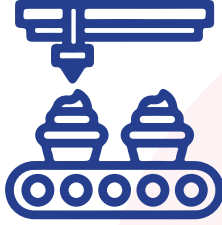




Scope for deep decarbonisation in MSME manufacturing sectors: Cluster report

Bakery, Coimbatore



Cluster Profile

Coimbatore has a prominent cluster of bakeries, housing approximately 700 establishments. Among these, six to 10 are medium-scale bakeries, while the majority comprises micro units. CSTEP conducted comprehensive energy audits in six selected bakeries in Coimbatore.

Location: Coimbatore

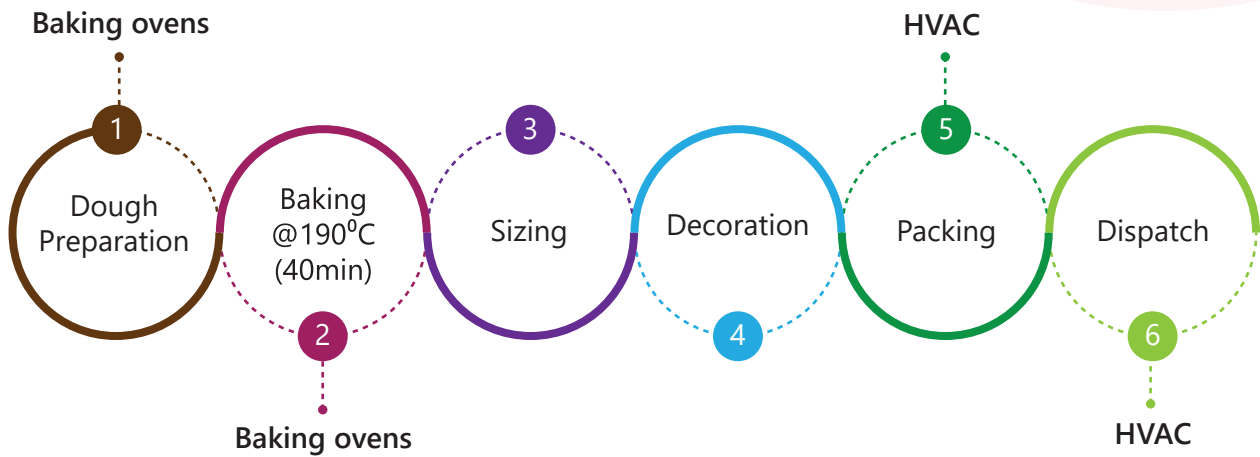
Sector: Bakery

MSME sample size: 6 (a mix of micro, small, and medium)

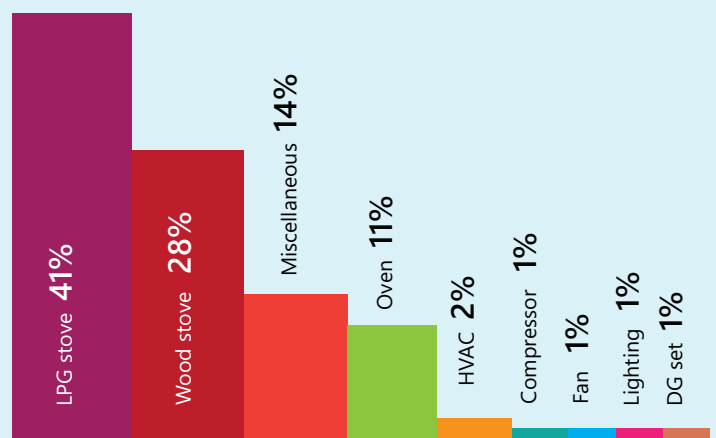
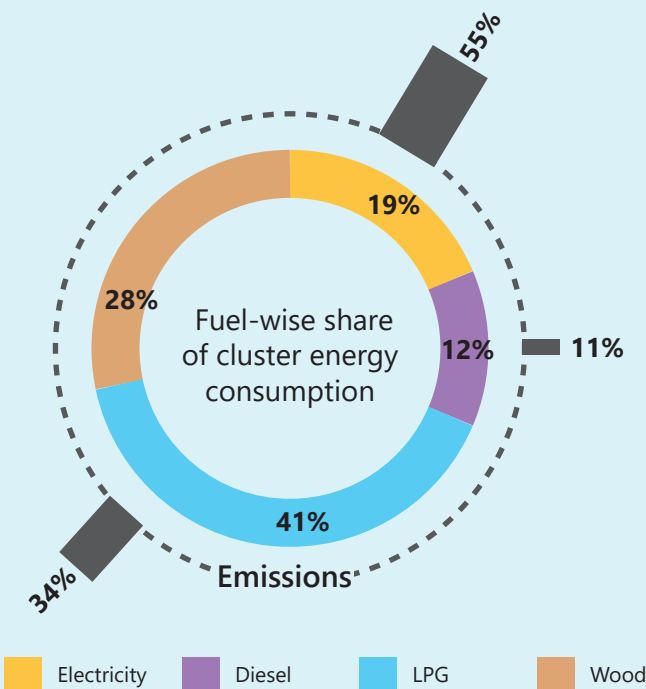
Products: Pastries; baked goods such as bread, cookies, buns; and savouries

MSME classification	Turnover (in INR crore)	Investment (in INR crore)
Micro	0–5	0–1
Small	5–50	1–10
Medium	50–250	10–50

Unit process diagram



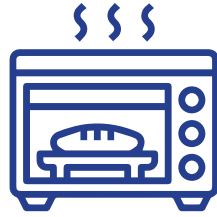
Energy Consumption Profile



Equipment-wise share of cluster energy consumption

Note: Miscellaneous equipment consists of lighting, fans, additional process equipment, and so on

Energy- and Emission-Intensive Equipment



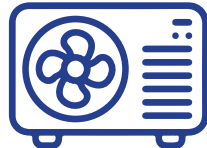
Baking ovens

Bakeries in the cluster use HSD- and LPG-fired baking ovens to bake goods. Only one surveyed unit has an electric baking oven.



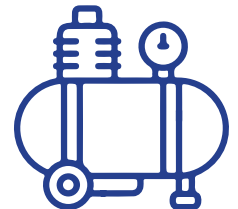
Cook stoves

Savouries are made in LPG- and wood-fired stoves.



HVAC

Refrigerators are used for cooling and preservation of products. In bakeries, refrigerators are high electricity-consuming equipment.



Compressors

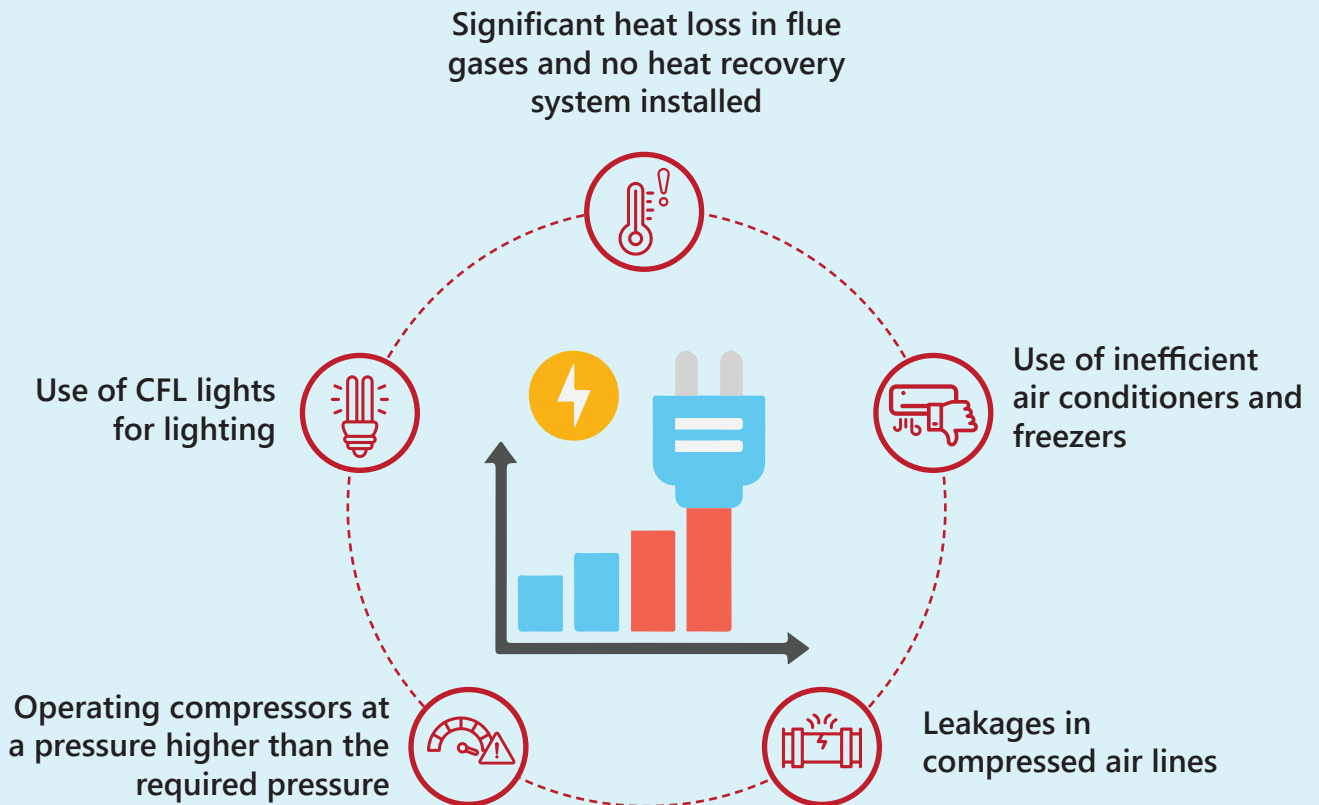
Used in refrigerated display cases to maintain the required temperature.



Other equipment

Slicers, kneaders, and blenders are some of the other baking equipment used in the bakeries.

Reasons for High Specific Energy Consumption (SEC)



Energy Efficiency (EE) Recommendations

- Optimise electric heater operation with proportional integral derivative (PID) controller **(medium term)**
- Energy-efficient air conditioners and freezers **(medium term)**
- Replacement of CFL lights with LED lights **(medium term)**
- Replacement of existing fans with brushless direct current (BLDC) fans **(medium term)**
- Waste heat recovery to preheat the water in the proving oven **(long term)**

Decarbonisation measure

Short term: <1 year

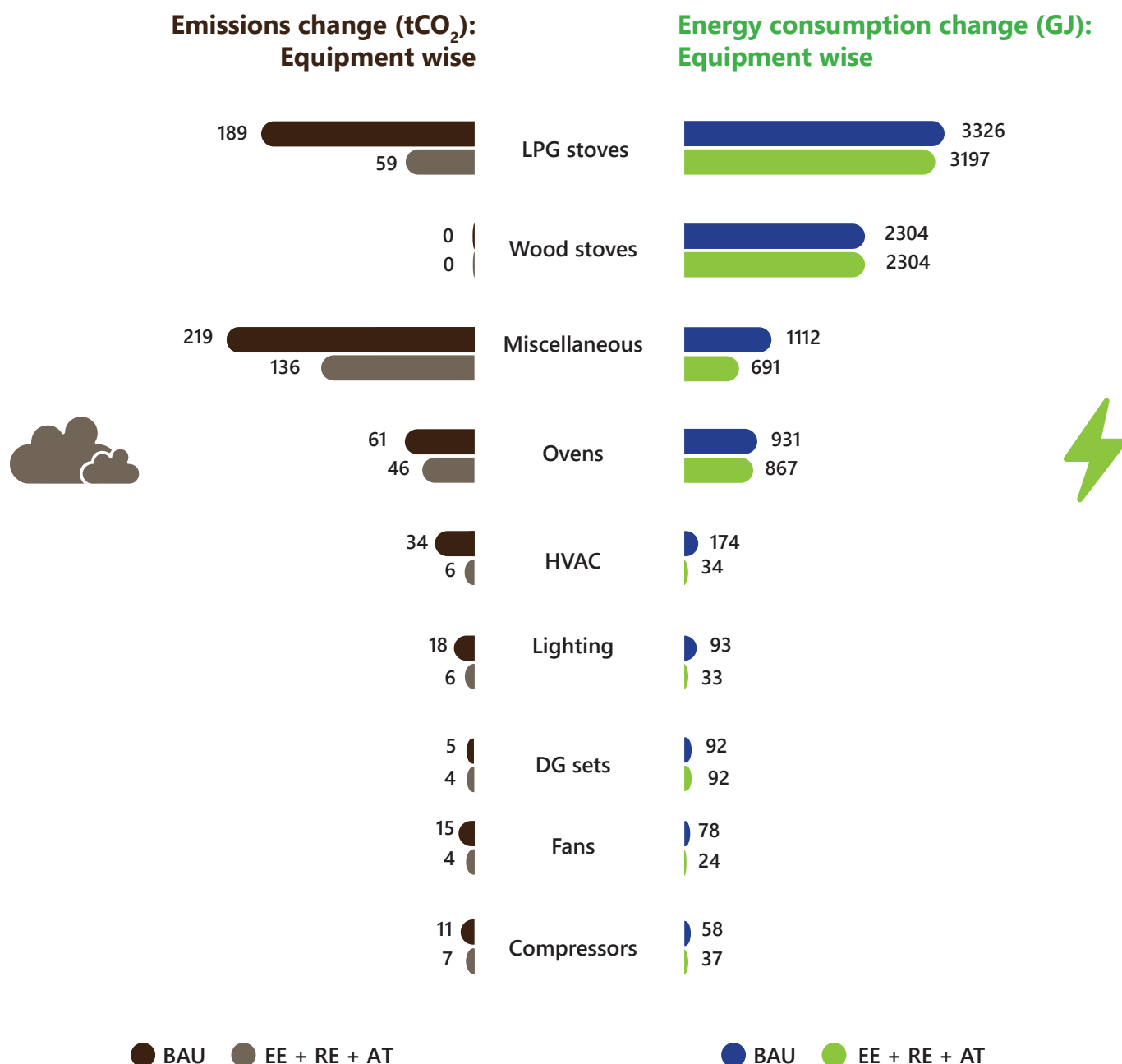
Medium term: 1-2 years

Long term: >2 years

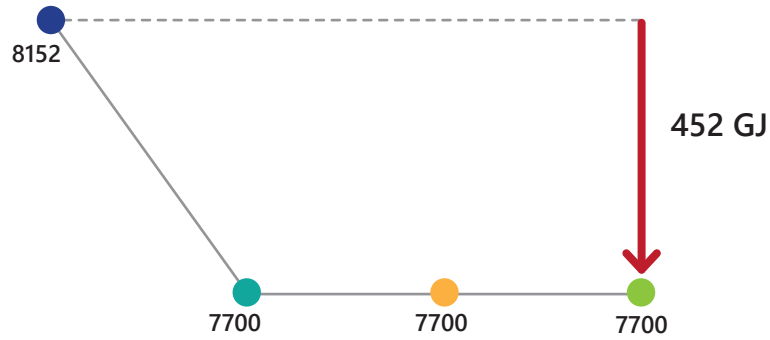
Techno-economic Analysis

A techno-economic analysis is carried out for a sample size of 6 units where energy, emission, and energy costs are modelled across four scenarios. The analysis shows the difference in each scenario and the impact of decarbonisation measures at various levels. The scenarios are as follows:

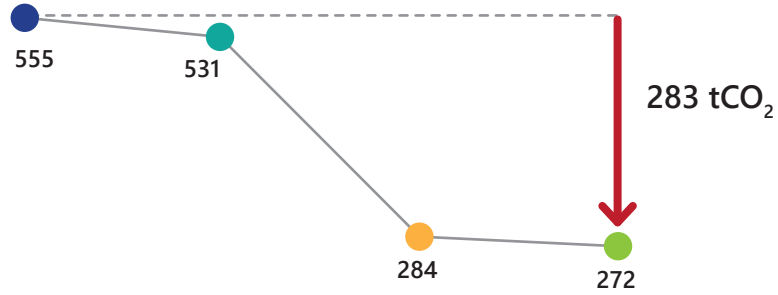
- **Business as Usual (BAU):** Without any interventions
- **Energy Efficiency (EE):** EE measures on existing equipment
- **Energy Efficiency with Renewables (EE + RE):** EE measures and renewable energy (RE) for electricity generation
- **Advanced Technologies (EE + RE + AT):** EE + RE measures and advanced decarbonisation technologies (clean fuels and process electrification)



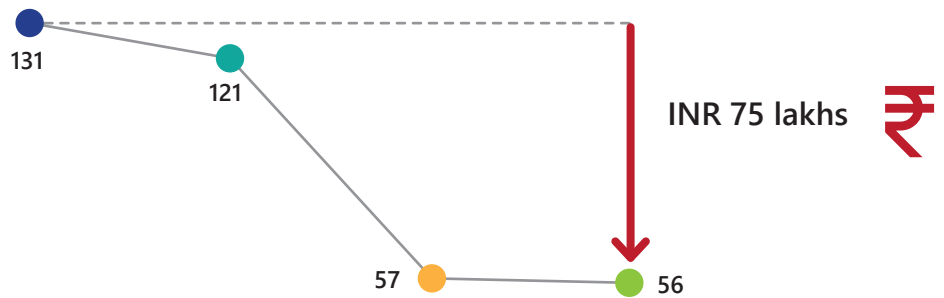
Scenario-wise reduction in cluster energy consumption (GJ)



Scenario-wise reduction in cluster GHG emissions (tCO₂)



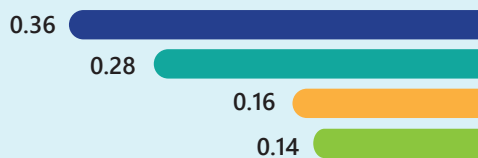
Scenario-wise reduction in energy cost within cluster (INR in lakhs)



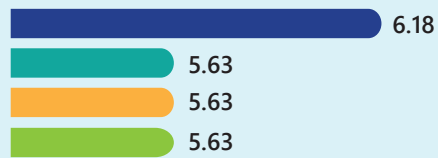
● BAU ● EE ● EE + RE ● EE + RE + AT

For a typical unit in the cluster, the change in energy and emission intensity of production is given:

Scenario-wise reduction in emission intensity (tCO₂/tonne)



Scenario-wise reduction in Specific energy consumption (GJ/tonne)

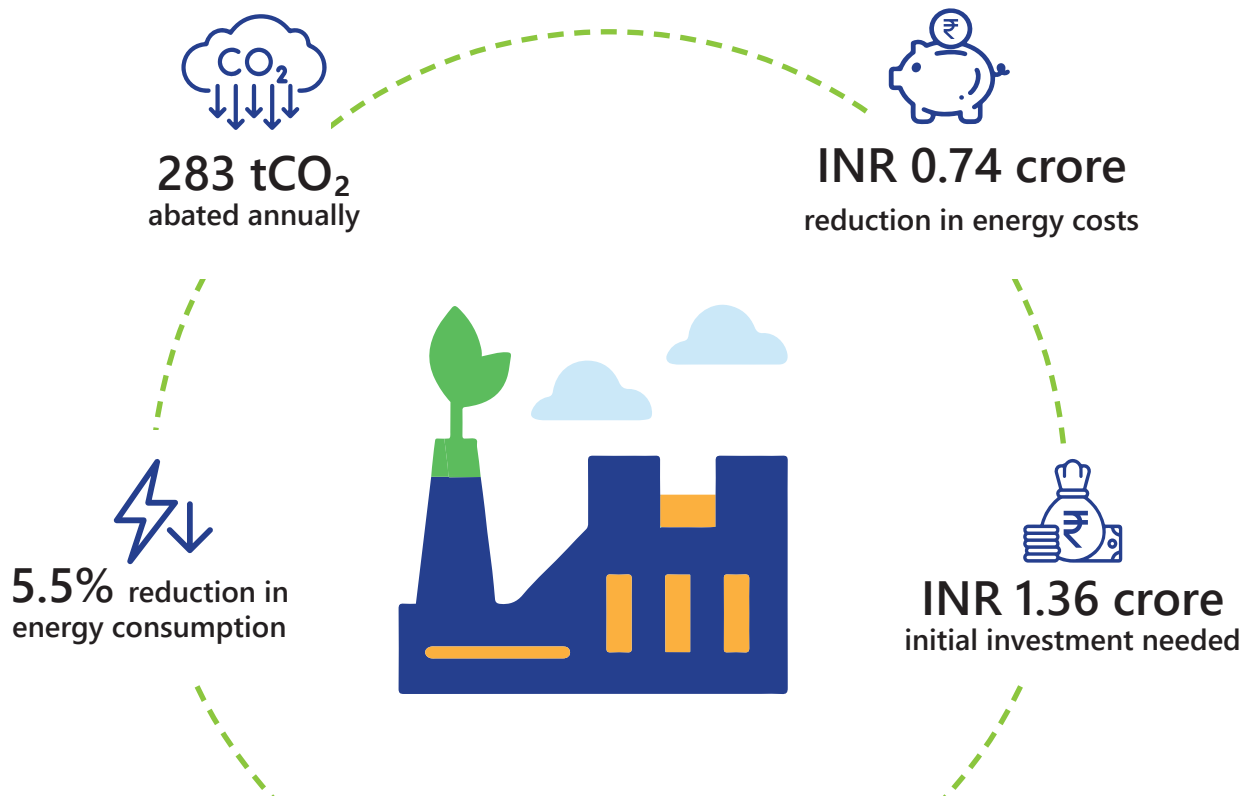


● BAU ● EE ● EE + RE ● EE + RE + AT

Advanced technology measures considered for cluster and impact

Equipment	Decarbonisation measure	Energy reduction	Emissions reduction	Investment cost	Payback period
All electric equipment	Installing rooftop solar	-	High	High	<5 years
All electric equipment	Using open access green energy from the grid	-	High	Low	Immediate
DG set	Biodiesel blending (20%) in DG set	-	Medium	Low	Immediate
DG set	Use of 100% biodiesel generator	-	High	Medium	<3 years
DG set	Conversion of DG set to battery	Medium	-	High	Not feasible
Oven	Biodiesel blending (20%) in diesel ovens	-	Medium	Low	Immediate
Cookstove	Electric heater instead of LPG stove	Medium	-		<2 years
Cookstove	Biomass gasifier instead of LPG stove	-	High	High	<2 years

Potential impact of decarbonisation measures



Way Ahead



Energy efficiency measures

Limited scope for energy efficiency measures (5.5% emissions and energy reduction). However, the installation of waste heat recovery systems and energy-efficient equipment such as freezers, lighting, and fans are helpful:

- Equipment likely to be eligible under PEACE implementation scheme. Facilitating more energy audits (energy audit cost subsidies and capacity building of state auditors) can have positive ramifications on the scheme.
- Setting local benchmarks for energy consumption
- Inclusion of energy-efficient technologies in the portfolio of banks
- Create awareness regarding energy audits and energy-efficiency measures
- Equipment benchmarks for energy consumption

Potential for using RE in units and increasing usage

- Since most bakeries have sanctioned loads of less than 50 kW, reducing sanctioned load requirements for open access would prove beneficial for them.
- Rooftop solar installation and the use of RE-specific financing schemes (e.g., MNRE)
- Reduce networking charges for RTPV
- Allow RTPV installation above the sanctioned load in the gross metering regime
- DISCOMs to provide power evacuation infrastructure for gross metering





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