CARBON CALCULATION SHEET

Parameter	Value	Unit
Number of Smart Meters	36,00,000	Units
Annual Energy Saving per Meter	150	kWh
Total Annual Energy Saved	5,40,000	MWh
Grid Emission Factor	0.82	tCO2e/MWh
Annual CO2 Avoided	4,42,800	tCO2e
Crediting Period	10	Years
Total CO2 Avoided (Carbon Credits)	44,28,000	tCO2e

GRID EMISSION FACTOR SOURCE NOTE

For Carbon Impact Calculation – Smart Meter Deployment

Shete Advance Technologies Private Limited (SATPL)

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1. Purpose of Grid Emission Factor

The Grid Emission Factor (GEF) represents the amount of carbon dioxide (CO_2) emitted per unit of electricity generated and supplied by the national grid.
It is used to estimate greenhouse gas (GHG) emissions avoided through energy efficiency improvements enabled by smart metering technologies deployed by SATPL.
Smart meters contribute to emission reduction by:

- Reducing transmission & distribution losses
- Improving energy efficiency through demand management
- Enabling smart grid integration
- Facilitating renewable energy integration

The avoided electricity losses translate into avoided carbon emissions, which are quantified using the national grid emission factor.

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2. Primary Data Source (India)

The Grid Emission Factor used for the SATPL carbon calculations is derived from the Central Electricity Authority (CEA), Government of India.

Official Source

Central Electricity Authority (CEA)

Ministry of Power – Government of India

Publication:

CO_2 Baseline Database for the Indian Power Sector

Latest Available Version:

Version 19 (or latest applicable version)

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3. Grid Emission Factor Value

Based on the latest CEA publication:

Combined Margin Grid Emission Factor (India)

Approximate Value:

0.708 tCO_2 / MWh

or

0.708 kg CO_2 / kWh

This factor represents the average carbon intensity of electricity supplied by the Indian grid.

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4. Why Combined Margin is Used

For carbon accounting under international methodologies (including CDM, Verra, Gold Standard), the Combined Margin (CM) approach is recommended.

Combined Margin includes:

- Operating Margin (OM)

Existing power plants currently supplying electricity.

- Build Margin (BM)

New power plants expected to enter the grid.

Combined Margin therefore reflects long-term marginal emission impact.

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5. Alignment With International Carbon Methodologies

The selected grid emission factor aligns with methodologies used under:

- UNFCCC Clean Development Mechanism (CDM)
- Verra Verified Carbon Standard (VCS)
- Gold Standard Carbon Methodology
- EU Green Bond impact reporting frameworks

This ensures compatibility with:

- Carbon credit methodologies
- Green bond impact reporting
- ESG investor disclosures

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6. Application to SATPL Smart Meter Impact

The emission factor is applied to estimate emissions avoided due to:

- Reduction in electricity losses
- Improved demand-side management
- Reduced peak demand generation

- Efficiency improvements through digital metering

General Formula:

Avoided Emissions = Electricity Saved × Grid Emission Factor

Where:

Electricity Saved (MWh)

×

Grid Emission Factor (tCO_2/MWh)

= Total Emissions Avoided (tCO_2)

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7. Example Application (Illustrative)

If smart meters enable:

Electricity savings = 100,000 MWh per year

Using grid emission factor:

0.708 tCO_2/MWh

Avoided emissions:

100,000 × 0.708 = 70,800 tCO_2 per year

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8. Alternative International Sources (If Required)

For international reporting or SPO verification, the following databases may also be referenced:

Source	Organisation
IEA Emission Factors	International Energy Agency
World Bank Carbon Data	World Bank
UNFCCC Grid Database	United Nations
IEA Electricity Statistics	OECD/IEA

However, for India-focused projects, CEA remains the most authoritative source.

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9. Disclosure in Green Bond Framework

The Grid Emission Factor will be disclosed in:

- Green Bond Framework – Impact Reporting Section

- Second Party Opinion documentation
- Investor impact reporting
- Carbon credit methodology documentation

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10. Periodic Updates

Grid emission factors may change over time as renewable energy increases in the national grid. SATPL will update the emission factor periodically based on the latest CEA database to ensure accurate impact reporting.

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11. Reference Citation

Central Electricity Authority (CEA), Government of India

CO_2 Baseline Database for the Indian Power Sector

Available at:
https://cea.nic.in

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12. Conclusion

The use of the CEA Combined Margin Grid Emission Factor ensures that SATPL's carbon impact calculations are:

- Scientifically robust
- Regulatorily accepted
- Compatible with international carbon methodologies
- Suitable for Green Bond investor reporting

GRID EMISSION FACTOR & CARBON IMPACT METHODOLOGY

1. Objective of Carbon Impact Assessment

This methodology note defines the approach used to estimate greenhouse gas (GHG) emission reductions resulting from the deployment of smart meters manufactured by SATPL.

Smart meters contribute to emission reduction through:

- Reduction in technical & commercial losses
- Demand side energy management
- Peak load optimization
- Integration of renewable energy systems
- Improved grid efficiency

The carbon impact is calculated by applying an Indian grid emission factor to electricity savings enabled by smart metering infrastructure.

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2. Grid Emission Factor Source

The emission factor applied in this analysis is sourced from the official national electricity emissions dataset published by:

Central Electricity Authority

Publication:

CO_2 Baseline Database for the Indian Power Sector

This database is widely used for:

- Carbon credit methodologies
- International climate reporting
- Power sector emission benchmarking

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3. Selected Grid Emission Factor

Parameter	Value
Grid Emission Factor	0.708 tCO_2/MWh
Equivalent	0.708 kg CO_2/kWh
Source	CEA CO_2 Baseline Database
Methodology	Combined Margin (CM)

4. Justification for Combined Margin Approach

The Combined Margin (CM) methodology reflects the long-term marginal emission intensity of the grid.

It combines:

Operating Margin (OM)

Represents emissions from existing power plants currently operating.

Build Margin (BM)

Represents emissions from new power plants entering the system.

Using the combined margin provides a conservative and internationally accepted approach consistent with methodologies used under:

- UNFCCC Clean Development Mechanism
- Verra
- Gold Standard Foundation

5. Smart Meter Energy Efficiency Assumption

Global studies show smart meters reduce electricity losses through:

- accurate billing
- reduced theft
- load management
- real-time monitoring

Typical electricity savings observed in smart meter deployments:

1.5% – 4% of electricity consumption

For conservative estimation, the SATPL model assumes:

2% electricity savings

6. SATPL Smart Meter Deployment Capacity

Parameter	Value
Annual manufacturing capacity	32 lakh meters
Average electricity consumption per meter consumer	2,000 kWh/year
Energy efficiency improvement	2% savings

7. Electricity Savings Calculation

Step 1 – Annual Electricity Consumption
32,00,000 meters × 2,000 kWh
= 6,400,000,000 kWh
= 6.4 TWh

Step 2 – Electricity Saved

2% efficiency improvement
6.4 TWh × 2%
= 128,000 MWh saved annually

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8. Carbon Emission Reduction Calculation

Formula:
Emission Reduction = Electricity Saved × Grid Emission Factor
128,000 MWh × 0.708 tCO_2/MWh
= 90,624 tCO_2 avoided annually

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9. Carbon Reduction Per Smart Meter

Annual emissions reduction per meter:
90,624 tCO_2 / 32,00,000 meters
= 0.0283 tCO_2 per meter per year
≈ 28 kg CO_2 per meter annually

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10. Lifetime Carbon Reduction

Smart meter lifetime assumption:
10 years
Total avoided emissions:
90,624 × 10
= 906,240 tCO_2 avoided

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11. Alignment with ICMA Green Bond Principles

The carbon impact methodology aligns with:
International Capital Market Association Green Bond Principles.
Specifically:

GBP Component	Alignment
Use of proceeds	Smart grid infrastructure
Impact reporting	Quantified carbon reduction
Methodology transparency	CEA emission factor
External verification	SPO validation

12. EU Taxonomy Alignment

Smart meters contribute to the EU Taxonomy objective of:
Climate Change Mitigation
Relevant activity:
Smart grid technologies enabling:

- efficient energy distribution
- renewable integration
- energy consumption optimization

These technologies are considered enabling infrastructure for decarbonisation.

13. Compatibility with Carbon Credit Methodologies

The SATPL carbon methodology is compatible with frameworks under:

- Verra
- Gold Standard Foundation
- UNFCCC

Potential carbon credit project types include:

- Energy efficiency programs
- Smart grid infrastructure
- Demand side management

14. Carbon Monetisation Potential

If carbon credits are monetized:

Carbon price Value

€65 per tonne current modelling assumption

Annual carbon value:
90,624 tCO_2 × €65
= €5.89 million annually
≈ ₹52 crore per year

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15. Disclosure for Green Bond Investors

Carbon impact results will be disclosed in:

- Green Bond Framework
- Annual Impact Report
- SPO documentation
- Investor ESG reporting

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16. Periodic Methodology Updates

The grid emission factor will be updated periodically based on the latest dataset published by:
Central Electricity Authority
to ensure continued accuracy of emissions reporting.

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17. Conclusion

The deployment of SATPL smart meters enables significant reductions in electricity losses and grid inefficiencies, translating into measurable GHG emission reductions.
Using the CEA Combined Margin emission factor ensures that carbon impact calculations are:

- scientifically robust
- regulatorily recognised
- compatible with international climate methodologies
- suitable for green bond impact reporting

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