants and floating solar plantsshould be promoted to tackle land availability issues.** The 'Hirakud dam' in Odisha is one of the largest dams with a vast canal network; also, the canal network of the Bargarh Canal division alone is more than 100 Kms.

i. **Demand-side management interventions help in reducing power requirements and eventually emission abatement** because the systems become more efficient and less power loss occurs. In a high existing technical loss system, as it is in Odisha, this may transcend to better result overall.

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Professor Jyoti K Parikh is the Executive Director of Integrated Research and Action for Development (IRADe), New Delhi. She was a **Member of the Prime Minister's Council on Climate Change –India and is a recipient of the Nobel Peace Prize awarded to IPCC authors in 2007.**Dr. Parikh has made valuable contributions to environment & climate change issues in developing countries. Dr. Parikh served as a Senior Professor at Indira Gandhi Institute of Development Research (IGIDR), Mumbai, and was the Acting Director of IGIDR during 1997-98. Recently, she has been appointed as the advisor for Global Commission on Adaptation set up by UN Secretary-General and Gates foundation managed by the World Resources Institute.

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